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VOLUME 2 NUMBER 1

THE AMERICAN BLACKSMITH

BUFFALO N.Y. U.S.A.

A PRACTICAL JOURNAL OF BLACKSMITHING

OCTOBER 1902

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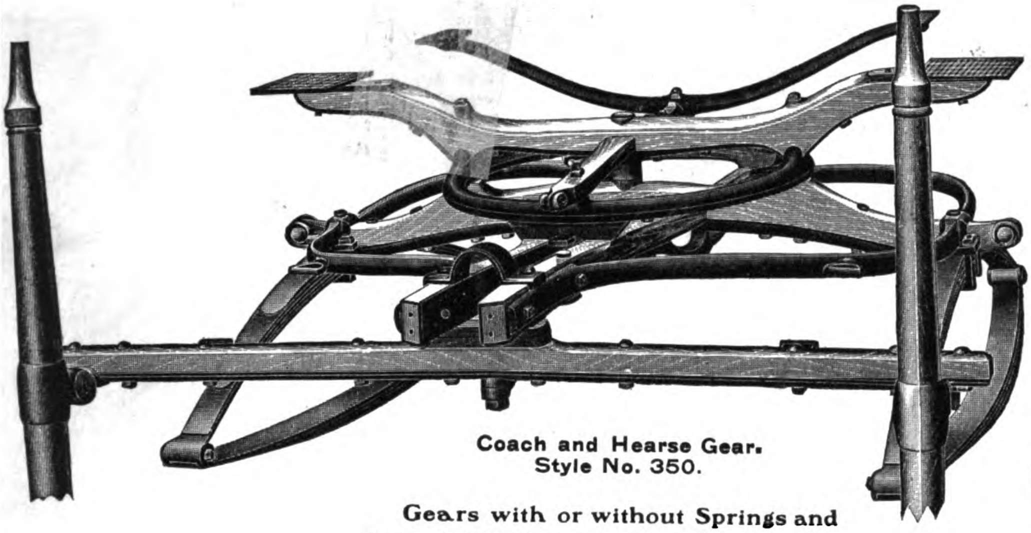

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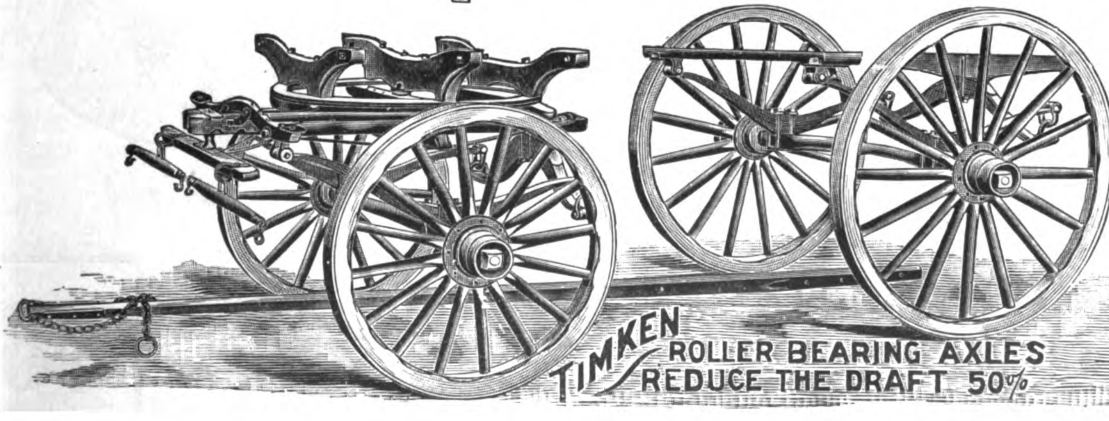

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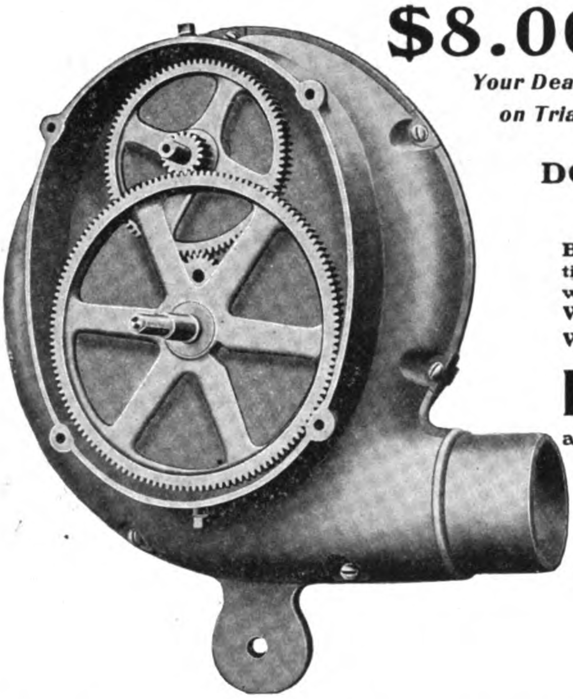

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THE AMERICAN BLACKSMITH

A PRACTICAL JOURNAL OF BLACKSMITHING.

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What Are the Advantages of a Gas Engine?

For the benefit of those readers who may be thinking of putting an engine in their shops, a cash prize of $5.00 will be given the person contributing the best article upon this subject from the blacksmith's standpoint on or before October 31st. If you have an engine in your shop, tell us plainly and to the point whether you consider the investment a good one. What are the special benefits which come from putting in power? How large should a shop be, in your opinion, before it could install an engine to advantage? If you are in a position to tell us something on this subject and have not yet done so, send in your letter without delay. Your experience should aid your brother craftsman in deciding his wisest course in this important matter.

America's Women Blacksmiths.

According to the official count of the returns of the twelfth Census, there are in the United States one hundred and ninety-six female blacksmiths. Although the proportion is of course a small one, it goes to show that if there are this many female blacksmiths in the United States, no craft or profession is secure from invasion by them. We wish them all prosperity. Of this number the greater part, it is to be supposed, are conducting the business of a deceased husband. Some there must be, however, who get down daily to the actual use of the hammer, making the sparks fly, like the boys. We would like to learn of these particular women blacksmiths. Do any of our readers know of a real woman blacksmith? We will suitably reward any one who will send us the name, address, and if possible a photograph, of any of these daughters of toil. We would prefer photographs of them at work, if they are to be had.

Keeping Up With the Times.

What proportion of your profits are you spending on new tools, improved machinery, helpful literature and other aids in the industrial race? What are you doing, in other words, to keep up with the times? It is characteristic of the large successful manufacturer of these days that he throws machines out of his shop, not when they become worn out, but when improved machines may be had which will do the work quicker, better or cheaper. It is just as important for the small manufacturer and artisan to thus keep abreast of the times as it is for the larger manufacturer. Don't think that because the other fellow is satisfied to get along always with the tools of his ancestors that you also must needs do the same. Be a leader and not a follower. Increased trade invariably follows an exhibition of enterprise on the part of anyone.

How much money are you spending for new tools? What books and journals relating to your work are you reading? How are you keeping abreast in the march of progress? Have you for instance considered whether it would pay to put in an engine? It is but little trouble to obtain an estimate of the cost of improvements or new equipments. The advantages are usually most readily apparent and well worth considering.

Volume Two.

The present issue marks the beginning of a new volume. A few words as to the ensuing publication year would not be out of place. The general policy laid down by THE AMERICAN BLACKSMITH at the beginning of the first volume will be followed out, unaltered. The idea is to give the blacksmithing, horseshoeing and carriage building public a modern trade journal which will be a direct aid to their every day work, a paper worth all and more than its subscription price. The reading columns of THE AMERICAN BLACKSMITH are for its readers, first, last and always, and matter for those pages is selected solely on the basis of its interest and value to readers. No considerations of advertising will influence the insertion of any matter in these columns. The ordinary trade puff and its colleagues, the stale clipping and funny story, will be conspicuous by their absence. Twenty pages of reading each month, all meat and no chaff, is the guarantee to subscribers. The staff of regular contributors embrace the foremost craft authorities in their respective fields.

The journal in the coming volume is to be bettered in many respects, the standard maintained or raised. Our idea is to secure introduction of the paper to a large circle of readers, feeling assured that after a year's acquaintance, none will care to do without it. When your subscription has expired, the publishers will appreciate the encouragement which a prompt renewal gives them.

The Decorative Spirit.

An increasing tendency toward ornamentation seems to be one of the evidences of our advancing prosperity. A nation, in effect a composite individual, once overriding the shoals of forced economy, devotes an ever increasing quota of attention to art and culture. Evidences of this spirit are to be seen on every hand. Architecture is its veritable handmaiden. The metal

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worker feels its influence also. Utility comes with him to be less and less the sole consideration. The straight lines, the sharp angles and the bare outlines of our iron work give way to forms of surpassing grace and symmetry. The value of the decorative side should not be underestimated.

The accompanying engraving shows a handsome wrought-iron piece from the forge of John Booth, 114 E. Lake Street, Chicago, Ill. It is hand-work throughout, the leaves being cut on a band saw and hammered into shape.

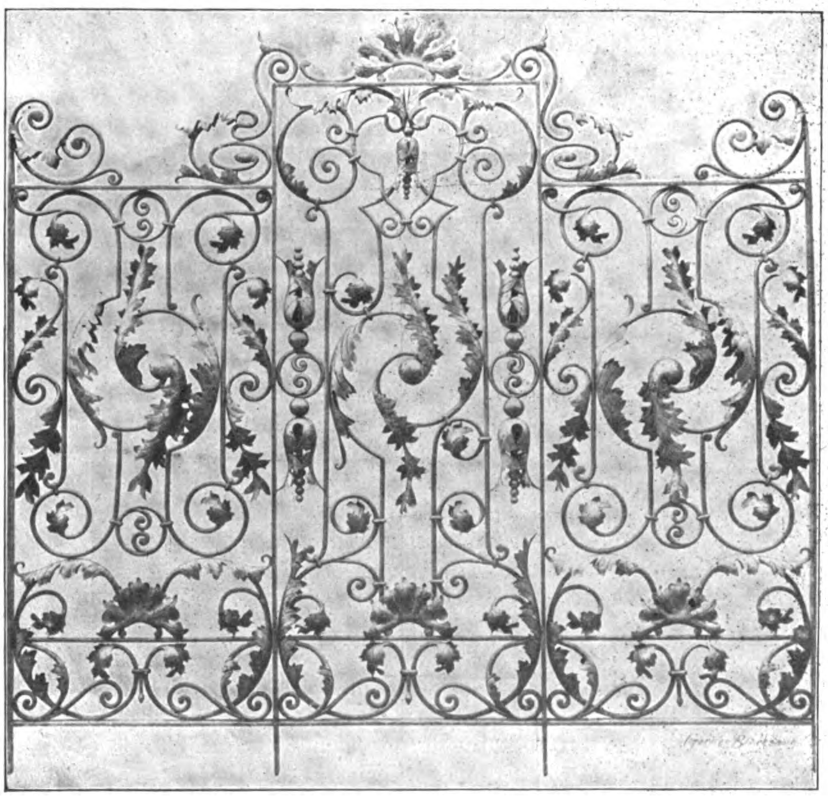
Axle and Tire Setting.

SANDFORD GRIMES.

In filling a patent hub, I first take all the rivets out, take the hub apart, make the flanges true and smooth. Then I put the hub together, leaving the box out. I have a $1\frac{1}{8}$-inch rod with good threads and with a ring welded around it about ten inches from the thread end, large enough to cover the end of the hub well. The rod extends down and has an eye on the end to fasten to the wheel bench. I put this rod through the hub, then cut my spokes just to fit the hub, dip them in hot glue and drive them nearly straight. I have a wrench six feet long that gives me great leverage. I tighten down a little and then drive the spokes up or almost up. Next I take the wrench and tighten all it will bear and then put on the rim and leave a good opening. Put on the tire next, good and tight, and settle the spokes by striking on each one of them. Then put the rivets in, leaving a good round head on them. Now loosen the clamp and put the box in, and the wheel is done.

In setting axles, $\frac{7}{8}$ of an inch up to one inch, I give $\frac{5}{16}$ of an inch gather, and see that both wheels are the same. Then set to a plumb bottom spoke, which leaves the width about five feet one inch on most common buggies. The standard track being five feet two inches, it will let the buggy follow the wagon ruts on rough roads, as the rims are narrow.

As to setting tires on a wheel that is solid with nothing more the matter than a loose tire and spokes loose in the rim, I wedge the spokes, setting wedge crosswise with the rim, then cut off the end of spokes just below the rim so that the tire will not rest tight against it. Then I shrink the tire on both sides about the same. If very loose, I give about $\frac{1}{8}$ inch draw on a low wheel. Then heat tire, not hot enough to burn wood, put on, and if there are no openings in wheel, I put bolts in by the time the tire is cold without boring the felloes any.



A HANDSOME SPECIMEN OF ORNAMENTAL IRON WORK.

Cutter and Sleigh Painting.

M. C. HILLICK.

The close of the country fair season brings to the paint shop a period of profitless hours, which in the snow belt of country can be remedied to a large extent. The season of sleigh painting, as seasons go, is not overflowing with the milk and honey of enormous profits, but it offers, if wisely used, substantial remuneration for the outlay of labor and material. THE AMERICAN BLACKSMITH in previous issues has clearly pointed out the necessity of uniting business talent with mechanical skill in the management of the carriage paint shop, and this rule applies no less forcibly to the smallest shop visited by the BLACKSMITH than it does to the imposing city establishment with its brigade of silk hat painters; and in respect to seasons, it has application with greater emphasis to the cutter and sleigh season than to that of the carriage and wagon. For of all vehicles which afford comfort and pleasure to the public, the cutter or sleigh is by far the most elusive, or rather, is made so by its owner.

In odd niches and dark corners, from cellar to hay-loft, the sleigh equipment is found secreted, and it often requires first-rate detective ability to disclose the whereabouts of said equipment before snow fall. Hence it is a case of getting out and coming in personal contact with the sleigh owner, and using the expert logic of business, in order to meet your competitor half way and acquire at least a fair share of local trade. The time to harvest the cutter and sleigh crop is when the crop is ripe, and the harvesting season is principally confined to the latter portion of October, throughout November and the greater part of December.

In respect to the cutter and sleigh painting, if these vehicles do not come to the painter, then the painter should come to them. The sleigh owner is almost invariably slow in moving his equipment to the paint shop. Naturally he desires to feel the chill of winter in the air and see "a tolerable run of sleighing" before seeking the painter. Then in a state of great impatience he invokes that personage's aid in getting the cutter or sleigh into the whirl of public gaiety. In view of which it is the first duty of the painter to get the sleighs in early. You may depend upon enough belated trade to keep the shop busy at the latter end of the season. Get in the equipment early and keep it moving. As a rule, the earliest run of cutter and sleigh work yields the largest profits. This present season should be an exceptionally profitable one for the painter located within the sleigh-using zone. Wonderfully favorable

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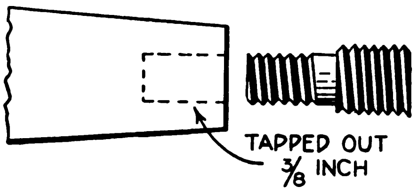
shop and trade conditions are everywhere present. Money is plenty, the confidence of the business world is at a high tide, and the people who use the sleigh equipment in this country are amply prepared to keep the painter busy, if hustling business methods are employed to bring about that result. As compared to prices paid for carriage work, sleigh painting rates are low, but compared to the required processes of carriage work the processes of sleigh work are easy and much more quickly carried forward. While the public is more critical now than formerly in respect to sleigh surfaces, there is the important and unsurmountable advantage of having the surfaces below and inconveniently out of line of the public eye. Less expensive varnishes suffice for sleigh work. Many colors which would otherwise remain unused upon the paint shop shelves may be worked over and tricked out with charming results upon the sleigh equipment.

When the cutter or sleigh is to be simply touched up and revarnished, but little unhanging should be done. Remove the shafts. With a soft sponge wet and dipped into No. 00 pumice stone go over the body surface just enough to remove the dirt motes, greasy accumulations, etc. Then wash up, and match the color, touching up sparingly. At best, touching up with match color is a difficult work, and the least touching up possible is always the best. If a coat of color, re-striping, and one coat of varnish is desired, sand over with No. 1 sand paper, dust off, and lay the color to dry flat. Stripe in due time and apply a heavy bodied, hard-drying, finishing varnish. In case the job is to be surfaced upon roughstuff the processes which govern in carriage work will apply, only less coats will be sufficient. The style in colors and striping embrace, for colors, popular reds, yellows, greens and varying combinations of these colors, and for striping, single and double line effects, with simple, but nicely wrought out, corner pieces. These colors apply particularly to cutters and light speeding sleighs. Deep, rich reds and light tints of yellow, striped with aluminum or gold, are notably popular for the lighter style cutter. The big, luxurious old comfort cutter, and its various relatives, along with two-seated pleasure sleighs, rule fashionable painted in the three shades of ultramarine blue, in the dark, handsome greens, popular on cabriolets, broughams and landous, and in maroon. Moldings are painted black, and the striping is selected to harmonize perfectly with the panel colors, the single line striping, with a dainty, cut up corner piece being preferred.

Repairing the Broken Thread End of an Axle.

J. F. COLLICOTTE.

I will endeavor to give you an idea of a piece of work I did the other day, which I never saw done before. A customer came to my shop with the



REPAIRING AN AXLE THREAD END.

thread end broken off of his buggy axle. I took an old axle and cut off the thread end a little above the threads, drew that end down to ⅜ inch and cut threads on it, as shown. Then I drill a hole in the end of the broken axle, tap it out, screw in the piece, braze, and have a solid job.

A Rough-and-Ready Remedy for Worn Axles.

E. C. JOHNSON.

I have a great many wagons and carriages to handle, the axles of which are so worn that the vehicle sways greatly when running. I have a quick way of repairing which makes them run true for a long time.

First I raise the axle with a wheel-jack, and before removing the wheel shake it to get an idea as to how much metal it will take to fill the worn box. After removing the wheel, I wipe out the oil and grease from the box, and take the wheel to the anvil. Taking a piece of iron or steel, I draw it out about ⅞ inch wide and thick enough so that when driven in the box, the wheel will fit tight on the axle. In other words it is simply a ⅞-inch band driven into the box to fill out the worn places. Steel will wear longer than iron, but is a trifle harder to shape. The ends must be filed square to prevent them slipping by each other. The thickness of the band depends of course upon the amount of wear. As a rule, the wheel will not quite go on, so that I file the spindle up next to the shoulder on each side. If you do a good job, there will be no wabble to the wheel and it will run smooth and tight, unless there is much wear at the front end of the axle.

The bands I use are mostly ⅞ by $\frac{1}{16}$ inch thick. I have put in a number of sets of bands at one dollar per set, and many customers say they like them better than cutting off the axles.

How to Install a Gas Engine.

BILLY BUNTZ.

When putting in a gas engine, the first question for the smith to ask himself is, "About how much power do I require?" and in answering it, he should figure not only on the amount which will be necessary to meet his present requirements, but he should add a little for surplus, and get an engine big enough so he may hitch on another machine or two in the future, especially if there be any likelihood at all of this ever becoming necessary. Anyway, it is best not to figure too close. A surplus of a half or a full horse-power is a good thing, as an engine which is a little large will run the machines faster and easier, and there will be no danger of straining it. The reason some gas engines give trouble is because they are required to pull too heavy a load, and therefore after a time become as an overworked horse, and only "hobble along." It seems to be the nature of man to expect a little more of everything than he is likely to receive.

In a shop which has a full complement of small machines, hammer, drill press, lathe, emery wheel, polisher, blower, saws, etc., it may be that only two or three of these at most are to be worked at constantly, the other machines being switched out or allowed to run light, in which case only about half the power will be required as were several men to work at them continually, as in a machine shop or factory. In operating the above number of machines for a couple of men, a 2½ or 3-horsepower engine should be used, while if three or four men are to work at them at one time the engine ought to be of 4 or 5 horse power. It is really surprising the number of machines a 3-horsepower engine is capable of pulling. A one or 1½-horsepower gas engine will pull a small blower and an emery, but if other machines are to be added it is better to have a larger engine. Many of the gas engines have valves for regulating the supply of gasoline, so that the consumption of oil is in proportion to the pull, as, for instance, a 3-horsepower engine when pulling only one horse-power can be adjusted so that the consumption of gasoline would be the same as though it were a one-horsepower engine, and at the same time the additional power is there to be used when needed.

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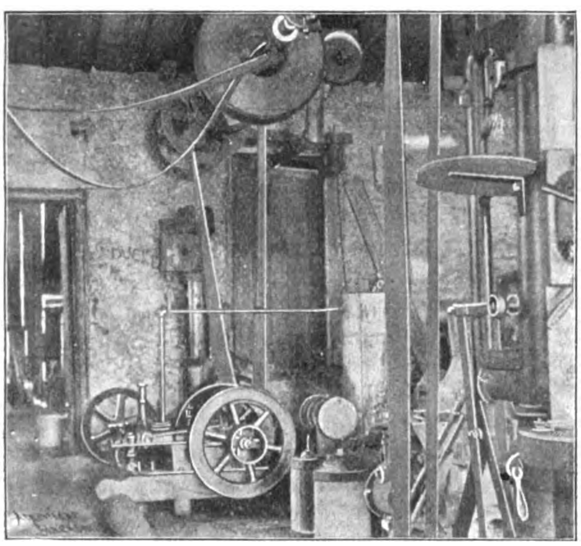
The exhaust from the cylinder is usually muffled by a "silencer" of some kind, such as a pipe provided with a bell-shaped cap. Some smiths run the exhaust pipe outdoors into a little hole in the ground which entirely muffles the sound.

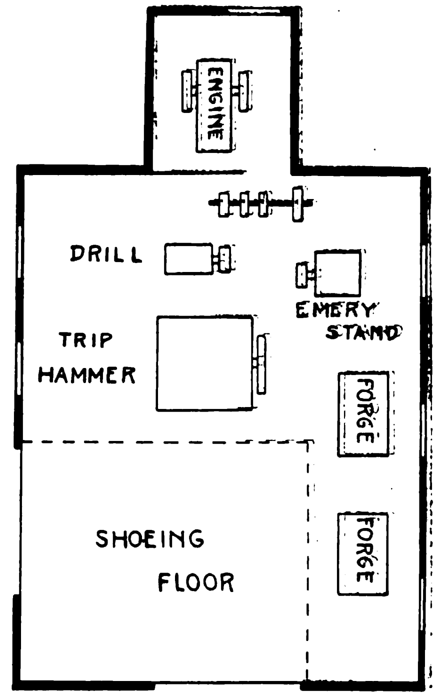
Gas engines in the small sizes are mounted usually on skids, which have holes for bolting the engine to the floor or to a box. An excellent foundation is made of masonry, which is inexpensive and holds the engine firmly, preventing shaking or jumping. A heavy, flat rock is just the thing. Where a cast-iron base is desired it can be ordered with the engine. By putting in a small box-partition to act as an engine-room, the engine may be kept free from dust.

It may be well to say right here, that while a gas engine requires little attention, it should be kept as clean as possible by wiping, and the bearings kept well lubricated. Gasoline of the best quality is the cheapest in rendering good service, that is, what is called "74 degree gasoline." Sometimes gasoline contains a little dirt or straw, and as these would choke the feed pipe, necessitating shutting the engine down to take the pipe off for cleaning, it is best to strain the gasoline through a piece of silk cloth when filling the tank.



INTERIOR VIEW—SHOP OF ROBERT KINGHAM.

In connecting up, the engine should be set in a convenient location, usually in the far corner, leaving the front of the shop for floor work. The line shaft may be placed overhead and the machines belted up at an angle of say 45 degrees, or, where the machines can be placed in a row, it may be put under them, which takes less belting and leaves a clear space around the machines. A shaft of about $1\frac{7}{8}$ or $1\frac{15}{16}$ inches in diameter is generally used, the same being held by a sufficient number of hangers to make it firm and prevent wabbling or bending. As the shaft is short or usually not over 30 feet in length, sometimes only 10 feet, from two to six hangers are sufficient, as one is not needed at every pulley. The speed of the shaft may be from 125 to 200 revolutions per minute, although 150 revolutions is amply fast. Wood-working machines require the higher speed, while machine tools are run more slowly. Generally speaking, emery wheels should run at a peripheral velocity of about 5,500 feet per minute; grind-stones, from 600 to 900; polishing wheels, 7,000, while a surface speed of from 20 to 25 feet per minute is a fair average for lathe, planer or shaper. When the exact speed at which a machine should run to give best results is not known, it had best be obtained from the manufacturer, as well as the size of pulley commonly used, if the machines are being changed from hand to power feed. As a rule, machines are fitted with pulleys of proper diameter for speeding them when shipped from the factory, and it is only necessary to figure pulleys for driving them off the line shaft, which is an easy matter when the speed of the shaft is known. Multiply the diameter of the pulley on a certain machine by its number of revolutions per minute, and divide the product by the speed of the line shaft in revolutions per minute, which will give the diameter of a shaft pulley for driving the machine. Should the machine be without pulley, multiply the diameter of main pulley on the line shaft by the number of revolutions of the shaft, and divide the product by the number of revolutions the machine should run, which will give diameter of pulley for the machine, with a pulley on the line shaft of the same size as the main pulley. The main pulley for the shaft may be figured by multiplying the diameter of driving pulley on the engine by its number of revolutions per minute, and dividing the product by any amount between 125 and 200, according to the speed desired on the shaft. Some smiths use extra heavy pulleys, web pulleys, or balance wheels on their machines to steady the motion. (Saws are usually provided with a balance wheel.) A shaft of small diameter is more speedy than a heavy one, but of course



SHOP OF W. E. GRUBER, OUTLINE PLAN.

the smaller the diameter the stronger should the material be. Likewise, a wide, thick belt will transmit more power than a thin, narrow one. However, though this be so, it does not imply that a shaft only 1 inch in diameter or pulleys of wide face or 3-ply belt of extra width should be used merely to run a few small machines, but that a little judgment should be exercised so as to figure an outfit of the best kind in accordance with common practice. The faster a belt runs, the smaller it need be to transmit a given amount of power. Ordinarily, a $1\frac{7}{8}$-inch shaft, a pulley of 5 or 6-inch face and a single belt 3 or 4 inches in width answer very well.

On account of the line shaft being of only one speed and required to run some machines very slow and others exceedingly fast, it necessarily follows that a pulley sometimes figures out a diameter so small as to be insignificant, or so large that its weight would sag the shaft or its cost empty a man's pocket. In such cases a speed-jack or counter-shaft should be used to change the speed.

If a machine is to be run very fast, use a fair-sized pulley on the line shaft so as to run the countershaft two or three times as fast, and then multiply the diameter of pulley on machine by its number of revolutions and divide by

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the speed of the countershaft to get a pulley of proper diameter on the countershaft for driving the machine.

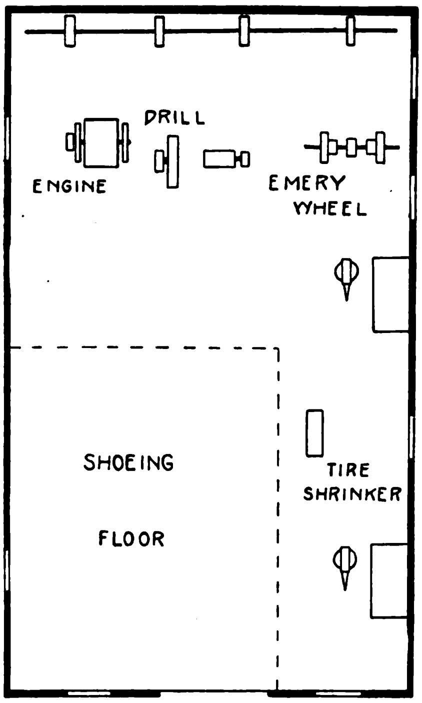
Lathes, drills, etc., are usually furnished with small countershafts by the manufacturer, the same having cone pulleys so as to run these machines at different speeds. The best countershafts are provided with clutch pulleys and a shipper for throwing the drive pulley in and out of power.

The more the machines are scattered the greater the number of countershafts needed, although some of them may be avoided by setting the machines in the most convenient location for belting to main shaft.

Decide on what machines you are to put in or run, where they should set for convenience in working at them, and you will readily know how long your main shaft should be and where countershaft should be placed for running the machines which are scattered. Then figure pulleys for the shaft, put in speed-jacks where necessary, and place your order.

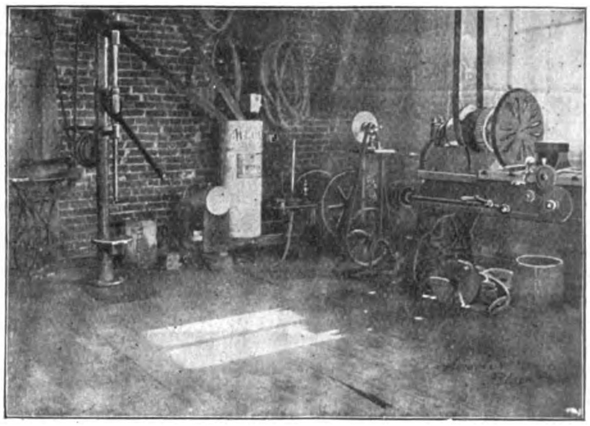
In order to give a practical illustration of the installation of power in smith shops, we will consider a few cases in detail.

Mr. Robert Kingham, Winfield, Kansas, runs a repair shop, making a



PLAN OF SHOP OF A. A. SCHAEFFER.

specialty of boiler and engine repairing. His shop is 30 by 20 feet. On one side are two lathes, one a 25-inch engine lathe and the other a 14-inch wood lathe. The former is driven by a 12-inch or 18-inch pulley on the main shaft, both belting to 12-inch pulleys on the lathe countershaft. The wood lathe is driven by a 36-inch wheel on the line shaft. On the other side of the shop is a double emery wheel stand, and a 24-inch shaper. A 26-inch drill press in the middle of the room is driven by a 14-inch pulley on the line shaft. The line shaft itself runs down the center of the shop, an 18-inch pulley on it belting to an 8-inch pulley on the engine. The latter runs at 375 revolutions per minute, giving a speed of 167 turns to the line shaft. The engine, as shown by the accompanying engraving, is mounted on a skid foundation which is bolted to the floor. It develops three actual horse-power.


SHOP OF P. P. BELT, SHOWING LOCATION OF ENGINE.

Mr. W. E. Gruber, White City, Kansas, running a general blacksmith shop, has a $2\frac{1}{2}$-horsepower Weber gasoline engine, driving an emery grinder and polishing wheel, a Little Boss trip hammer and a Champion Drill Press. He states that it pulls all the machines together and that a 13-year old boy gives it the necessary attention. The engine sits in a dust-proof room, 10 by 8 feet. The engine driving pulley is 8 inches in diameter, and runs at 375 revolutions. The 8-foot line shaft, $1\frac{7}{16}$ inches in diameter, has a 12-inch pulley belted to the engine. The emery wheel, drill press and trip hammer are driven by 26, 10 and 12-inch pulleys on this line shaft. The general plan of the shop is shown by the accompanying figure.

Mr. A. A. Schaeffer, Tarkio, Mo., has a blacksmith shop, 16 by 42 feet. Along the short side furthest from the door runs a $1\frac{1}{2}$-inch line shaft, driven by a 11-inch pulley at one end of the shaft, belted to the 8-inch pulley of a 3-horse power gasoline engine, the latter running at 375 turns. A 14-inch line shaft pulley drives a $6\frac{1}{2}$-inch pulley on the drill. A $3\frac{1}{2}$-inch wheel belts to a 12-inch wheel on the disc sharpener, and a 24-inch pulley, with a $3\frac{1}{2}$-inch one on emery wheel, drives the latter at 1800 revolutions. The engine and machines sit in a line across the short way of the shop, being belted up to the line shaft at an angle of 45 degrees. This arrangement leaves the front half of the shop clear for the forges, tire shrinker and shoeing floor.

Mr. P. P. Belt, Fredonia, Kansas, has a 3-horsepower gas engine driving a 25-inch engine lathe, 13-inch foot lathe, 20-inch upright drill, 24-inch planer, 12-inch emery grinder, blower, etc. The gas meter registers only about 150 cubic feet per day, which, with natural gas costing but 25 cents per thousand, gives a fuel cost of about three cents per day. The engine in this shop is placed in one corner and belted up at 45 degrees to the line shaft running down the center of the room and revolving at 150 revolutions per minute. The two lathes are placed along one side of the room, with the planer and emery grinder on the other, the drill standing directly under one end of the line shaft. The accompanying engraving shows one corner of this shop.

Estimating Costs in Carriage Shops.—3.

BY D. W. M.

A really fine vehicle can be produced by building in quantities at about half the cost of the usual retail method. The difficulty is not in the manufacture but in the marketing of really fine articles. The customers who buy anything fine are isolated, making the cost of finding and convincing them so great that it is seldom profitable to build such work in large quantities. For this reason the small shop still has a chance. A favorable acquaintance in the community will bring a certain amount of trade wanting a really fine article.

If the manufacturer is possessed of correct ideas and abilities, he may make the working drawings for the vehicle he is to build. If he has a wood shop and a good body maker, he may make the body and wood parts, but he must not neglect to count in the making of the draft as part of the cost. If, however, he has not a good body maker, and

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thoroughly seasoned timber, he had better get some good body shop to build the body. Good body shops are scarce, but they exist.

He may also buy his gear, wood parts, shafts and wheels. Prices vary greatly according to quality. Some consider forest timber good enough. A fine vehicle, however, should have the following: Black hickory axle caps and head block; second growth hickory reach and spring bars; black hickory rims, second growth spokes, and elm or green hubs in the wheels. A good "B" wheel, made by a reliable house, is generally good enough.

The object of this article is to show how a small builder should proceed to make an estimate of cost. We will therefore suppose a shop with a woodworking department adapted for repairing, as most small shops are. The blacksmith shop is the main feature. The proprietor is a smith by trade and sometimes works at it when busy. He hires his wood-worker and painter. He does no trimming, but buys the trimmings already made. He has a paint shop, but farms out the work to the painter. We will suppose he has an order for a delivery wagon from a dry goods store of his town. After making a sketch of the design, he marks out the dimensions of all the parts and makes an estimate of the number of bolts he must use, and their sizes—the screws, Norway iron, charcoal iron, steel, clips, fifth wheel and other forgings; malleables, etc. He sends his sketch to a body shop for a figure on its cost. He writes to a wheel factory or to his jobber for price on the wheels, and to his jobber most likely for prices on all the other items. He may buy everything from his jobber because his credit is good there, and he can be more promptly served than by some factory which cares but little for such semi-occasional customers. He may even be able to buy cheaper from his jobber for the same reason. Having gotten his prices on material, he is in position to draw up a schedule and proceed to make an estimate which he can file away for future use.

I would suggest the following formula because it gives the estimate of cost on such parts as may be separated and applied to the estimating on other vehicles. Inasmuch as many small shops have workmen who can build bodies, I also give the schedule for the same, but if bought from a body shop one must add freight and drayage, also design and drafting cost.

It is a good plan to make a memorandum on every invoice bill of the amount paid on freight and drayage on those items, so that in looking up the bills the cost delivered at the factory will be shown.

Under the head of labor one will simplify cost estimating by having as much as possible done by piece work. There will often be drilling done by men or boys who work by the day and this must be added. The piece worker wishes to have his work delivered to him, which is an extra cost. I include these under the items, "machine work" and "porterage"—including also any other outside work appropriate under those heads.

It is well to have the lists of bolts, screws and other items used in a body, gear, or other parts, kept separately and handy for reference, and revised as needed, either for quantities or prices. It is customary to include priming as one of the items of cost of all wood work, as something done outside of the work of a piece, or contract price of painting. But I have not included it in this schedule, because in a small shop the painter does the priming as part of his work and takes the job in hand as soon as it is ready. I am supposing a shop in which nothing is built except on order. My object is not to show how cheap a wagon can be built, but the plan on which to estimate the cost. The item under "Foreman" may include the proprietor's time, if he has no foreman, given to superintending the work. But if he performs any of the actual work it should be counted as labor under its proper head.

Delivery Wagon Cost Table.

BODY.	
Lumber—	
Ash	$ 2.50
Poplar	4 20
Pine	1.00
Bolts, screws, nails	.70
Glue	.15
Screws	.12
Hinges	.80
Lock	.20
Wrought iron, including labor, $8.00—	
Rocker plates	4.00
Post irons	1.50
Braces, etc	1.00
Malleables	1.20
	$16.87
Machine work	.80
Bench work	2.00
Design	5.00
Draft	5.00
Porterage	1.50
Foreman	5.00
Total cost, body in white	$36.17
Irons for body—	
Wrought	$ 8.00
Malleable	.50
Iron (raw material)	1.20
Bolts, screws	1.00
Coal, etc	.25
Smith labor	4.00
Other labor	1.00
Porterage	.50
	$16.45
Total cost, body ironed in white	$52.62
GEAR.	
Gear woods	$ 0.40
Machine work	.40
Bench work	.50
Axles	4.00
Springs	4.50
Fifth wheel	1.00
Clips, axle, spring etc	1.20
Shaft shackles	.60
Bolts	.50
Iron	2.50
Coal, etc	.50
Forgings bought	.80
Malleables	.20
Labor by contract	6.00
Labor extra	1.50
Porterage	.50
Foreman	2.00
Total for gear	$27.10
Wheels in wood	$ 8.00
Tire, bolts, clips	3.00
Coal, etc	.20
Labor—	
Bend'g, tiring, bolting, drilling tire	1.20
Porterage	.40
Boxing	.20
Banding (if wood hubs)	50
Cost of wheels	$13.50
Total cost, gear in white	$40.60
Paints and varnishes for body	$ 4.00
Brushes, etc	.50
Labor, painter	$10.00
Porterage and other assistance	1.50
Lettering	3.00
Total cost painting body	$18.00
Trimming goods	$ 1.00
Covering roof	.80
Cushion	4.00
Carpet	1.00
Apron	1.00
Leathers	.50
Labor	.40
Total trimming	$ 8.70
Hanging off bolts, etc	$ 1 00
Glass, bev. Fr. pl	12.00
Lamps and irons	10.00
Handles, plated rails, etc	3.00
Whip socket	.80
Touching up material	.20
Shaft rubbers, etc.	.20
Labor, hanging off	2.00
Labor, touching up	.40
Labor, getting ready to run	.40
Cost mounting	$30.00
Shaft woods	$ 1.00
Labor on same	.80
Malleables	.40
Screws	.10
Porterage, etc	.10
Cost of shafts in wood	$ 2.40
Iron for shafts	1.20
Malleables	.10
Bolts	.40
Screws	.10
Coal, etc	.10
Smith work	1.50
Additional labor	$ 0.50
Porterage, etc	.20
Total cost of shafts (ironing)	$ 4.10
In white, ironed	$ 6.50
Total cost gear and shaft in white, ironed	$47.10
Paints and varnishes for gear, brushes, etc	$ 2.00
Labor painting gear	4.00
Cost of painting gear	$ 6.00
Paints and brushes for shafts	$ 0.60
Labor painting shafts	.50
Cost of painting shafts	$ 1.10
Total cost of shafts painted	$ 7.60
Shaft leathers	$ 1.50
Tacks, screws, etc.	.10
Plated tips; Pl'td hold-backs	.50
Labor, trimmer	.75
Cost of trimming and mounting shafts	$ 2.85
Total cost gear and shafts	$57.05
Total cost body	$109.32
Total cost job	$166 87

I have added an item for freight and drayage at the end of the list, to include any items not accounted for in estimating costs of material. If not already included in the invoices as suggested above, the totals for freight and drayage may be inserted here. A separate enumeration of trimming goods should be kept, such as the cost of cushion, carpets, apron, etc. I have separated the cost of painting the body from the gear and shafts. Usually the contract price includes the whole vehicle. But for purposes of convenience in figuring costs, it is preferable to have a separate figure on the items as indicated. In a small shop the cost of ironing will include, ordinarily, the whole job, but I have separated the cost of ironing the body, gear, wheels and shafts for convenience in future reference for making estimates. I have not mentioned dash, because that is supposed to be of wood and part of the body.

In repair work, every job must be estimated separately with liberal allowances for unknown quantities, for they are sure to turn up. The items of taking in a repair job, estimating on it, cleaning it up preparatory to putting in the shop, taking it apart and other merely preparatory steps, together with assembling the parts when the work is done and overhauling the little things are matters which can hardly be charged for by item, but must be included in the estimate of cost. Many

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include it under "general overhauling and tightening up."

Total cost gear	$ 46.60	$166.87	— $55\frac{48}{100}$ %.
Total cost shaft	10.45		
Total cost body	109 82		
Gen'l exp. { Fr'gt drayage, etc. / Wear and tear }		10.00	— $8\frac{1}{3}$ %.
Rent, ins., interest on capital		10.00	— $8\frac{1}{3}$ %.
Taxes, office exp., com., etc		10.00	— $8\frac{1}{3}$ %.
Selling expenses		25.00	— $8\frac{1}{3}$ %.
Total cost		$221.87	
Profit		78.63	— $26\frac{21}{100}$ %.
Selling price		$300.00	
Merchandise total { not including gen'l exp. as above ($10.00). }		$102.53	— $34\frac{18}{100}$ %.
Labor total		$77.85	— $25\frac{95}{100}$ %.
General expenses, etc		$55.00	— $18\frac{1}{3}$ %.

When the work is actually done, the necessary corrections can be made in the estimate to keep for subsequent use. At the end of any period, one month, three months, six months, or a year, correct accounts having been kept, the total amount expended for merchandise ought to bear a close percentage relation to that indicated by the cost estimates, so also the amount expended for labor and other departments. If not, then something is wrong and needs revising. We will suppose the following to be the report of the business for three months:

Amount charged for new work	$2,100.00	
Amount of repairs	4,500.00	
Total sales	$6,600.00	
Number of new jobs	77.00	
Average value of new jobs	300.00	
Total wages (outside of office)	$1,980 00	= 30% of sales
Total for merchandise	1,650.00	= 25% " "
Total cost of office and general expenses	990.00	= 15% " "

The discrepancy between the percentages of the estimate and those of the report may be due to conditions in the repair work, where the labor exceeds the value of the material. Hence it would be advisable, if possible, to keep the repair accounts separately, as some shops do, only certain hands working on repairs and others on new work, and the two sets of men being run as two shops, as far as the accounts show. In that way the facts may be arrived at and proved up.

The cost of general expense, etc., in the report appears to be less than in the estimate, hence that can be corrected, but as the next three months may show an increase, it is best to get the results of a year's work before cutting down estimates on general expenses.

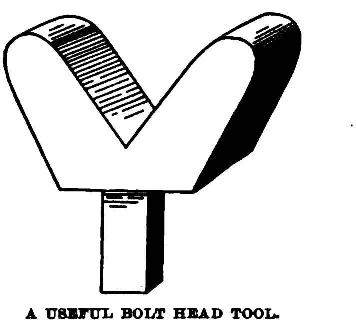
It is only by continual revising and proving up by the best means practicable that anything even approaching certainty can be arrived at in a repair shop, and if an error in figures is to be made, let it be always in favor of the house and not of the customer.

If all data bearing on the subject of costs be carefully preserved for reference, the immense advantage of such a system will quickly make itself felt.

A Tool for Working Up Bolt Heads.

WILLIAM P. DAVIS.

I have a useful tool for working bolt heads that are welded on. I take a piece of steel about $2\frac{1}{4}$ inches square, and fit one end into the square hole of the anvil. The top I split as shown in



A USEFUL BOLT HEAD TOOL.

the illustration, to receive a one-inch rod. Then as you weld the bolt head on the anvil you can lay it in this tool to smooth up the end, then back on the anvil to square the head, then in the tool to chamfer the corners.

The Elements of Blacksmithing.—11.

JOHN L. BACON.

Instructor in Forging, Lewis Institute, Chicago.

Tempering Springs, Milling Cutters, Etc.

Spring tempering when done in oil on a small scale serves as a good example of work where the temperature of the reheating is determined independently of the "temper colors." This method of tempering springs is known as "blazing," and gives about as reliable results as any on a small scale for ordinary work. The spring is heated to a hardening heat and cooled in oil. To draw the temper, the spring, still wet with the oil, is reheated until the oil commences to blaze up and then plunged into and immediately taken out of the oil bath and again reheated until it blazes. This is continued until the oil blazes uniformly over the entire spring at the same time.

Springs are generally not uniform in thickness, the thin parts heating more quickly than the thicker, and this momentary plunge into the oil cools thin parts somewhat, while it affects the thicker parts very little. As the reheating is continued, all parts of the spring are thus at last brought to the same temperature at the same time. If the reheating were continued without this partial cooling, by the time the thicker parts were hot enough to have the proper temper, the thin parts would be heated to too high a temperature, and have no temper left. Springs of course must be very tough and not so very hard; for this reason they are hardened in oil, as the oil extracts the heat much slower than the water. The steel is consequently left tougher, and not so hard as if hardened in the ordinary way.

Animal oil and *not* mineral oil should be used for this kind of work, as the mineral oil is too uncertain in its composition and will sometimes blaze at one temperature, sometimes at another—while the animal oil is fairly uniform in composition, and generally blazes at about the same temperature. Lard oil is a good material for this kind of work.

Another way of tempering springs, which is rather risky, but which is sometimes used, is to harden the spring in the ordinary way in water. It is then reheated over the fire, and to test the temperature, from time to time, a dry, fine splinter is scraped over the edge of the spring, and as soon as the minute shavings thus made will catch fire, the right temperature is supposed to be reached. The burning of the wood in this case takes the place of the burning oil mentioned above. Sometimes, when no fine splinters are convenient, even the hammer-handle is made to serve the purpose. This is not a process to be recommended, but is merely given to show how the proper temperature to which to reheat to give the desired temper may be determined in a variety of ways, viz.—by the blue color of the scale, by the blazing of the oil, by the burning of the wood.

In all hardening, the greatest care must be taken to have the steel heated to a uniform temperature throughout. The metal should not be left in the fire one instant longer than is required to accomplish this, but, if good results are wanted, it must be uniformly heated. Care must also be taken in dipping—so as to cool as nearly as possible, uniformly. An object can be warped all out of shape by dipping improperly. The minute the metal strikes the water, it starts to cool and contract—and unless this contraction takes place on all sides of the piece at the same time, the side which cools first is apt to pull the others out of shape.

Suppose we have a piece of steel like Fig. 97 to harden, and dip it edge first into the water, that is, let it strike the water in just the position in which it is shown here. The lower edge will of course be cooled first and start to contract, while the upper edge is still hot. When the upper edge strikes the water, the lower edge will be somewhat cooled and consequently set; as the thicker

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part cools, the whole blade will be sprung out of shape. As a general rule, it is always best to dip pieces of this shape, *end* first into the cooling bath. In this way the steel is cooled more evenly; and contraction starts from all sides at the same time; warping being thus more easily avoided.

The hardening of files is a good example of this sort of work, and the

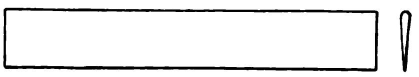

FIG. 97. SPECIMEN PIECE FOR HARDENING.

method employed may be used to advantage for many other long, thin, shapes. The files are heated in a pot of red hot lead having charcoal sprinkled over the top. The charcoal is to prevent oxidation of the lead. The files are placed in this pot on end, and as soon as properly heated, are plunged end first, being held almost straight up and down, into a vat of brine. Brine conducts the heat from the steel faster than water, and therefore leaves the files harder than if hardened in water.

The files nearly always warp slightly when hardened, and when the warping is slight are straightened as follows: Across the top of the brine vat are fastened two wooden strips, about two inches apart, and joined by two iron pins about six inches from each other. The hardener draws his file from the brine before it is entirely cold, the metal having just heat enough left to cause the water on the surface of the steel to disappear almost instantly. The file is then placed under one pin and over the other with the concave side up. Fig. 98 illustrates the method employed. The hardener then bears down on the end of the file, springing it straight, and at the same time pours some of the cold brine on top of the concave part.

FIG. 98. METHOD OF STRAIGHTENING WARPED PIECES.

This will generally straighten out the file, and leave it perfectly true. Of course, if the files are too badly warped there is nothing to do but reheat, straighten, and harden again.

There is a belief among some people that files are burned in the making, and consequently that the steel in old files is worthless. Such is not the case, as a file made from burned steel, or even *overheated* in the hardening, would be absolutely worthless.

The best practice for all-around hardening is to heat in a gas furnace, where an even heat can be maintained and a pyrometer is used to determine the proper heat. Small shops cannot always have this apparatus, and one of the best substitutes is to heat in red hot lead as described above. For small work, an ordinary ladle will sometimes do to heat the lead in. One advantage of the lead is the fact, that steel being so much lighter will float on the surface of the melted lead, and may be easily watched as the heating proceeds.

When milling cutters and such things have to be heated in an open fire, it is a good plan to lay a thin piece of sheet iron in the fire; the cutters may then be easily moved about, and do not come in direct contact with the fire, insuring more even heating. Cutters, taps, dies, etc., are ordinarily hardened when made on a small scale, as follows: The cutter, or other tool, is first heated to the hardening heat, and hardened by cooling "stone cold" in water. (It should be kept in motion all the time it is in the water). It is then polished all over. To draw the temper, it is laid on a large piece of red hot metal, and turned frequently to avoid uneven heating, until the surface of the steel shows the color corresponding to the temper which it wished to give the tool. For ordinary milling cutters about a "dark straw," brownish yellow, is right. A good plan for heating taps, small end mills, etc., is to lay a piece of pipe through the fire, and heat the tools in this. This makes a sort of crude, muffle furnace, which is very satisfactory for many kinds of work.

Another method of tempering which the author has used for milling cutters and taps, and which has proved very satisfactory, is as follows: The tools are heated in the ordinary way, and cooled in water, but are not left in the water long enough to become completely cold,—being drawn out of the water as soon as the "singing" stops. (When red hot metal strikes water, the water in immediate contact with the metal starts to boil, and this boiling produces a decided humming, or singing noise, and a throbbing sensation easily felt through the tongs. This ceases when the outside of the metal cools to about the temperature of boiling water). When the tool is drawn out of the water, it is instantly plunged into lard oil, and left there for a very short time, depending upon the size of the tool, and then withdrawn. It is then held in the flame of the forge, or near the fire, until the oil on the outside just commences to smoke—when it is again plunged for an instant into the oil and again reheated, this being continued until the oil smokes evenly all over the tool, when the tempering is complete, and the tool may be cooled off. The object of this method is this: The first cooling in water hardens the outside and cutting edges of the tool, and the tool is then taken out of the water and plunged into oil while the inside is still comparatively hot. As the oil conducts the heat more slowly than water, the cooling of the tool is continued in the oil, thus leaving the center rather tougher than if hardened in water. But even here the metal is not completely cooled, as it should be taken from the oil bath while there is still some heat left in the center. This heat in the center will help draw the temper of the outside, and consequently the tool can be reheated much quicker

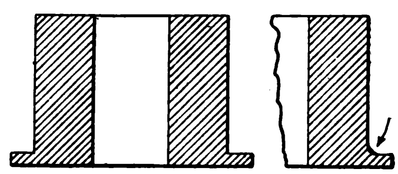

FIG. 99. A DIFFICULT SHAPE FOR HARDENING.

than if entirely cooled. The smoking oil merely serves to indicate the temperature to which we are reheating. With a little practice the tool can be withdrawn from the oil bath while there is still heat enough left in the central part to draw the temper. In this way, no reheating in the fire is necessary—the tool being simply taken from the oil, allowed to reheat itself until the oil commences to smoke, and then plunged in water to prevent further reheating.

The two great things in tempering are uniform heating and common sense. You *must* have a uniform heat or you can not harden satisfactorily.

There are some shapes which are very difficult to harden. Fig. 99 shows a sectional view of a steel bushing which should be very hard. The body of the bushing is thick and contains proportionately a large volume of metal, while the flange is very thin and light and joins the body in a sharp angle, making a bad shape to harden. The thin flange cools almost instantly when it hits the water, while the body takes some seconds to cool and by that time the flange is set. As the body contracts in cooling it pulls away from the flange

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and is very apt to crack through the sharp corner. Of course a shape like this will not *always* crack, but there is always the tendency to do so when a thin body of metal joins a thicker in a sharp corner. This danger can be lessened by leaving a fillet in the corner as shown in the side sketch. This equalizes the strain somewhat by not leaving a distinct line between the thick and thin parts. Milling cutter teeth when made with a sharp angle at the bottom are liable to crack in hardening, but if left with a slight fillet between them very rarely crack when properly heated.

Self-hardening steel is steel which does not have to be hardened in the ordinary way. Tools made from this steel are forged into shape, and then allowed to cool in the air, or if wanted extremely hard, cooled in a cold blast of air. This steel can not be worked cold to any extent but has one great advantage. Tools made from it may be ground until the points are red hot and then put in a lathe and used as ordinary tools. They will also stand harder usage than if made from ordinary steel, and will work hard material to better advantage. In forging, however, very much more care is necessary as the steel must be worked at almost a constant temperature—a higher temperature will cause the metal to go to pieces, while if worked at too low a heat the steel will crack. The proper heat can only be learned by experience.

Self-hardening, or air-hardening steel as it is now more properly called, is sometimes known as Mushet steel, from the fact that Mushet made air-hardening steel when it first came into common use. There are other firms which now make air-hardening steel so that the name Mushet steel can not be properly applied to all such material, although Mushet steel is now used to a large extent.

Special steels have been produced in the last few years that promises to cause a revolution wherever machine tools are used to a large extent. These tool steels are of the air-hardening variety and are being constantly improved upon.

(To be continued.)

A Pair of Useful Combination Tongs.

J. P. MULRONY.

The tool shown on this page, I find of use as a pair of tongs, clip tie and bolt head holder, both at the fire and at the vise. The jaws have a half round swage crease sunk on the inside of each. About ⅛ inch from the outer end of each, I sink a transverse or cross crease suitable for receiving the edge of the head of a bolt. As it is deeper in the center than on either edge, it holds a short bolt firmly in the fire or in the vise when welding, cutting threads, taking off nuts, or running down nuts on plow bolts or carriage bolts. This is done without damage to the heads.

COMBINATION TONGS, CLIP TIE AND BOLT HEAD HOLDER.

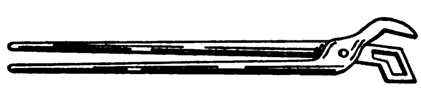
The ends of these tong handles are made, one hooked, the other flat, straight and fitting inside the hook of the other handle. This forms a clip tie.

Such tongs will be found a combination which will save a blacksmith many steps during a day's work looking for the tools which it combines. It will also hold flat and round iron.

Hints on Plow Laying.

WILLIAM L. GREEN.

Plow laying is a piece of work that requires no little amount of skill, and the percentage of blacksmiths that make a good fitting and good looking share is small. To put on a short bar or slip share, first strip the plow of the old share, then forge your bar to fit properly, so it will line up with landside, but do not drill your holes. Take a small clamp and place on plow, so that you can fit your share. With regard to the share itself, as nearly all blacksmiths use the shapes as they are ground, you will have to make some changes in almost all of them, some by upsetting and some by setting down. After you have fitted your share properly, remove your clamps. Take the bar and share without drilling any holes and weld.



USEFUL TONGS FOR PLOW WORK.

The figure shows a sketch of a pair of tongs for welding, having a slot in the lower jaw for the bar. A ring can be placed over the end while taking the first and second heat. They are certainly very handy for this work.

Place the bar and share in the tongs, heat with point up, then bend over and take a good heat. Another heat will bring you up to your tongs. Now remove the tongs and take the final top heat. This is the time when you want to do your fitting. While it is good and hot, hold share and plow, and if your joint is open drive back on point of share, which will upset the bar and make a good joint. To clean your work, it is good to hot rasp it. Now heat again, and shape it as you work back to the point. Be sure in so doing that you keep your bar straight. Now finish by working your point in shape, making a diamond point, which makes a nicer job. Some smiths do not like drilling the holes, as you cannot drill from the inside. Mark outside very closely, then with a wedge-shaped block of wood you can drill nicely. Now countersink the holes so that a new plow bolt head will come down even with the share. Always in making new shares, use new bolts; never use the old ones. Now square your holes and you will never have any trouble taking them out, when you want to sharpen. In the long bar plows, you should drill your holes before welding. There is more work on them than on the short bar, but not so hard to fit as a general rule. You will have to make a new bar out and out, if they are worn badly. You can weld on the front, and by laying a piece of steel on the head, they work all right.

When the bar is fitted, bolt on temporarily so as to fit your share to it when welding, start at point and weld up, then as you go back down you finish by shaping your point. The welding is an important part, and good fitting makes the welding an easy task. I will say in conclusion, that using the tongs mentioned for welding slip shares and drilling your holes often insures good fitting and better looking work than any other way. I have had a good deal of experience and find this to be the best for general shop use.

The Repair of Revolver Cylinders.

WILLIAM DUFF.

I will endeavor to explain how to repair a single action or solid frame double-action revolver cylinder, when the notches upon which the lever works in revolving it become worn. The simplest and best way of repairing them is as follows:

Take a piece of mild steel, the same diameter as the notched piece, drill into the cylinder ⅜ to ½ inch, and drive the

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plug in tightly. If the plug is driven in while the cylinder is hot, it will fit more securely than if driven in when cold. Next take a drill the exact size of the old hole in the cylinder, fasten the latter in a vise, and from the front end of the cylinder drill a hole through the plug. Be sure to notch the cylinder the same as before, so that it will move $\frac{1}{5}$, $\frac{1}{6}$ or $\frac{1}{7}$ of a revolution around, for the corresponding number of shots. The number of notches must correspond to the number of chambers in the cylinder. If this is done properly the revolver will work as well as when new. A better way is to drill a hole through the plug, turn up a plug and fit it securely. Cut notches and set correctly, then drive in with a copper hammer. A lathe accomplishes the truest work.

HEATS SPARKS WELDS

Now begins a new volume.

Endeavor to get up a club this fall.

Repair before fall rains all leaky roofs.

Do you keep a record of the work in your shop? It is interesting to refer to.

We are waiting for you to tell us how we can make the paper better adapted to your needs.

How many blacksmiths in your town take the paper? Have you asked any why they did not?

If you get the highest prices charged for work in your vicinity, it is your shop that does it quickest and best.

The Trade Catalogues. Have you the latest ones on file? They're a good study for rainy days and evenings. A postal card will bring them.

Missouri State Normal School, at Cape Girardeau, expects to open up a manual training blacksmith department and will need an equipment for the same.

At Independence, Ky., the blacksmith shop of Eli Baker will be run by Mrs. Goodner. Do you know of any women smiths who do their day's work in the shop?

How about that letter on Gas Engines? Have you had any practical experience with them in the shop? If so, sit down and tell our readers what your opinion is.

What is the best advertisement for the village and country smith, or any shop for that matter? Isn't it the very highest class of work and a reasonable price for it?

Is there a tool in your shop which is constantly out of repair? Figure up how much time is lost and see if it would not be best to discard it altogether and purchase a new one.

Many manufacturers now offer blacksmiths a trial of their machinery before paying. This fact shows a wholesome regard for the smith's opinion and a substantial faith in his honesty.

What will bring more work to your shop? Study the other smith's equipment, his way of doing things, the methods of the most successful shops in larger towns. Avoid what is poor. Adopt what is best.

When a bill comes for your subscription to a periodical, treat it as you would like to have customers treat your bills. Publishers are only human, and promises to pay or neglected bills are a scant diet.

Listen to the ideas of your apprentices. It encourages them. If they stumble on to a method of greater merit than the one you are following, do not let prejudice stand in the way of its being adopted.

Electricity is to be installed as power throughout the enlarged carriage and blacksmithing plant of Ortiz & Co., Albuquerque, N. M. This is progressiveness for you. The experiment will be an interesting one.

Give a dog a bad name and hang him. If you expect poor work from the apprentice, he will probably not disappoint you. The way to bring out the best there is in a man is to show that you have high confidence in his ability.

Gratification over a service rendered is pardonable. Mr. Henry Schmitt of West Bethany, N. Y., writes that he found his present place through an item in our December issue, and is very well satisfied with it. We are pleased in like measure.

Five hundred blacksmiths in various machine shops in Hudson County, New Jersey, struck for a 10-per cent. increase in wages, and several firms have partially suspended operations. The employers claim that the high price of coal makes a raise in the men's wages out of the question at present. The increase is deserved, the excuse invalid.

There is many a kink you practice daily which would help a brother smith, especially the younger generation, if described in these columns. Let us have it in your own language, with or without sketches. The editors will put it in shape for publication.

The twelfth census states there are 196 female blacksmiths in the United States. Send us the names and addresses of any you may know. We will present them with a year's subscription to The American Blacksmith. If the women are to invade our ranks, let's educate them.

A handsome farrier. At a recent outing of the Master Horseshoers' Protective Association of Albany, N. Y., a year's subscription to The American Blacksmith was presented through the kindness of Mr. T. H. Sargent to the handsomest Master Blacksmith present, to be decided by vote of the ladies. About twenty-five of the fifty-six present, considering themselves eligible, were drawn up in line after dinner and carefully scrutinized by the ladies. Everyone was well pleased with the decision, which declared President Thomas J. O'Brien the best looking by a good majority.

Blacksmiths are in demand. You can scarcely pick up a daily paper in a large city without noting advertisements for smiths of different classes. Employers are paying larger salaries and demand a higher standard of work than ever before. The men who obtain and hold these lucrative positions are of the up-to-date, energetic and thinking kind. They are eager for new ideas and methods of value. They do not think their ways of doing things incapable of improvement. They are always open to suggestions, and quick to adopt what they see is to their employers' interests.

Peter Tumble-down is the name of an interesting character often referred to in that excellent agricultural paper, the Farm Journal. Peter leaves his plows and machinery outdoors all winter, never repairs his fences and does all manner of shiftless things. The editor didn't say who shoes his horses. Probably he goes to the lowest priced blacksmith shop, doesn't know whether the work is done right or not, and finally doesn't pay his bills. He is a good customer for the back number smith.

In behalf of the apprentice. The blacksmith may be called the King of Mechanics, but is his attitude to the apprentice boy as favorable as the machinist or the engineer? Is there as much encouragement and as great an incentive to take up blacksmithing as other lines offer? Opinion seems to indicate otherwise. This should not be. The work may be made as attractive as other mechanical lines. The increase in the number of competent blacksmiths does not hold its own with the increase of mechanics in other lines, and we would like to see the necessary steps taken to bring about a change.

Eight muscular daughters have been trained by a sturdy smithy at Leeds, England, says the New Orleans Picayune, to assist him at his work. At present four are at work in his shop. The other four wielded the hammer for several years and then left the business to take up the duties of running homes of their own. Every one of these four daughters of the master smith are to be seen at the anvils following the trade of their father. They are up early and spend the working hours in making gas hooks—broad, bent nails which are used by plumbers for fastening gas pipes to walls. It is not such a hard task, yet the work requires great patience and enduring strength.

The heavy part of the work is performed by a machine worked with the foot. After the mechanical device has finished its labors the fair blacksmiths, with sleeves rolled up, put the finishing touches on the hooks with a hand hammer and get them ready for market. They toil on a piecework basis, and the ingenious blacksmith calls each a "full hand."

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Railroad Master Smiths' Annual Convention.

The Tenth Annual Convention of the National Railroad Master Blacksmiths' Association was held at Chicago, August 19-21, and was attended by the largest number of delegates in the history of the Association. According to the report of the Secretary, the affairs of the Association are in a most flourishing condition. During the past year a larger number of members enrolled than during any previous year, the total membership being 261.

As officers for the ensuing year, the election resulted as follows: John McNally, Chicago, president; Geo. Lindsay, Evansville, Ind., first vice-president; T. F. Keane, Helburn, N. Y., second vice-president; A. L. Woodworth, Lima, Ohio, secretary and treasurer; G. H. Williams, Boston, chemist.

As announced in our September issue, the balloting for next year's convention resulted by an overwhelming majority in the choice of Buffalo. Reports upon a number of very interesting subjects were presented to the convention and adopted by the Association. A few of these are reproduced in the following columns:

Report on Repairs to Locomotive Frames.

W. C. SCHOFIELD, FRANK PECK.

Locomotive frames are of so many kinds and sizes, and the conditions under which frames may be broken so different, that it makes the repairs so varied that it would be too tedious and altogether unnecessary to try to give any specific method of repairing each particular break.

The cost of removing, repairing and replacing a frame is considerable, and it should be our aim to carefully inspect every frame for other defects than that for which it was removed, so it can be repaired while in the smith shop.

Before repairing broken frames we should look into causes and try to find remedies if possible. If the break is from insufficient metal, put in new pieces, increasing the size where you wish it. If the break is from bad designing, you have a trouble that is ever with you, and often is impossible—it seems—to right; but each successive trial should suggest some new remedy until your efforts will be crowned with success. If from inferior workmanship, which is often the case, do it right. If from a wreck "cuss" the transportation department and fix the frame. Often we must make repairs as Mr. So and So says, regardless of what we may know is best.

We think it of paramount importance to have a good smith to make a successful job of repairing a frame. We are satisfied that if at the feast of Solomon it had been a botch blacksmith, his head would have deservedly paid the penalty for his effrontery.

Often we have frames with small cracks to be repaired. This in our opinion can be easily and quickly done by cutting out to the depth of crack, and with a suitable tool backing up sufficient stock for a good heat. Make a V of proper size, take separate heats, weld and work smooth, and frame is ready to put up without any machine work. If properly done it will be a first class job. But we think splitting and inserting, in shop parlance a "dutchman," is bad practice, and should not be permitted. We think a V weld is the easiest and best method of making welds in repairing frames, if properly done, except in special places.

We think the V should be so made that fiber of iron will be in the same direction as the parts to be welded. You can make a job look as well by disregarding this, but it cannot be as permanent. In making V welds in heavier parts of a frame, the scarfs should, when put together, be not less than a right angle; the V should touch at the bottom first. We think it safe practice after the first V is welded on one side, instead of the next V being of sufficient size to fill, to use a smaller V and weld with pene of sledge or a fuller of suitable size; by doing this you are sure of a good weld in the center. Then put in piece of proper size to finish, and you will have a job that will be permanent. Now, it has occurred to most, or all, of you, that after your frame was machined you could plainly see where the two V's met, and sometimes more easily where the V's did not meet. Of course, if you have a suitable steam hammer this precaution will be unnecessary.

Steel frames are as yet not much in evidence; seems to be an expensive luxury that only a few roads can afford, and when you have them, make up your minds to repair them, for they are sure to come, and often in several pieces. We repair them the same as we do iron frames, and always use a V weld if possible; making the V of iron. Then we look every time the engine comes in to see if it is broken.

We have noticed where some of the craft, with the assistance of the round house foreman, have found it unnecessary to remove broken frames to repair. This might be practical if we could pick the place for the frame to break. We have all seen the genius who welded the steel driving tire,—he didn't expect it to stand, but it was welded all right.

In conclusion, we think the manner of handling frames, and especially long frames where broken near center, has much to do with successful repairing. Where you have two cranes suitably located, it is an excellent way; when you have only one, you generally have to use most of the scrap iron on the place to counterbalance.

We think a good device is a bar of iron 1½ by 7 inches, by 14 feet long, with a hole in the center for the hook of the chain block, tapered to the ends and a sheave on each end for the chain to roll over, and two chain wheels placed at proper distance from breaks in frame so as to balance. Thus your frame is easily handled and repaired; it is on the principle of the apparatus long in use for handling truck frames.

Report on Springs and Spring Making.

C. A. MILLER, C. D. MILLER, R. G. MILLER.

The subject of springs and spring making is one of the most important that comes before our convention to be considered and discussed. To make a first class spring, the quality of the steel is the main factor. The best is invariably the cheapest. The most skilled mechanic can have but indifferent success with a poor grade of steel. He can only get out of it the best there is in it. The life of a spring depends upon the quality of the steel and the manipulation it gets at the hands of the spring-maker. Any steel manufacturer will furnish any grade of steel your purchasing agent calls for, but as they sometimes look at the first cost, we do not always get the best. Be that as it may, the only thing for us to do is to give the steel in hand fair treatment. If we fail to do this our Company will save money by getting the cheapest article.

The heating and tempering are the most particular points about spring making. The spring-maker should be as conscientious in the treatment of his steel as the toolsmith. If by accident a leaf should get too high a heat, the proper place for it is in the scrap pile. It will do no harm there, but if allowed to go into the spring it condemns the whole spring, and will be a source of trouble and expense.

Some people have a preparation that they use in the bath that is a specific

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for burned steel. "It not only brings it back to its normal condition, but makes it better." That is all a delusion. The cold water cure is as good as any patent medicine for burned steel, if dipped at the proper heat, but the best thing to do with burned steel is to throw it away. There are spring-makers that make a practice of plunging their steel in the bath at a white heat and drawing no temper, and still have no trouble with broken springs. Wonder if it is a fact? If so, the spring-maker should not be blamed. It is not his fault.

In the past thirty-five years I have had more or less experience with most makes and grades of spring steel. I have roasted the maker of some of it at times, but have used none of it that was not more or less sensitive to roasting. All grades of steel have a safe heat limit. To go beyond that means disintegration. This is as positive as the law of gravitation. It is very true that there is steel low enough in carbon to stand the white heat without any perceptible deterioration, but such steel is not fit to make springs of. Steel for springs should contain sufficient carbon to harden at a red heat. If sufficient hardness cannot be obtained with the oil bath at this heat, raise the specific gravity of the bath, but never the heat, until you get the desired result. Steel has a refining heat which can be readily found by experiment, and in heating it for the bath the nearer it approaches that heat the better.

The question of hardening steel is the time consumed in cooling. The bath that cools it the quickest hardens it the most. Anything added to oil or water only adds to or detracts from its density or specific gravity. Farther than that it has no power to make steel harder or softer, better or worse. Salt, owing to its specific gravity and purifying quality, adds to the density of water, removes all foreign substances, such as sulphur, etc., from the surface, and gives the bath free access to the steel. The same may be said of acid or anything of an acid or alkaline nature. They have no other virtue. For steel that contains sufficient carbon to harden in oil at the proper heat, this is the safest bath to use. It seems to have an affinity for steel and reduces the loss by cracking to a minimum. The oil should be kept at a low and even temperature by pumping it through cold water, changing the whole every five or ten minutes. A pump for this purpose can be constructed at a nominal figure, and the same run by the air blast, virtually costing nothing for power. Turning the air blast into the oil bath for the purpose of keeping it cool is poor practice. It perhaps would be of some benefit in a dry atmosphere, but in a humid atmosphere too much water gets into the oil which makes it flashy. We tried the experiment twenty-five years ago and had to abandon it on account of the danger of burning the old wooden building we were in at the time; besides we got no perceptible benefit from it. A good and economical bath is the drip from the chest of the steam hammer. Use a little salt as a cleansing medium. The steam can be turned on at will to temper the bath to suit the steel in hand. Of course you can add any specific you have that you imagine is a restorer of lost vitality.

The proportions of a spring govern to an extent its elasticity and durability. The space should gradually decrease from the longest-drawn leaf to the shortest, making a graduated run. It makes the spring more elastic toward the ends and lessens the liability of breaking at its central portion. The question is often asked, "Why do the short leaves of a spring break first? There are two good reasons,—first, excessive gather or snap; second, the rigid band. Excessive gather throws too much strain on the short leaves. When the spring is clamped together for bending, it throws from one to one and a half inch more camber on the main leaves. It puts a strain on the short leaves to do this. When the spring takes its load, the long leaves act as levers on the shorter ones until this added camber is taken out. When they commence to take their load the short leaves have more than their proportion and it is only reasonable to expect them to break first.

The solid band not only destroys the resilience of the spring as its central portion, but provides an anvil to break the leaves over. A leaf of a spring or any other bar of metal that is subjected to shocks, strains and vibrations, will invariably break where it is held rigid, or where vibration suddenly ceases. For instance, if you were to break a short piece of steel off of a bar, you would hold the nick over the corner of the anvil. If you were to break a piece from a small rod or iron or steel and nothing in sight to do it with but a vise, you would put it in the vise and squeeze it tightly with the desired point of fracture even with the top of the jaws of the vise, and vibrate the bar back and forth. It will break even with the jaw of the vise, or where vibration ceases. The solid band acts the same as the anvil and the vise. It destroys the elasticity; also the steel by crystallization at that point.

For the past fifteen years we have grooved all drawn leaves on one or both ends. We have a tool that nibs and grooves them at one operation. We have a gauge for each class of springs which is hinged to the tool, and which makes the work very rapid and accurate. The grooved leaf is an invention as old as the elliptic spring itself, so far as I know, but it is an addition to the spring that costs nothing, and it takes a great deal of the responsibility off of the band by holding the leaves in longitudinal alignment with each other. A great many springs have to be taken out and bands reset which are other ways all right. The grooved leaf obviates all of this trouble. We compress all springs before banding at double their load deflection. By so doing, any defect in the steel or bad manipulation at the hands of the spring-maker will become manifest and the defect remedied. It is less expensive to find these defects before the spring leaves the shop, than to do so after they are put in service. It also has a tendency to make the spring-maker more careful.

Report on Case Hardening.

WM. HODGETTS, H. HARRIS, HENRY HINKENS.

Case-hardening, as we all know, is a process by which we put a coating of steel on the outside of iron, for the purpose of getting a hard wearing surface, and still retain the inside of the material soft or unchanged. Wrought iron, if heated to a good red heat and brought in contact with granulated bone, or any other material in which there is a large amount of animal carbon, will absorb the carbon from that material, and the outside will become coated with steel, the depth of which is regulated by the length of time you keep the work in the furnace. Case-hardening to the depth of $\frac{1}{16}$ of an inch is enough for all practical purposes, and is even better than if you go deeper, as sometimes you will find cracks in motion work that are caused from hardening too deep.

Case-hardening to-day is not as serious a problem as it used to be, as most of our railroads have adopted the use of mild steel for all heavier class of work, such as crank pins, guides, etc. On the road with which I am connected we do not case-harden anything heavier than

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links, lifters, eccentric blade jaws, etc.

Your committee has no new methods as to the process of case-hardening; in fact it would be a hard matter to come before this convention and set down any fixed lines as to how this work should be done in all shops, as that is out of the question. The larger shops on our different roads have the advantage of being able to get anything in the way of tools. They also have the mechanical engineer close at hand, with pattern maker and foundry to call on at any time they wish to build an improved furnace, but how entirely different in the small shops where the master smith has to rely on his own resources, and make shift with anything he can get, not even having a furnace, but usually some crude affair that he has had to make out of whatever old scrap he can get, and even using a piece of cast or wrought-iron pipe to place his work in. In spite of this, he will procure the same result we do with all our best improved furnaces and boxes and every facility for doing work. When conditions are favorable for doing this kind of work, we recommend an oil furnace placed close to the ground, so that the work can be easily removed from the furnace without raising or lowering the boxes, with the vat close at hand, so that there will be as little handling of the work as possible. The vat should also be placed in the ground with the water coming in from the bottom end so as to keep a constant circulation of cold water at the bottom, and an overflow pipe at the top to allow the surplus water to escape. A piece of perforated plate should be placed about four inches from the bottom of the vat and above the inlet, so that a cold stream of water can flow under the work to cool it quickly. The boxes may be made from either cast iron or boiler plate, if a foundry is at hand. Cast iron boxes are the best, as they can be easily replaced. The boxes should be about 12 by 30 inches long in size, with lid to suit, for such work as links, pins, bushings, quadrants, etc.

In packing your boxes be sure to leave enough space between the pieces to insure getting all the flux that is necessary. About two-inch space for large work, and one inch for lighter work is sufficient. In heating your work, do not urge the fire too much at the start, but give it time to heat thoroughly. After the box is hot it should be kept at the right heat from five to six hours, which will give you a case-hardening for all necessary purposes.

Report on Tools and Tool Steel.

BENJAMIN BURGESS, CHAIRMAN.

Tools.

Under this head are included all tools brought to the toolsmith to be made, dressed or repaired. Right here we are confronted with a field of inquiry that could take up all our time. We have only time to glance at it. It is conceded that a successful toolsmith is an artist, and every tool that passes through his hand is a triumph of chemical science and mechanical art.

We will not attempt to describe how tools for lathe, planer, slotter, etc., ought to be made. It is plain, however, that there is a right and a wrong way, a proper form for every tool, a correct angle, amount of clearance, etc. This we leave to the machinist to determine, and the toolsmith soon finds out that machinists, as well as doctors, differ. Therefore we hail with pleasure the "Gisholt system" with grinding machines that will grind at the proper angle, exact amount of clearance, and the tool dresser furnished with proper tools and forms; this will fill a long felt want. For the past fifteen years or more, we have been making our shear blades with cutting edges square instead of bevelled, with good results. By turning them around or upside down, we get four edges instead of one. All that is necessary is to have holes in blade central and countersunk on both sides.

Crucible or Carbon Steel.

We recommend three grades: Select for lathe, planer, slotter, screw cutting, dies, etc., the higher grade; for clipping chisels, hammers, etc., that have to withstand shock, second grade; for hot punches, fillers, flatters, sets, etc., the third grade. Your experience coupled with good judgment will prove the best guide for selecting the best steel for the purpose to which tool it is to be applied. How are we to get the best results from this wonderful metal with the different modes of treatment? We know of nothing better to recommend than the yearly proceedings of this Association. There will be found different modes of treatment to choose from, and experience will do the remainder.

Here are a few simple rules on which nearly all are agreed, and which must be followed to insure success: Select a good steel for the purpose for which the steel is intended; have a clean fire, a deep body of fuel to prevent the cold blast from getting through; heat slowly and thoroughly; use judgment in forging; turn steel over and upside down frequently; see that your anvil is nice and smooth; never try to temper on the same heat of forging unless in be a track pick. For machine tools, after forging to shape, lay aside until cold, then reheat as above, in a clean, deep, bright fire, slowly and thoroughly, not any higher than is necessary to get the required hardness, then dip in your cooling bath. For lathes, planers, etc., we do not think it is good policy to draw temper; a little practice with dipping will be found as satisfactory and more so.

We all know color stands for nothing unless the necessary hardness is first placed there; that a bright piece of steel in its natural state, or even a piece of iron, will show color just as well as hardened steel, and the probability is you will get as uniform a temper by dipping as by drawing. We have purposely avoided calling these different degrees of heat red, full red, dull red, cherry red, etc., as being too indefinite. Only the man behind the anvil with experience and good judgment knows what these heats are. The artistic part of this business must be acquired and cannot be taught.

It will be noticed there is much here that is very indefinite. The heat for hardening is indefinite, because the eye, wonderful organ though it be, has its limit and cannot register the degree of heat. Let us look on while a large reamer or tap is being hardened in the good old way. After getting by the eye the proper heat, it is removed and immersed in the cooling medium; there was, perhaps, from half an hour to three hours, according to the size of the tool, allowed to bring this tool to proper heat; this was to allow the grain or particles of steel to get into proper position for the coming battle; the tool is gradually lowered, the water boils with the intense heat. We notice small scales of iron or steel that are on the surface of the water are sometimes attracted and then repelled, as two of the greatest forces of nature are pitted against each other, fire and water — the same forces that destroyed Pompeii in years gone past, and Martinique a few months ago, carrying death and destruction all around; the same kind of a struggle is progressing in your cooling medium.

The operator feels the struggle going on; the action of the steel is conveyed to the tongs, from the tongs to the hand, from the hand to the brain; earnestly the operator watches as the

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contest progresses; gradually the water becomes calm, the vibrations cease, no crack has been felt, and on withdrawing from the water it is found just about right—another good tool is added to the tool room. Now, who can tell what changes in the meantime have taken place while this process of refining was going on? Science has wrested many secrets from Mother Nature, but this she will probably never give up. Mystery appears at every step. This we call tempering by sight.

Tempering by Science.

The first thing we want is a good grade of steel and a knowledge of its contents. How are we going to find this out? By experience and testing. Now we want a good heating furnace for steel, one that is slow and steady, with a pyrometer to register the degree of heat. Raise your furnace until it reaches the degree of heat wanted, hold there until you are certain your steel is thoroughly heated through, immerse in your cooling liquid and your job is completed.

It will be noticed there is no guesswork about this; the eye may be deceived but here you are governed by laws that are absolute, and every day, whether dull or bright, the results will be exactly the same. This may be called tempering by science, and when everything is properly adjusted, any one can do the tempering. In this case there is no drawing of temper, there is no drawing necessary. You know you have the exact degree of hardness required.

A FORGED COPPER-INGOT TRUCK.—LOADING.

When tempering large quantities of small tools it is sometimes found necessary to draw temper. This is best done in oil in a pan over one or more gas jets. Place pieces in pan filled with oil, raise to correct temperature by thermometer, then turn down jet, allowing pieces to cool off slowly. Such a device will prove a great saving in labor. Such a plant is only practical and is best adopted for large quantities, and for railroad shops generally; it may not be a necessity, but the way railroads are being merged, the day is not far distant when such a plant for tempering will be a necessity in all large shops.

Self-Hardening Steel.

For extremely hard work this steel has taken a prominent place, and so far is maintaining it. Of late, different modes of treatment have been recommended. The burning process is beneficial to some brands, while to others it proves to be detrimental. High-priced steel is being placed on the market; machines are being speeded faster and faster all the time; everything along this line seems to be in a state of chronic transition. It is evident, therefore, that nothing but the best grades of steel will prove satisfactory.

Concluding, we have confined ourselves to a strictly practical basis. The field is wide and limitless—the possibilities are great. We believe the steel question, with different lines of treatment will continue to thrust itself forward for recognition, until we receive from the manufacturers an article that will be practically perfect.

We have no experience with local patent treatment of steel. We hope some of our members will be able to throw some light along this line. Steel is being put on the market that is seemingly high priced, but if we can increase the amount of work from thirty to sixty per cent., then the price of steel is a very small item. The days of cheap steel are numbered, and those in authority who will only buy a cheap grade of steel will simply be relegated to the rear.

A Forged Hand Truck for Copper Bullion.

The two half tone engravings shown herewith are of a hand truck for copper bullion, designed by Mr. J. H. Brown, Junction, Arizona, for use in transferring ingots of copper from narrow to standard gauge freight cars. These trucks have been in constant service since 1898, handling the entire output of the United Verde Copper Mine at Jerome, Arizona.

As shown by the illustrations, the truck is constructed entirely of gas iron and steel, every piece of it (except the two cast wheels) being forged in the blacksmith shop. A steel hook pivots on a peculiarly-shaped fulcrum, which is riveted to the axle frame. This hook has an extended portion which projects beneath the fulcrum and engages the floor when the truck is tilted backwards with the load, being thus

A FORGED COPPER-INGOT TRUCK.—LOADED.

forced backward behind the truck frame automatically. We are indebted to Mr. Brown for the photographs and details of this interesting creation of the hammer and anvil.

The Cure of Corns.

WILLIAM W. PETERS.

Corns are usually to be found at the inner heel, or at the angle between the bar and the crust, and are caused by the shoe pressing upon these parts. This will be most likely to occur should the wall break down, or be cut away to such an extent as to allow the shoe to rest upon the sole, or if the shoe should be nailed well back on the outside and toe. Then if it is left on too long, it will be drawn outward and forward, so much so that the inner heel will be drawn under the quarter and rest upon this part, bruising it. When the sensitive sole is thus bruised, the effused blood mixes with the horny matter and forms a red spot. If the irritation is continued, so as to produce very much inflammation, ulceration may take place, which would in some cases be sufficient to affect the inner wing of the coffin bone, and cause matter to break out at the coronet.

Sometimes when the quarter is very much contracted, the space between the bar and quarter being greatly lessened, it causes such bruising or pressure upon the soft parts as to excite inflammation, or cause a corn. The usual remedy is to cut away the parts, so that the shoe will not rest upon it, and put on a little caustic, or touch it with a hot iron, which destroys sensibility. The usual way in severe cases is to put on a bar

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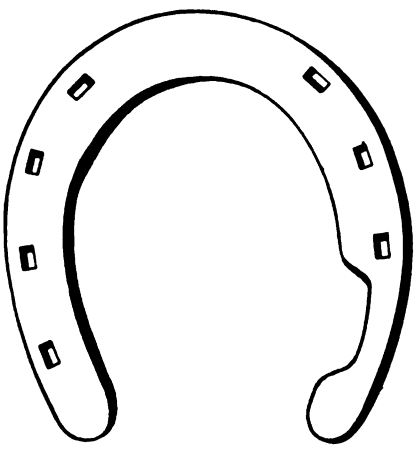
shoe, so as to remove all pressure from the sore part. This treatment is not curative. It will ease the horse for a time, but if the shoe is left on a little too long, or presses upon the parts in the least, or should gravel or dirt accumulate between the part and the shoe, lameness will follow. The only remedy for this is to remove the pressure, but in time, by this treatment, the difficulty is only aggravated and made worse; hence the assertion that corns can not be cured. I maintain that they can. The reason I say this is because I have cured them.

One of my neighbors had a horse with corns, one in each front foot. He brought her to me, and I shod her in this way. I took a pair of plain steel shoes, fitted them nicely to her feet. I held them in place while I took a pencil and marked the shoe over the



SHOE SPECIALLY PREPARED FOR CORNS.

corn. Then I cut that part out, and filed it smooth. The figure will explain my meaning. I shod her in this way until the corn disappeared. Now I shoe her with a plain steel shoe, and she travels with as much ease as a colt. You can put tips on and turn the horse out to pasture, and sometimes they will get all right, but by this method you can use your horse all the time.

Diseases of the Foot and Their Treatment.—9.

E. MAYHEW MICHENER, V. M. D.

Bog Spavin.

The above named disease of the hock is also known by the names thoroughpin and blood spavin. It is characterized by a soft and fluctuating enlargement of the synovial sac of the true hock joint, visible in front and to the inner side of the hock joint and in addition by another smaller point of enlargement behind the hock joint and visible on one or both sides of the large tendon known as the "hamstring" or tendon of Achilles. Pressure made by the fingers upon the last named enlargements will produce a greater fullness and tension in the enlargement at the front and inner side of the joint, thus showing a communication between the two parts, which is made through the joint itself.

This condition of the hock is very common in hard-worked animals, and other conditions being equal is more likely to occur in animals, which have been worked hard at an early age. Conformation plays an important part in the causation, for hocks which are badly shaped are prone to spavin; sickle hocks, as well as those which are abnormally upright, are predisposed. The enlargement is due to an excessive secretion of synovia, or what is commonly known as the joint water. The excessive amount of the synovia distends the joint sac, and the enlargement makes its appearance at the points above named, because they are the points where the least resistance is encountered by overlying parts. Lameness seldom results from bog spavin, and while the presence of the condition is strictly an unsoundness, yet it is one which but rarely impairs the animal's usefulness as far as work is concerned. For breeding purposes, however, an animal with bog spavin is not desirable, as the tendency for transmission in breeding is well marked.

The treatment of bog spavin is rather rarely attempted, because a cure is rather the exception in well-advanced cases, and also because the condition is generally considered as a blemish only. In young animals and in mild cases it is sometimes possible to remove the enlargement by causing an absorption of the excess of synovia. Several methods of treatment tend to produce the desired result. A safe method is to coat the surface of the skin over the enlargements with a covering of some quickly-drying material, thus forming a compression upon the parts which tends to cause absorption of the synovia. Ordinary glue mixed with finely cut oakum or hair from the horse's tail may be applied with a brush, care being required not to have the glue too hot. Several layers are applied until a firm covering results. Another good application is the silicate of soda which is applied cold, additional layers being applied as rapidly as hardening takes place. Whichever material is used for the purpose, the coating is not disturbed, but allowed to remain until it comes off, when the treatment may be repeated if thought advisable. Blistering bog spavins is sometimes practiced, but not generally with much benefit. Firing with the fine platinum point has given good results in some very pronounced cases, and is a fairly safe operation in experienced hands only. Heroic surgical treatment of bog spavin consists of opening the synovial sac either with the knife or with the hot firing iron. Some recoveries are reported, but the danger is certainly considerable, and rarely is a surgeon found so bold as to apply such treatment.

Prevention of bog spavin consists of care in the use of young animals, and the proper shoeing and care of the feet with a view of correcting as much as possible the faults of conformation. The sickle-shaped leg indicates use for the thick-heeled shoe and shortening of the toe of the hoof.

Another enlargement at the posterior part of the hock is that caused by dilation of the sheath of the perforatus tendon. This enlargement is found, when present to any considerable degree, just above the point of the hock, and is visible on both sides of the hamstring or tendon Achilles, which appears to divide the swelling into two parts from above to below. The enlargement is compressible from side to side, especially when the leg is lifted from the ground, but is distinguished from bog spavin by not causing enlargement at the front of hock when pressure is applied. This enlargement is most commonly seen in heavy animals where it seems to be the result of severe work. Lameness is very rarely caused by it. The treatment is essentially the same as mentioned for bog spavin, and the chances of the enlargement being removed are slightly better than in that disease.

Capped Hock.

By the above name is included any enlargement of the point of the hock. It may consist of a simple thickening of the skin covering that region, or it may be the result of injury to the deeper structures of the part, namely, the subcutaneous connective tissue, the tendons of the perforatus or of the gastrocnemi muscles which together make up the strong cord commonly known as the hamstring, and in rarer and more severe injury the underlying bone of the hock, which at this situation is known as the os-calcis, may be injured. Capped hock then varies greatly in its severity and importance. If the superficial parts alone are injured lameness is rare, but if the tendons or bone is

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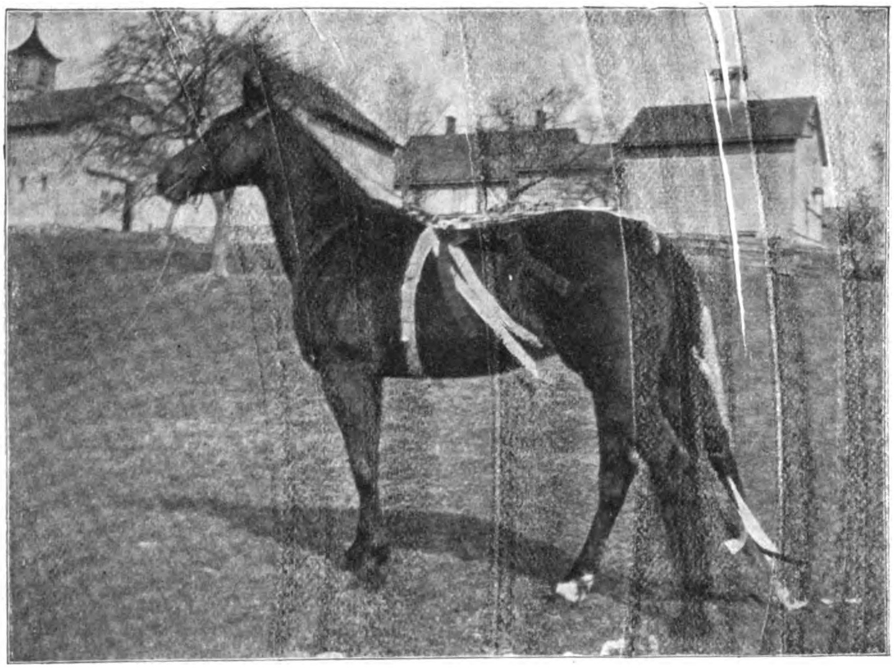
involved the lameness may be severe and persistent. The common cause of all cases of capped hock is direct violence to the part. The common ways of injury is by the animal kicking against some hard surface, as the side of stall. Injury of this kind is frequent in shipment of horses by car or boat on account of cramped quarters. Contact with the cross-bar of vehicles or with the singletree in heavy work is sometimes a cause. The presence of thick hocks at this point is in certain animals an indication of the habit of kicking in stable or harness, and animals showing it may be looked on with suspicion until their good habits are verified. Many colts are blemished for life by being kept in short or cramped stabling.

The treatment of capped hock, depends upon the condition of the case. If the injury is of recent origin and the swelling, heat, and pain of the part considerable, then measures calculated to reduce inflammation are to be employed. Place the animal in such a situation that the injury cannot be repeated. In the case of ill-natured animals, it is sometimes better to remove other horses from adjoining stalls. In some cases padding of the place kicked against, will be required. The application of very warm water to the swollen parts is good treatment, also very cold spraying with a hose is good either alone or alternately ·ith the warm water. Twenty minutes ·ee or more times daily may be re- th· ed in severe cases, or where the ·quir are severely lacerated by contact parts ·me rough surface a continuous with s· ream of cold water should be small st· the wound, through a small applied t· rubber tubing, tied to the leg diameter at · not tight, strips of muslin. by broad ba· rcise is an aid in the Moderate ex· ch cases as are able to treatment of s· lameness is slight or walk, and where rk is beneficial. Open entirely absent, wo ted by applications cuts should be trea tic solution. One of some good antisep lin to a pint of tablespoonful of cre·

water is good for the purpose. After acute symptoms have subsided and all open sores, if any, have become healed, the application of the silicate of soda, as advised in treatment of bog spavin, is frequently of benefit; allow the coating of the soda to remain until it falls off of itself, when the parts may be again coated as before. The application of tincture of iodine repeated four times daily until the skin is rendered sore to the touch has given some good results. Blisters are also sometimes used but should never be applied to a recent case. Whatever form of treatment be adopted the process of removal is generally slow, and in some cases the enlargement never entirely disappears.

(To be continued.)



CUTE, "QUEEN OF GUIDELESS WONDERS."

A Remarkable Mare.

Cute, 2.05¼, "Queen of Guideless Wonders," as she is termed by her owner, was first brought to the attention of the public early in the season of '99. She was bred at Round Top Farm, Bernardsville, N. J., by Hon. F. P. Olcott, sired by Lord Eldon, dam Winona, by Jersey Prince. As a three-year-old she started in at once taking a record of 2.21¼, in a winning race; as a four-year-old she raced successfully, reducing her record to 2.17¼. She was extensively campaigned as a five-year-old, again reducing her record to 2.15¼, and paced a trial mile over a half-mile track in 2.10½.

She is a remarkably handsome mare, with a fine, clear-cut head, showing docility and intelligence in every line, a round smooth barrel, with powerful quarters, giving her great propelling power, and a flat, cordy leg, and an elegant set of feet. She wears bar shoes all around, five ounce in front and four ounce behind. She wears knee boots, and quarter boots only in her exhibitions.

In the fall of '98, her education as a Guideless Wonder was begun. It was not difficult to teach her, as her racing education was perfect. She was an apt pupil, and she caught on to what was wanted of her from the start. At the first attempt she circled the half-mile track (New Paltz, N. Y.), twice, coming to a stop at the completion of the mile, which she made in 2.14¼. She began her career as a Guideless Wonder the following season, pacing forty-one exhibition miles, averaging 2.10 and a fraction. During the season of 1900 and 1901, she exhibited in different sections of the country, and at the present writing is on an exhibition tour filling her engagements. She has paced 108 exhibition miles from 2.10 to 2.05¼ (and a trial mile in 2.04), mostly over half-mile tracks. No mare, living or dead, trotter or pacer, has paced as many miles in 2.10 and faster. The wife of her owner has many records with Cute to harness, having gone an exhibition mile in 2.10¼, half-mile track, also a world's record, besides numerous miles in 2.11 and 2.12.

Cute performs the feat of pacing alone at the top of her clip without bike, driver, or any prompting whatever. She not only goes alone, but with hearty thoroughness enters into the sport, for such it seems to her. She requires no pace maker, no guiding, no whipping, no urging.

She starts at the usual scoring place, and on getting the word "go" is off like the wind. She keeps to the pole, cutting "the corners short." She paces every mile as evenly as though guided by hand, always saving a burst of speed to finish on the home stretch. N demonstration from the grandstand or crowds upon the track causes her to falter, but, rather, they incite her to better speed. She performs equally well on mile or half-mile tracks, whether fenced in or in an open field.

After passing the wire she appears to know her work is done, for she slackens her speed, comes to a stop and returns to the starter for recognition, viewing the crowd with an air of conscious pride and satisfaction.

For the above description of this interesting mare, we are indebted to her owner, Mr. V. B. Strong, New Paltz, N. Y.

The Scientific Principles of Horseshoeing.—12.

E. W. PERRIN.

Hot and Cold Fitting.

Much has been said both for and against hot fitting by some eminent authorities. For instance, Prof. Russel in his "Scientific Horseshoeing" speaks of hot fitting as a practice which cannot be too severely condemned; on the other hand, Prof. George Fleming, M. R. C., V. S., Principal Veterinary Surgeon to the British Army, in his prize essay on horseshoeing is just as strongly in favor of hot fitting.

The practice of hot fitting, like shaving, has it uses and abuses. For instance a razor is an excellent instrument to shave with, but because some demented person cuts his throat with one is not sufficient reason to deny others the use of a razor. In like manner a hot shoe is an excellent thing to get a perfect bearing with "a perfect juxtaposition between horn and iron" (Fleming), but because some inexperienced shoer pares the plantar surface of the hoof down to the vascular structure, then puts a hot shoe to that foot, thereby laming the horse, is not sufficient reason to deny all shoers the use and advantages of hot fitting, any more than it is right to argue against the use of nails to secure the shoe to the hoof, simply because some shoer pricked a horse in driving the nails. This argument against the use of a practice which it is possible to abuse is on a par with the act of a cranky veterinary surgeon once in charge of my regiment, who, because one shoer pared the sole of a hoof too thin, collected the knives from every shoer in the shop. Superintending the shoeing in person, he made us prepare the hoof with a rasp only, arbitrarily keeping us without the use of this most useful and necessary tool, the knife; for months.

That an inexperienced shoer sometimes fits a shoe too small, chops off the wall to fit the shoe, and invariably pricks the horse as a natural result, is readily admitted, but then there was no excuse for chopping away this wall, and had he fitted the shoe big enough, and left the wall to nail to, he would not have pricked the horse. In like manner, if a shoer pare a hoof so thin that it is almost bleeding, to put a hot shoe to such a foot would cause pain and lameness, but then there is no excuse for paring a hoof so thin, and if nature's protection—the sole—had not been so ruthlessly cut away, the shoe could have been fitted hot with advantage. It is a great mistake to pare the hoof so thin that you cannot try a hot shoe to it for a few seconds without risk of injury. The foot of the domesticated horse should carry as much sole as those in a wild state, as a protection to the sensative structures from injuries from stones, glass, nails, etc. When you next have an opportunity to dissect a foot of an unshod horse that has not been unduly thinned by paring or a long journey without the shoe, saw it through from toe to heel, and when you see the natural thickness of the horny sole, you will be convinced that you could fit a hot shoe to such a foot without risk of injury.

Some years ago it was a common practice to pare the horny frog to a standard shape, and much harm resulted from it. Veterinary surgeons took the matter up and much was written against this pernicious practice. Then both horse owner and shoer went to the opposite extreme of not cutting the frog at all. Now there is a great difference between cutting away all the frog, and simply trimming away semi-detached horn—which harbors dirt, producing thrush—in like manner there is a great difference between trying a hot shoe on a foot for a few seconds, and roasting a hoof for a few minutes.

I have seen cold fitting given a very extensive trial. Some sixteen years ago, when machine made shoes were first introduced into the British Cavalry, four troops of my regiment were shod cold and four hot, and the shoeing smiths soon became efficient at cold fitting. But the difficulty of obtaining a perfectly even bearing between horn and iron was never surmounted, as was amply proven by the large number of shoes lost at manœuvers from off the cold shod horses. If I have to deal with a customer who does not approve of hot fitting, I take great pains to fit his shoes cold; but you may hammer a shoe as level as possible, and rasp the surface of the hoof as level as an expert mechanic can make it, but the end of the horn fibres prevent a true and equal bearing between horn and iron, and as a general thing, when the shoe is nailed on, you can see daylight between hoof and shoe—an uneven bearing—and this inequality of the distribution of the weight is admitted by all writers to be very detrimental to the health of the foot.

In hot fitting, the shoe should not be red hot, but simply hot enough to char the ends of the fibres, and should only be held to a foot for a few seconds, under which circumstances hot fitting is a great advantage,—in fact it is the only way, as Prof. Fleming says, to obtain exact juxtaposition between horn and iron. I therefore recommend the use, not the abuse, of the practice of hot fitting.

The Use of Rubber Pads.

The principal use of rubber pads is the adaptability of rubber to save not only the foot, but the whole limb, from the concussion resulting from work on hard roads and paved streets. But rubber pads do much to restore the health of the foot by restoring as nearly as possible the natural distribution of weight over the plantar surface of the foot. The pad affords frog pressure, also some pressure on the margin of the sole, and the hoof being packed with tar and tow, which is the best substitute known for nature's packing—moist earth—we have a pretty close imitation of nature's plan.

The ordinary shoe obliges the wall alone to carry the whole weight of the horse, and this unequal distribution of weight, together with concussion and the want of moisture, is the cause of 70 per cent. of the cases of foot lameness. The rubber pad—properly applied—restoring as it does, the natural distribution of weight, does so much to restore the healthy functions of the foot. The pad is an important adjunct in the cure, but far more important in the prevention of many forms of foot lameness, because the pad, closely imitating nature's plan, keeps the foot sound much longer, even under the very trying circumstances of street work.

Rubber pads are useful for all kinds of foot lameness, except in the few cases where frog pressure is not admissible. As showing the value of a pad in restoring the foot to its normal dimensions, you may sometimes have occasion to use a pad on one foot on account of some form of lameness; if so, measure both feet carefully, make

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a note of any peculiarity in shape and form, and keep it for record. Measure the feet again in three or four months and you will find that the one which has worn the rubber is wider at the heels and in far better condition than its fellow that has been shod with the ordinary shoe. I have kept a doctor's mare in this city sound for six years of steady work by the use of rubber pads. She was pronounced incurable on account of a shrunken inside quarter, resulting from a barb-wire cut. I have used pads for corns, contraction, laminitic feet, split hoof, side bones, ring bones, etc., with eminent success.

As regards mistakes in the application of pads, some shoers have failures with pads because they are not properly applied, or because they select pads not suited to the case. For instance in horses shod with ordinary shoes, especially with calks, the frog in its effort to reach the ground grows as high as the shoe, while the heels of the hoof are often low. Hence when the shoe is removed, the frog projects high above the heels. Now you cannot successfully apply a pad to a foot in such a condition, because the elevated frog prevents the pad coming down on the heels. To remedy this, some shoers pare the frog down as low as it will stand, but the frog cannot stand the sudden change, and lameness is usually the result. In such a case use a bar shoe and leather sole for about six weeks, arch up the bar so that the frog takes but little weight at first, and in two weeks you can remove the shoe, heat the bar and hammer it a little lower. Repeat this in two weeks, and you will find the frog sinking back to its normal position, while the heels—having been thus relieved of the abnormal weight—will grow higher, and as soon as the heels are even with the frog, you may apply the pad with success. Again there are some pads which obtain more sole pressure than others, so that in selecting a pad for a thin flat sole, avoid sole pressure until the foot has grown more protection—more bottom—in which condition it will be benefited by carrying its natural share of weight.

With reference to the application of frog pressure I would remind you that you must change conditions gradually. When a frog has been deprived of its natural function for years, and you wish to restore it to normal conditions, you must be careful how you make the change. If you desire to use rubber on a foot where frog pressure is not admissible, as for instance in navicular disease, or thrush, use a Goodyear shoe.

There is another advantage in the use of pads which should not be lost sight of, and that is the excellent protection they afford to the foot against injuries from foreign bodies, such as stones, glass, nails, etc.

There is some prejudice among some horsemen against the use of rubber on horses' feet. I have met with some who are strongly convinced—I fear without proof—that rubber is not healthy for horses' feet. Some say that rubber draws the feet, that in time it rots the sole and frog. True, the sole that is covered up gets soft and the frog somewhat mushy, but this condition is the result of the packing, not the rubber, as is proved by the presence of identically the same condition under a leather sole, wherever tar and oakum are used. I have never met with a case where the use of tar and tow did a foot any harm, and I know of thousands of horses shod with leather soles, tar and oakum all the time. If rubber is any detriment to a foot, a case of the kind has never come under my notice, and I put rubbers on in England fifteen years ago. I could name some half dozen horses in this city that have been shod with rubber for the last five years, and their feet are in excellent condition. However, for those who prefer not to cover the sole of the hoof, there are several makes of open pads. Now as to the choice of pads, I know of no pad on the market to-day which has not some excellent merit, and I know I would not use a horse of my own on streets or hard roads without rubber pads on the front feet.

Appended is a list of firms manufacturing rubber shoes and horseshoe pads:

Consolidated Hoof Pad Co., 18 Vesey street, New York City.

Davie & Co., 1310 Wallace street, Philadelphia, Pa.

Dryden Hoof Pad Co., 433 Wabash avenue, Chicago, Ill.

Goodyear Tire & Rubber Co., Akron, Ohio.

Hahn Manufacturing Co., 356 Grand street, New York City.

M. Hallanan, 186 W. 4th street, New York City.

Wm. Killion & Sons, 20 Cambria street, Boston, Mass.

Neverslip Manufacturing Co., New Brunswick, N. J.

T. C. Octigan, 11 E. 26th street, Chicago, Ill.

Revere Rubber Co., Boston, Mass.

Western Horseshoe Pad Co., 56 5th avenue, Chicago, Ill.

(To be continued.)

QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

Welding Compound—Can someone give me a recipe for a first-class welding compound? B. B. B.

A Question About Axles—I desire to know how to put a wooden axle with skeins in a lumber wagon, the gather, draft, etc. H. O. Walker.

A Shoeing Question—I would like to ask some good horseshoer how I can shoe a horse that walks on his heel when he steps and then rocks forward. He is the same in both feet. Ben Musto.

How Shoe a Turned-Under Foot? I should like to have some brother shoer tell me how to shoe a horse who has the outside of his foot turned under. I would like to know how to straighten it. W. Trammel.

A Plow Work Question—Will some brother smith with experience in this line of work, explain to me what section or shape a plow lay should have for old ground and also for very hard ground. What shape gives the lightest draft? Hans Hanson, Jr.

How Can Shoes Best be Made to Stay on? Will some brother blacksmith tell me the best way to make a horse's shoes remain on? Should the nails be driven high or low? Also what is the best nail to use to make them stay on a long time? W. H. Hahn.

How Make Ready-Mixed Glue—I would like to ask some brother smith through The American Blacksmith for a good receipt for making ready-mixed glue. It is considerable of a nuisance to be obliged to cook glue every time a small job requires it. J. W. Summs.

Soldering and Brazing—I should like very much to have the experience of some of my brother craftsmen as to what they have found to be the best methods of soldering and brazing, especially brazing, as I have considerable of this work to do myself. W. J. Parker.

Gas Engine Inquiry—How large a buzz saw will a $2\frac{1}{2}$ horsepower gas engine like the Weber Jr. require to drive for cutting cord wood? How much gasoline will it burn running eight hours at its full capacity? Also how many revolutions should a saw run to do the best work? Hans Hanson, Jr.

How Weld Up Plow Lays—What is the best plan for welding up new plow lays? Is there any possible way to prevent their springing when subjected to the hardening

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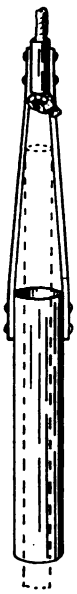
compound? Does the quality of the compound have anything to do with the springing of a lay? I refer particularly to hardening old lays. W. A. HENRY.

Removing Obstructions from Drilled Wells—In reply to the question of Mr. G. W. Dycus in the August issue about tools for removing piping and buckets from drilled wells, I would say for buckets, that if he knows the size of the buckets on the inside the best way is to take a piece of square iron that will fit tight on the inside of the bucket, draw the end down tapering so that it will start on the bucket easily and then with a chisel cut the corners down so as to form barbs. By driving this down into the bucket, the latter can be removed unless it is stuck fast.



TO REMOVE PIPING FROM DRILLED WELLS.

For removing pipe, take a piece of casing about three feet long, rivet a piece of heavy wagon tire to each side of pipe, about three and one-half feet long, and bring this together at the top, fastening to a smaller pipe, to which the rope is to be fastened. By driving this down over the pipe, the latter will wedge between the side irons and in this way the pipe can be removed. *See illustration.*

If this fails, take an old car spring or any good spring steel that is large enough and make two jaws sharp on the end. Rivet these on the inside of the casing at the bottom, so that the jaws reach up inside the casing and come nearly together. When forced over the pipe the jaws will catch, and the pipe can easily be removed. J. IVAN RANDALL.

To Tighten the Band of a Warner Wheel—Rest one side on the edge of the anvil and set the band to the wood with the hammer all around. Do this on both sides, and in many instances it will save the wheel, though it will leave the band bruised up with the hammer marks. There is little or no danger of breaking the band however. J. W. RESPESS.

A Plea for Better Prices—I would like to hear from some of my fellow blacksmiths with regard to some plan for establishing a proper price for shoeing. We blacksmiths out in the country are driving new shoes for 25 cents per shoe, and feel that it is not enough in view of the advanced price of iron and nails. It would be a great benefit if we could come to some understanding, one with another, by means of a union or association, and secure a uniform price for shoeing which would allow us a proper profit at all times. I should like to hear from country smiths on this subject. J. M. SMITH.

A Question on Interfering—I should like to hear from some brother smiths as to their experience on horses that interfere. I have a horse to shoe which interferes so badly that he has large knots on his hind and also his front pasterns. I find that he does not interfere quite so badly when he is barefooted. What would be the best way to trim the feet of the above horse, and also what kind of shoe would you use? In putting on side weights on which side ought the weight to be, the inside or outside?

Another question is, how should a horse be shod that overreaches and strikes his front heels every step? Inform me as to how to trim his feet. T. C. CAMFIELD.

Plow Lays—I noticed in the May number an article by Mr. Bruton telling how he put on a plow lay. His method sounds very ancient to me. Now the way I put on one is first to fit a short landside just as I want it to fit the plow, projecting about one-fourth of an inch below the bottom of bar. I then clamp it on with a pair of tongs, after which I fit my lay. I now put the landside and the lay in the fire, taking a welding heat on both of them. Then I have my helper take the landside and put it in an Ideal landside holder and place the lay where I want it, projecting over the landside holder about a quarter of an inch. I weld it down and upset the shin. I never have any trouble with my lay breaking loose. C. B. WOOD.

The Welding of Springs—In welding springs many smiths split them, but according to my view this is all wrong and I scarcely ever saw a good weld formed by so doing. My plan is to take the spring, get a short heat on it and upset the edges, making a very short scarf, which I hack with a hot chisel. I then take a borax heat, and put the parts together. After this, I clean the spring all off with an old rasp, and laying it over my fire, I apply the borax as the heat comes on without removing it from the fire. I use a striker and finish up by water, hammering until black. On a lap weld, the shorter the better, and you can scarcely find the weld.

An old wheelwright was in my shop once when I was steeling a mattock, a difficult tool to make. I struck with my hammer, as also my striker, as fast as we could, but the result was a poor weld. He asked why smiths do this and almost always fail to make a good steel weld. His theory was that the rapid blows strike in one place and loosen in another before it had time to unite. In my opinion he was right. The main thing is to be patient and take your time. No craft in the world has as many trying things to contend with as the blacksmith. I often have said that poor old Job wasn't a blacksmith. T. J. WALLACE.

A Few Words on Tire Setting—I wish to reply to Mr. C. W. Smith's opinion of cold tire setting in the August issue. He says that cold tire setting will do very well on a solid wheel. The great difficulty is that it will dish wheels too much, when the bolts are not removed. I have had thirty years experience in this business. I purchased a Schau Cold Tire Setter a year ago in July and have been using it ever since. I can do much better work with it on any wheel that has not got to be repaired than I can do the old way and in one-fourth the time.

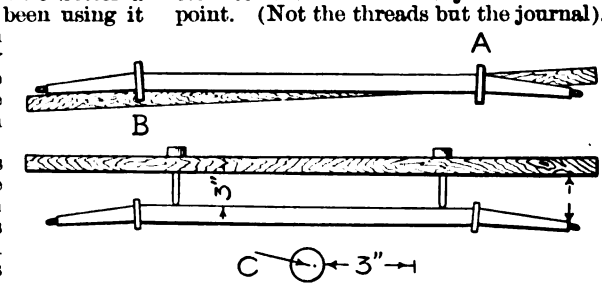
The great advantage is that you need not dish the wheel a particle. You can dish it little or much just as you please, for when you stop the lever the dish stops right there. The tire is cold and everything is finished.

On three-quarters of all the wheels, the tire gets loose on one side first, or in one little space, while the other side is all right. In this case you can put your machine on near the loose side and upset it, which it will do very easily and nicely. Also you can set a tire on a newly-painted wheel without making a mark on the wheel except on the edges of the tire. No man can set a tire the old way without disturbing the paint. There are many other advantages of the tire machine, which I could mention if I had the time. W. B. NELSON.

To Remove Cinders from the Eye—I wish to bring to the notice of the craft something which I have found very useful, a trick which was imparted to me by a brother smith. The blacksmith shop is necessarily more or less dusty, no matter how well swept, and a gust of wind will sometimes locate a speck of dirt in one of the eyes, and it is there to stay. Sometimes specks of scale will find their way there and the same trouble is experienced to get rid of these. I was visiting a brother smith in his shop one day, and while there caught a speck of dust in my eye. I, of course, rubbed, but he said: "Hold on, I will get that out." So he pulled out a hair from the tail of a horse standing near by, bent the hair in the form of a loop about one and one-half inches in length, keeping the ends between the forefinger and thumb. Then with the other hand he gently raised the eyelid and pushed the horsehair loop up under the lid as far as he could. He then told me to close the lid firmly. After this he pressed the lid firmly on the ball and pulled the loop out from under the lid and lo! the obstruction was gone. I have since then used this method often, and in nine out of ten cases it succeeds. Of course, for severe cases a doctor had better be called, as the eye is a very delicate member and cannot be trifled with. Still the horsehair remedy does not hurt or injure the eye. If any one of the craft knows of a better method of home treatment, I should be glad to hear from him. VETERAN.

Axle Setting—In answer to R. G. Parson's queries on axle setting, I take pleasure in giving the following methods as being very excellent ones for the approximate setting of axles: The first way is to place one edge of an iron or wood straight-edge even with the top of the axle at one corner, as at A, and even with the bottom of the axle at the other corner, as at B, and then make the bottom of the journal lie in line with the straight-edge. I always get very close to a plumb spoke in this way. I give the axle gather at the eye, by making the journal straight with the front edge of the axle.

Another more accurate way of setting axles is to have an axle set with hard wood or iron with removable iron points, in order to use it for wide or narrow axles. The two points or pegs should be of quarter-inch rod iron about three inches long. To get the set of the axle take your compass and describe a circle exactly equal in diameter to the size of the journal at the point. (Not the threads but the journal).



AXLE SETTING METHODS.

Then open your compass to three inches or exactly the length of the pegs on your set, and after laying this distance off from your circle, as indicated in the cut, increase the opening of your compass or dividers sufficiently to allow for the dish of the wheel. For new wheels, I usually allow about a quarter of the circle's diameter, as shown at C. For dished wheels, I set

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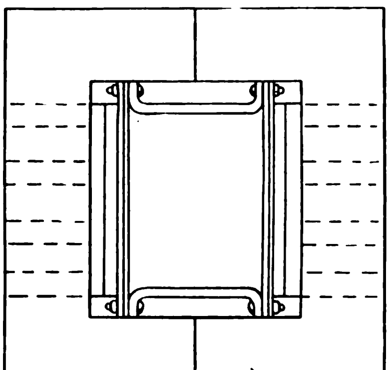
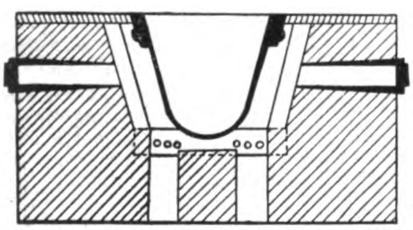
the axle down a little more. You can calculate the exact set of axles if you wish and apply it in the above way. This is a very satisfactory rough and ready rule. Having gotten the correct distance on your dividers, the points of the axle should then be set down from the straight edge exactly this distance. M. S. Hewitt.

Contraction and Corns—I should like to join in the discussions going on in the columns of your paper, and having had twenty years' experience, may be able to say something which will interest the younger members of the craft.

In regard to horseshoing, I have had considerable success in the same and





Figs. 1 and 2. Top and sectional view—galvanizing kettle setting.

attribute it, first to the close and practical study of my work; secondly, to the careful observations of methods of work wherever I went; and thirdly, from a perusal of papers such as The American Blacksmith.

Considering the question of contraction, perhaps many may be surprised to know that contraction in some cases is hereditary. One of my customers kept a stallion and raised all his own stock; his mares were very bad with contraction and all their offspring were the same, and had to be treated from the first shoeing. Ordinary methods, such as shoes convex at the heels, or putting on a shoe wider than the foot and drawing the foot with the nails, would be no good in this case. Something quicker must be had. Hence I made a screw or expander which I have used very successfully ever since. It is an arrangement inserted between the heels, which are then expanded by means of a screw, and the shoe then being nailed on, the foot stays spread. In a short time you will effect a cure.

Referring to corns, Mr. Kenyon says there are no such things. This is obviously an error. A corn is a callous lump caused by undue pressure, generally on the inside heel of a horse's foot. Some one was pleased to call this a corn, which it seems to me is a very good name. I suppose Mr. Kenyon will not attempt to deny the existence of this callous spot in many horses' feet. My treatment is to pare them well and destroy them by dropping on muriatic acid. W. H. Jekill.

To Weld Axles Successfully. Regarding the welding of steel axles, some brother craftsmen advise splitting and putting the short arms inside of the V. I think that is a poor plan and a vast amount of unnecessary work, giving in the end a poor looking job at the best. Two things are absolutely necessary for a good job, plenty of material and a good fire. Without these it is impossible to make a job. I have seen smiths fret, sweat, fume and, I am sorry to say, use "cuss words," and make a miserable failure in the end, not knowing what the trouble was, while all the time the difficulty was with the fire. So many of the craft set their tuyere irons too high, and again, when building their fire, I have seen them clean all the fine dust and ashes away, throw on a lot of green coal and go to work, the result being failure all day, to be repeated again the next. I never allow anyone to clean away the dust entirely from my fire. Indeed I take very little away at a time. I always coke my coal about half and use water. By so doing, you can make a heavy weld in a small fire.

Now we are ready for the axle. This I upset well before scarfing, making a fairly long lap. I always scarf front and back, never top and bottom. The reason for this is obvious. Hack your scarf well, have a good clean fire, and heat your pieces on top of the fire, for they will be down into the fire enough by the time you have a heat. Put on a steady blast, heat slowly and avoid taking the pieces out and in to look at them, for two or three times is sufficient. I use no borax or welding compound of any kind on the first heat. When hot, take out the pieces, give them a hard blow on the anvil to knock off the impurities. Let about one-half of the scarf of the bottom piece project over the anvil so that the point of lap will not cool off as it does when in contact with the cold anvil. The smith and his helper should then push the pieces up against each other. Don't be in a hurry, but keep your hammer off for three or four seconds, and then with the pene of the hammer tap lightly over the point of the lap. Then turn over and pene down all high or uneven places. Now, if necessary, clean your fire, make it up in good shape, lay your axle on as before and heat slowly, as I find the outer surface will sometimes burn when the inner parts will not be heated enough to weld. If you think best you can use borax, although I imagine it only adds to the slipperiness of the stuff and is of no immediate benefit. I use none at all on axles or tires, and rarely miss a weld. If the above instructions are carried out, you will experience no trouble. T. J. Wallace.

Galvanizing Work. My work is used in salt and accordingly needs to be protected against rust. Can you inform me how to put in a small galvanizing tank, so that it would be profitable to use for small jobs ranging from $5.00 to $10.00. I would like to know how to prepare the iron. Also how to prepare the coating substance and how to use it. If you can inform me on this subject it will benefit me greatly in my trade. W. L. Paul.

Coating articles made of steel and iron, with zinc, or, as the process is generally known, "galvanizing" them so as to retard oxidation, has become quite common.

When installing a galvanizing plant, bear in mind that the fumes of the chemicles used are destructive to tools and machinery. For this reason the outfit should be in a building by itself. The size of kettle should be determined by the amount of galvanizing to be done. As it is very difficult to control the heat in a small body of metal, it is not advisible to use a kettle, for any purpose, less than three feet in length, twenty inches in depth and eighteen inches in width. The kettle should be made of refined iron or best fire-box steel. Considerable water is used in this work and provision should be made to secure proper drainage.

Figs. 1 and 2 show a method of setting a small kettle that is not to be operated continually and which is to galvanize small articles. The grates c c in Fig. 3 are bars of iron that can be withdrawn when it is desired to allow the fire to go out and replaced when required for use.

In filling a kettle with pigs of zinc, or as it is termed in the trade, "spelter," place the metal in a way so that it will lie very close to the sides of the kettle. If this instruction is not heeded the kettle is apt to be injured by the heat. Do not allow the fire to burn too freely in melting a kettle of zinc, or firing up a kettle that is full of cold zinc.

The principal materials used in galvanizing are zink, sal ammoniac, sulphuric and hydrofluoric acids, and gas coke.

The tools employed in this work usually consist of tongs of various shape and sizes, baskets of sheet iron or heavy wire cloth and wires bent in various shapes.

Nearly all articles made of wrought iron or steel or of sheet metal are covered with more or less heavy scale, which must be completely removed before the zinc will adhere. To remove this scale make a pickle of sulphuric acid and water, one part acid to twenty of water and bring the solution to a temperature of about 150 degrees F.

To enable the zinc to take to the work quickly and firmly make up a solution of muriatic acid and water. This acts as a flux and also removes any rust that has

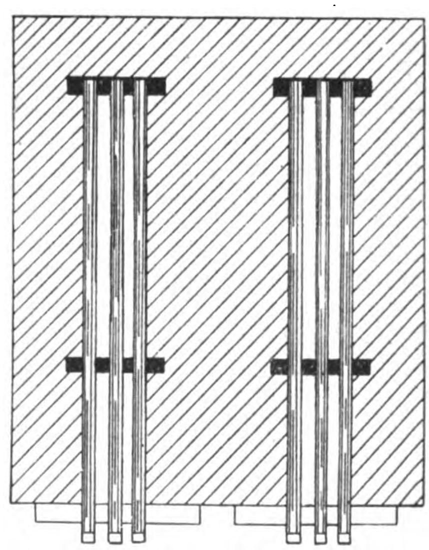


Fig. 3. Grate bar setting.

formed on the work and which the sulphuric acid pickle failed to remove. If rust has not formed on the work, all that is necessary is to immerse it for two or three minutes in the muriatic mixture. However if rust has formed the work must remain in the mixture long enough to remove it. This solution is made by diluting the acid about one-half and adding one pound of sal ammoniac to a gallon of the mixture. E. G. Z.

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The Winter's Work.

Are you prepared for winter's coming, in your shop, that is? Or will the flying snow take you unawares? It is always a good plan to provide in advance for a season's work. Perhaps the time has come to replace some of the old tools you have been managing to get along with before. Are you prepared for a long run of shoe sharpening? Then there are the sleds and the sleighs which will need repairing. It might repay you to speak to the owners about them now instead of having them all come piling in on you at the last moment when the snow finally sets in.

Handling Repair Work.

The line of repairing coming to the usual general blacksmith shop is, to the smith whose heart is in his work, the most interesting part of his daily labor. Its wide range and very complexity is fascinating in itself, though calling for the exercise of ingenuity and resourcefulness, often of a high degree. No blacksmith should ever turn away a repair job simply because he cannot see his way clear to the end of it the minute it is put before him. Take it and lay it aside for a day or so to think it over. A little reflection will clear up matters wonderfully, and the mere starting on a job causes its difficulties to dwindle most perceptibly. Undertake and overcome,—such would be a good maxim for the repairman.

The Preservation of Back Numbers.

We believe almost without exception, that the trouble taken to preserve the back numbers of a periodical which prints useful information is labor well spent. It does not always happen that you are interested in the subject-matter of a given article at the time it is first printed, but in times of future need it comes very handy often, to be able to turn to the desired information without delay. Lay your AMERICAN BLACKSMITH away—you may be in a mood to look it over again some rainy evening and pick up some points which you skipped before and which may be helpful to you in the future, if not at the immediate present. An excellent plan is to use a binder for filing them away as they come from month to month, and then at the end of the volume, bind the index away with them so as to be able to refer quickly to anything appearing in the twelve issues of that volume.

The Reader or the Advertiser.

There is one point to which we wish to call the particular attention of our readers. It is the entire absence of what is known as the free "write-up" from the columns of THE AMERICAN BLACKSMITH. These columns are divided into two separate and distinct groups, the reading pages and the advertising pages. The former, twenty in number each issue, we consider as belonging to the readers who have paid their money for the paper, and nothing is inserted in those columns which would not be of direct interest and value to them in their craft. The manufacturer who thinks that "write-ups," descriptions of old tools, or implements at any rate, which are not new and therefore not novel, will be considered in the light of news, deceives himself more than he does the reader. We aim to keep readers posted upon the new devices of interest to them as they are placed upon the market, and are always glad to publish such descriptions if they possess any elements of novelty, but we will not do this for any considerations of advertising. The advertiser can contract for a portion of the advertising space, and use that as he sees fit, within certain wide limits, but encroachments of advertising upon the reading space will be guarded against, whatever form they take, "write up" or other. The reading pages are for the readers, first, last and always.

The C. B. N. A. Convention at Detroit.

BY D. W. M.

The thirtieth anniversary convention of the Carriage Builders' National Association was held in the city of Detroit, Mich., during the week beginning September 29th. Detroit, with its historical attractions and the warm welcome given by its citizens, proved easily one of the most interesting points ever visited by the C. B. N. A.

The Light Guard Armory, the largest hall suitable for the exhibits of accessory trades, had been enlarged by frame additions, fully doubling the exhibition space; but even this proved too small, and many exhibitors found space in near-by buildings. All the Cleveland exhibitors occupied and filled a large room at the end of the main corridor in the Hotel Cadillac, and a dozen other rooms and parlors were occupied by exhibits from other points. There were also a number at the Hotel Normandie.

The headquarters of the Association and the sessions of the convention were held at Hotel Cadillac. The convention room was large, well lighted and beautiful in its appointments. The sessions began on Tuesday and lasted for three days, occupying the mornings only from 10 to 12. The Mayor of the city gave the Association a right royal welcome in a speech full of cordiality and good

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sense. Several instructive addresses were listened to, and the various reports of committees were received. The New York Carriage Drafting School, in which the Association has always taken a pride, and which it supports by contributions from its members, showed a flourishing condition.

Prizes had been offered for the best original design and working draft on several varieties of vehicles. Only three competitors appeared; nevertheless the committee decided it best to award the prizes in order to encourage a larger endeavor in the future, and the Association voted to renew the prize offers for the following year. Messages of greeting were exchanged between the C. B. N. A. and the British Institute of Carriage Builders. The discussion of the question of where to meet next year brought a number of orators to their feet, presenting the claims of Boston, Buffalo and Niagara Falls, but it was evident that Boston was going to win, which she did by a very large majority. Col. E. M. Bailey, of Amesbury, Mass., was elected president for the succeeding year, and this fact had some weight in determining a choice for Boston.

There were about two thousand people in Detroit in connection with this convention, and it was considered one of the most successful, if not the largest, ever held in the history of the Association.

The arrangements for entertaining visitors were very complete, embracing receptions, trolley parties and boat rides.

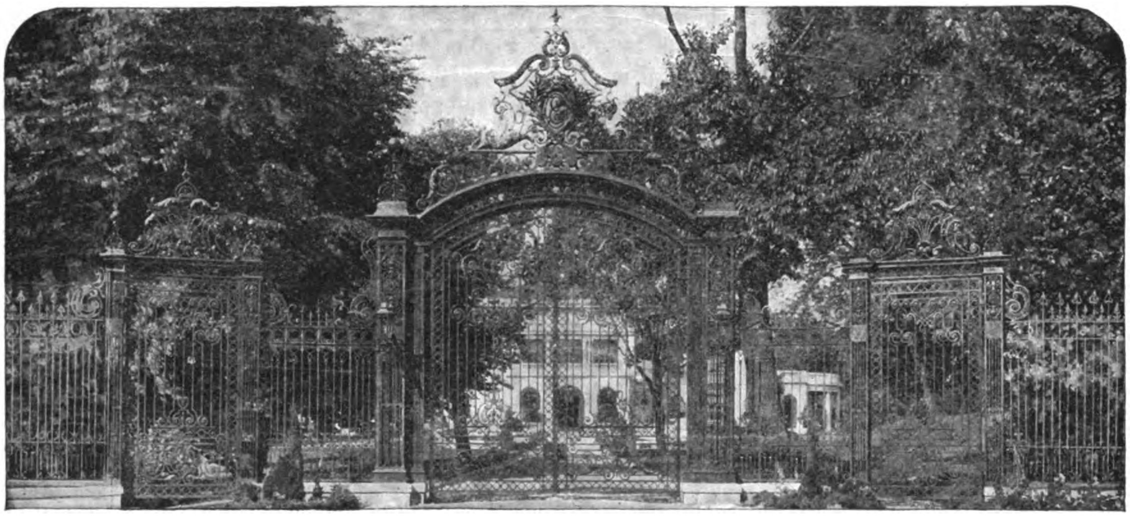
A special reception was given on Wednesday evening by President H. C. Staner and his wife, at the Hotel Cadillac, at which music, refreshments and a pleasant time for everyone were provided.

The grand annual banquet was held in the ball room of the Masonic Building, seating about six hundred at the tables. The decorations were beautiful.

A Fine Product of the Iron Worker's Skill.

The excellent half tone engraving appearing on this page shows an exquisite specimen of ornamental iron fence and gate work, decorating the residence of William L. Elkins, at Ogontz, Pa. Work of this nature gives scope for artistic constructive designing of a high order, and though much of this work is done, it cannot all be said to possess real artistic merit.

The work shown here was executed by John Burkhardt, of New York City, and the Wm. F. Remppis Company, of Reading, Pa., in conjunction with Mr. Horace Trumbauer, Architect, Philadelphia. After completion, the iron work was protected by a special paint of the Joseph Dixon Crucible Co., of Jersey City, N. J., to whom we are indebted for the material of this reproduction.



ORNAMENTAL FENCE AND GATE WORK. RESIDENCE OF WILLIAM L. ELKINS, OGONTZ, PA.

High Class Painting of the Medium Grade Buggy.

M. C. HILLICK.

The country and village jobbing shop painter is not infrequently called upon to paint a new buggy from the wood. Not infrequently, too, the vehicle is of the medium grade and the finish is desired to be a strictly A No. 1 kind, the price to rule accordingly. Following is the process covering the above class of painting:

Sandpaper the vehicle throughout until the surface, in both grain and texture, is perfectly smooth. Prime with primer made of three parts white keg lead, and two parts yellow ochre of the best grade. Break up in raw linseed oil, and to eight parts of oil add two parts of turpentine, and a gill of coach japan to each quart of the mixture. Use enough pigment to nicely stain the oil. Brush primer on freely and wipe up into a clean, smooth surface. Let this primer stand 48 hours in a warm *dry* air. Then with No. 1 sandpaper, surface the coat close and uniformly. To the body apply a lead made up of white keg lead and lampblack to a slate color. For liquids use one part raw linseed oil and three parts turpentine, still maintaining the same proportion of japan as in the primer. Brush on with an oval bristle brush. On this coat, when dry, do the necessary puttying, using a quick regulation carriage putty, made of one part dry white lead and three parts keg white lead colored with lampblack; equal parts of quick rubbing varnish and coach japan serving as the liquid ingredients. This putty will also answer for the running parts. When the putty is thoroughly dry (48 hours under good drying conditions should suffice), apply a coat of lead and filler, made of three pounds of American filler and one pound of white lead beaten to a heavy paste in equal parts of three-day rubbing varnish and coach japan, the mass then reduced with turpentine. Inspect this coat and do any further puttying, if needed. The day following, apply a coat of roughstuff made of equal parts, by weight, of American filler and keg lead. Mix to stiff paste with rubbing varnish and coach japan, and reduce to brushing consistency with turpentine.

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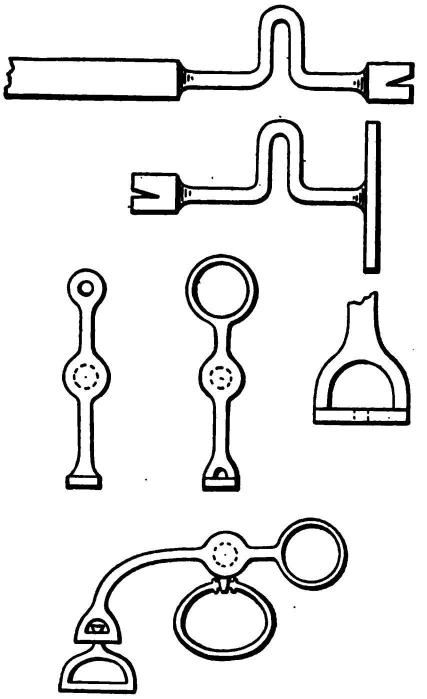
Avoid extremes in the matter of application. Roughstuff should be a little heavier in body than ordinary coats of paint, but not heavy enough to cause brush marks. Nor should it be so thin as to lack substance. Apply one coat per day, for four days, using sufficient yellow ochre in the final coat to serve as a guide in rubbing. Thus the body comes to the rubbing deck with seven coats of pigment.

Rub out with Eureka rubbing brick, and insist upon a surface faultless in every respect. The inside of body should receive three coats of lead all thoroughly sandpapered. After rubbing, set the body aside to dry out over night. This will insure a surface absolutely free from moisture. Give the surface rubbed a good polish with curled hair, sand inside of body and seat carefully, dust out and off thoroughly, and apply a coat of ivory black, japan, ground, and simply thinned out with turpentine. Use a separate cup and brush for coating inside. At the expiration of eight hours, again polish with curled hair and apply a second coat of black to body, both inside and out. Work in clean surroundings, and keep clean, both self and the surface.

The day following the application of the second coat of black, varnish the inside of body with a black color-and-varnish. Then tip the body so the surface yields a flat expanse, and with a half elastic flat bristle brush, width 2½ inches, *flow* the color-and-varnish over one side and one end of body. After 20 minutes turn the body over and flow the remaining side and end. After three days rub this coat, both inside and outside of body, using No. 00 pulverized pumice-stone and soft, clean water. Wash *clean* and again flow body, inside and out, as before, using an elastic rubbing varnish, with a dash of ivory black to eliminate the greenish cast of the varnish. This coat, in due time, will stand a harder rub with pumice-stone and water than the first one. The next and final coat of rubbing varnish, with still the bit of black to maintain the purity of the color, should look about as full and fine as the finishing coat itself. When dry, rub this coat just firmly and uniformly, but not close and hard like the preceding one. Wash up thoroughly. Then first flow inside of body with a hard drying body varnish. The outside, flow with an elastic body finishing varnish of high quality, using a full elastic brush, and laying as heavy a flow of varnish as can, by the exercise of the best skill, be made to stay in place. This should furnish a mirror-like surface, free from blemishes.

The running parts are sandpapered very thoroughly on the primer. Then apply rub lead, to make which, mix dry white lead to a grinding consistency in raw linseed oil, three parts; coach japan one part, carefully measuring the liquids. Add sufficient lampblack to give the lead a positive slate color. Then run through the paint-mill, after which reduce to a brushing consistency



THE PROCESS OF FORGING A CURB BIT.

with oil and japan used in the exact proportion above indicated. Mix stiff enough to brush on with a fairly stiff brush. After the lapse of 15 minutes, following application, if the drying conditions are favorable, the lead will be "tacky" enough to rub into the grain of the wood with the palm of the hand. Rub lead the running parts entire, and after 48 hours putty all cavities, etc., and 24 hours later sandpaper the surface fine and close throughout. Apply a second coat of rub lead. Rub the lead out smooth and clean. For an ordinary job one coat of rub lead will suffice. When the second rub lead coat is thoroughly dry, sandpaper carefully and apply a lead coat made of keg lead darkened with lampblack and thinned with turpentine, a half gill of raw linseed oil and the same quantity of coach japan being added to each quart of the thinned lead. Apply with a camel's hair brush. This should be as smooth and clean a coat as the color itself. The day following application, go over the surface with a tuft of curled hair, working up close and clean around bolt heads, felloe and axle clips, etc. Then dust off and apply flat color. After eight hours apply color-and-varnish, using a badger hair brush, and flowing the varnish on freely. Rub this coat, after 48 hours with a fleecy sponge dipped in No. 00 pulverized pumice-stone and water. This will remove specks, etc. Stripe on this coat, and apply a flowed-on coat of clear elastic rubbing varnish. Flow an entire wheel before wiping up, or half of the gear, and so on. Have confidence in your varnish and lay on all the surface will carry free of runs and sags. After four days, under good drying conditions, rub this varnish coat firm and thoroughly, but avoid cutting through at any point. Wash up, using the sash or water tool freely, and make the surface perfectly clean before finishing. Use a 1½-inch badger hair, chisel-pointed, flat brush to finish with, and flow on all the surface will carry of elastic, gear finishing varnish.

The above process covers a strictly first-class system of painting and finishing, such as the provincial painter is often asked to do and such as he should be able to do. It should afford durability, symmetry of surface, and brilliancy of finish to be proud of.

Forging a Curb Bit.

F. H. BUMP.

One of the fine forgings we are very often called upon to do, is a curb bit. In making this we take a piece of mild steel and forge the mouth part first, as Fig. 1, making a spade, or not, as the customer desires, and forging to the required length and size. We next cut it from the bar, allowing stock enough at each end for the cheek pieces. Then split the ends, as in Fig. 2, turning them back and flattening them, so as to get a cheek piece, at least an inch wide. Next forge these pieces to the shape of Fig. 3, leaving the lower end ⅜ inch thick.

The next step is to punch a hole at the top and bottom and draw to size of Fig. 4. We then punch or drill a hole in the lower end, as Fig. 5. Now we shape the cheek pieces to suit, and forge the lower ring by punching out a piece and drawing it over the horn. We leave a stud projecting which we pass through the hole shown in Fig. 5, and head it down inside the stirrup, over a washer. Then we split out the washer, which should have been counter-sunk on the upper side, and the bit is done.

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Occasionally we leave stock on the center, to punch for another ring, as in Fig. 6. The only weld is in the last ring which is put in, and this should have two projections, above and below the hole, to prevent it changing ends. In fact it should be made like any other bit ring though smaller.

Pointers on Axle Setting.

L. VAN DOBIN.

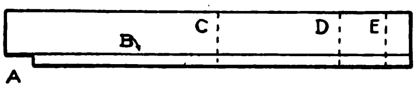
In a recent issue, the author of an article on axle setting speaks of using the wheels in setting axles. This method to my mind is wrong from every standpoint. First, it takes much longer; secondly it requires more work; thirdly you should not put a hot spindle in your wheel. Last, but not least, if your wheels are not true, or your box not put in true, you are sure to be led astray. I do not attach very much importance to this matter of a plumb spoke; the bottom spoke may be moved in or out considerably and your team not know it, but move the front or back spoke in or out and your horses would know it immediately.

The accompanying illustrations and directions outline the method which I employ for work of this nature, and every one who can understand my methods from what is given here will have no trouble setting an axle that will stand a wheel on a plumb spoke without seeing the wheel, if only they know the amount of dish.

Fig. 1 represents a straight edge, four or five inches wide, as long as any axle to be set, to be held in the vise, flat side up for convenience when being used. A is a notch in the left hand corner, B a gauge mark or line running from corner of notch A to further end of straight edge.

Fig. 2 represents a cheap gauge for setting axles, one side for bottom, and the other for front and back of spindle, F and G to be adjusted to fit spindle when properly set, and K adjusted to suit length of axle. Thumb nuts are placed at H, L and N. M is a board three inches wide by $\frac{7}{8}$ inch thick. P is a slot in the board. (F, G, K and other straps are made of iron about 1 by $\frac{3}{16}$ inches).

Get the length of the axle from face to face of the collars. At that distance from the notch A, Fig. 1, draw chalk line D. Then at the length of the spindle from D, draw E. Divide the size of the wheel by two, lay off from D and draw line C. Now suppose we are setting a two-inch axle. Take half the size of the axle (or one inch in this case) above the gauge line B, stick the point of your knife in the line D. Supposing our wheels have $\frac{5}{8}$-inch dish, add that to half the size of our axle, making $1\frac{5}{8}$ inches, and lay this off above the gauge line on the line C. Now take a straight edge, bring it to touch the two prick marks on the lines C and D, and mark where it crosses the line E, which gives



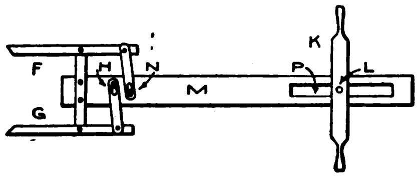


Fig. 1. AN AXLE SETTING STRAIGHT EDGE.
Fig. 2. A CHEAP GAUGE.

the center of the spindle at the point. Now calliper the point and after getting its size, take half that distance below the prick mark on E, which gives the bottom of the spindle at the point. The gauge line on the board represents the bottom of spindle at the collar.

Now take the gauge, Fig. 2, place one end of K in the notch A, then adjust part F or G (as the case may be) so it will touch the gauge line at D, and lower prick mark at point or chalk line E. Now fit the bottom of spindles to gauge, and wheels will stand on a plumb spoke.

Straightening up a Carriage Pole.

J. W. LAMBERT.

It may be interesting to know how to fix a buggy or carriage pole that has become warped or sagged down. I fixed one recently for a man who brought me his carriage and ordered the sagged pole taken out and replaced with a new one. It was a good pole but badly sagged.

I cut a piece of old buggy tire long enough to reach from the pole tip to the whiffletree bolt, and drilled two $\frac{9}{32}$-inch holes at each end, six inches apart. I then clamped the iron to the under side of pole and marked the holes exactly. Next I bored $\frac{1}{4}$-inch holes from the under side and bored them as if the iron was $\frac{1}{2}$ inch longer than it really was, putting a forked prop under the center of pole, and weighting the end sufficiently to spring the pole a little beyond the straight line; then I heated the iron along the center so as to expand it rather more than half an inch, and slid the iron between the forks which made a middle support for the same, clamped one end of the iron on to the bolts and fastened the other end in the same way. If the iron is a little too long you have to wait a while. I then straightened the iron, which is apt to get a little crooked in heating and handling, by hammering lightly to the pole, after turning up the nuts at each end and releasing the clamps, I fastened the center part of the iron with 1 x $\frac{3}{16}$-inch wagon nails, driving one in each tire bolt hole. The owner came for his hack and eyed it suspiciously, but after giving the pole an unappreciative kick and getting on it with his weight, he concluded there must be something in it. I charged him 50 cents for the job, and the pole never warped any more.

The repairing of the pole was on the truss principle. I will say in this connection that this is the proper way to apply a truss-rod or a strap to wagon axles, to protect the axle against straining or sagging. But how many trusses do we see that fail to perform this function. Perhaps half of them do not. Any truss of this kind that has no tensile strain, especially when the wagon is loaded, is of no benefit whatever. The axle may break and of course the truss alone could not bear the load. It is therefore essential that they act simultaneously. There are many different styles of trusses now used by different wagon makers, but the best and most effective of all is the $\frac{5}{8}$-inch round truss extending clear through the skeins, with nuts on ends, forming skein bolts and all. They are bridged underneath the axle to prevent contact with the bolster bolts, and any one with a wrench can "yank up the slack."

The Wood Saw and the Feed Mill.

BILLY BUNTZ.

Many of the country smiths who have power are putting in a wood saw or a feed mill to operate when business is slack. These machines are usually placed in a room or shed back of the shop, out of the way, and frequently are operated by the helper or the smith's sons.

Manufacturers of saws and mills seldom state the exact power required to run these machines, as a great deal depends upon the conditions under which the work is to be done and the way the machine is handled by the operator. The power is generally stated as being from 2 to 6 horse-power.

For sawing ordinary cordwood, a 22 or 24-inch saw is big enough. It should

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be fitted to a strong shaft, preferably of steel, and the journal boxes should be of an extra quality of Babbitt metal or of brass. A heavy balance wheel should be on the end of shaft opposite the saw to give a uniform motion to the saw and to hold it steady when it is cutting a stick. Or, the balance wheel may be on a little countershaft under the saw, shaft, out of the way. The frame should be heavy, strongly bolted, and provided with either a sliding or a swinging table to deliver the stick. The pulley should be small, usually about 5 or 6 inches in diameter, or small enough to speed the saw at about 1,000 revolutions per minute, as the speed is considerably decreased when the blade enters a stick.

A 2½ or 3-horsepower gasoline engine with heavy balance wheels will pull a 22 or 24-inch saw and render good service where the operator has any consideration at all for his work. When the wood is soggy, knotty, or full of slivers, care should be taken, as even an 8-horsepower engine might be stalled on bad wood. Even wood dense in texture may be sawed with a 3-horsepower gasoline engine, although for large, hard wood, or a large saw, say one of diameter from 26 to 30 inches, an engine of from 4 to 6 horse-power is better. As a rule, the 3-horsepower engine is big enough for such wood as the smith would have to saw, as, for instance, for a small woodyard.

As coal is high-priced at this time, there is no doubt that a sawing outfit will soon pay for itself where there is wood to saw. It is really fun to saw wood with a small gas engine, and as an outfit of this kind is very attractive to boys, it is an easy matter to obtain plenty of help. An industrious boy will work all day for nothing if allowed to occasionally stop and start the engine.

Some folk mount the engine and saw on a wagon or low trucks, as shown in the illustration, and cart the outfit from pile to pile, sawing wood for everybody at about 50 or 75 cents a cord. The outfit here shown is operated by a 2½-horsepower gasoline engine, which has heavy balance wheels. It is in use at Shreveport, La., and made the record of sawing 28 cords of hard wood in a day, which shows the practicability of the small engine when properly handled and pulling a saw of medium size.

A 2 or 3-horsepower gas engine will pull a small feed grinder, grinding from 8 to 15 bushels an hour, according to the kind of grain, fineness to which it is ground, rate of feed of the mill and the speed at which it is run. As on all small machines, an extra heavy balance wheel steadies the motion and aids in running the mill to its full capacity with least possible power.

A PORTABLE WOOD-SAWING OUTFIT DRIVEN BY A GASOLINE ENGINE.

In a good mill the best grinding buhrs are used. A stone or French buhr is "hard to beat," while many steel or iron buhrs have commendatory features, one being that they may be easily replaced at small cost when worn out.

Outfits of this kind will soon pay for themselves, and as the smith also has the use of the engine in running his shop, the small outlay for power and machinery is soon back in his pocket again.

One or Two Facts About Shoeing.

J. A. SUTHERLAND.

The first thing a horseshoer should learn is the anatomy of the foot and leg. This should be understood so well that the different positions of the foot and the effects these positions have on the joints will be perfectly understood. The next is how to balance the foot. By microscopic examination he will find that the moisture necessary to keep the hoof perfect is supplied by nature by the vascular laminae, and this moisture is carried through the foot by small tubes. As they reach the outer walls and sole, they are closed by attrition. This is to prevent evaporation. By cutting the sole or rasping the hoof wall we allow evaporation, and we usually try to remedy the resulting effect by soaking the feet and using hoof ointment. But as we cannot improve on nature by any artificial means the foot is spoiled for the time being, and in a short, time will dry out. Thus the foundation is laid for contraction, corns and all the other troubles with the foot.

If the above is properly understood by the shoer, he will be able to dispense with most of his different styles of shoes, and use a plain shoe on most all horses, unless the horse is naturally deformed. A bar shoe may have to be used sometimes. If so, make the bar full size of the frog. Make the bar first, turn both heels and fit the shoe. Weld at the toe. Let the frog bear the weight; that is what it is there for.

You can make a horse go in any shape by the toe calk, retard the movement of the foot, increase the movement and make him break over any way. Always use the lightest shoes, consistent with the wear, with the fewest nails and smallest size suitable for the shoes used.

Cut down the toe of the foot until you have the proper length. You can find this by the common square if you have not a foot adjuster. Do not cut the sole, but remove any horn that can be readily taken away. Cut away any hanging shreds around frog. Level heels with rasp. Shoe the same size as foot all around, as level on bearing surface as possible. About 1½ inches from the heel forward, bevel the shoe just a bit about $\frac{1}{32}$ of an inch. Warm shoe just enough to slightly color the foot, not burn it; press the shoe to

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place and this will give a better, closer fit and close the pores opened by the knife. This must be carefully done as the hot shoe will destroy the foot. This is very important. Do not fit the shoe hot, but warm. Nail on shoe, but be sure the holes in shoe fit the nails tightly. Do not drive nails high, as the more unbroken the hoof the stronger the foot. All breaks in the hoof have to grow down and out. Cut the nails off, don't twist off. Scarf and point with a blank edged rasp. Clinch with a good clincher and the job is done.

I have been shoeing for thirty years and have had very little trouble to get horses to go square. I never use any contorted shoes, except in cases of actual deformity. I have used with good results sharp shoes in summer, either where the roads were hard or the horse suffering from navicular disease. This reduces the jar on foot to a minimum.

The Elements of Blacksmithing.—12.

Steam Hammer Work.

JOHN L. BACON.

Instructor in Forging, Lewis Institute, Chicago.

Steam hammer work is so similar to other forge work in the shaping of the metal that more attention will be given here to the tools used than to the actual working of the iron. In the first place, the best material for forgings made "under the hammer" is soft steel. It is very difficult to work wrought iron without splitting, because of its stringy, fibrous nature, while steel, being granular and not fibrous is less easily split, and stands more hammering.

As to the hammers, these are rated by the combined weight of the falling parts—the hammer or ram, die, piston rod, and piston. Thus in a 1,000-pound hammer, these parts would weigh one

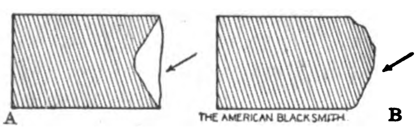
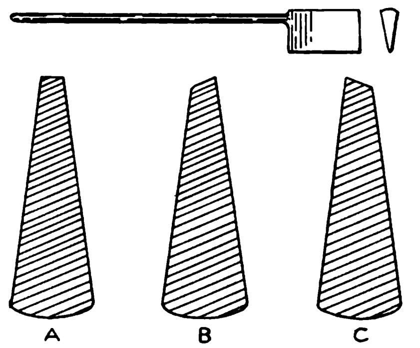


Fig. 100. EFFECT OF DIFFERENT WEIGHTS OF HAMMERS.
A, TOO LIGHT. B, PROPER WEIGHT.

thousand pounds. Hammers are often spoken of as striking a *blow* of so many pounds. This is incorrect, as the number of pounds of the blow, or the number of pounds pressure exerted by the hammer, depends entirely upon the *distance* in which the blow is stopped. If we could put up even a 200-pound hammer in such a way that there was absolutely no give to the anvil, theoretically the force of the blow would be so great that it could not be calculated. Of course such a case is not possible as there is always some give under the hammer, either in the anvil itself, or in the anvil and the metal being worked together. If the steam pressure, weight of hammer, length of stroke, condition of valve, etc., were always



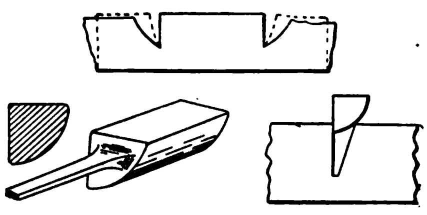
Figs. 101 and 102. CUTTERS FOR HAMMER WORK.

the same, energy of the blow could be calculated and would always be the same—but the "number of pounds blow" depends entirely upon the resistance with which the blow is met, and varies with every stroke, although the work done by each blow may be the same.

The best way to determine the size of a hammer is to specify the size of stock which the hammer will work properly. This can easily be determined as follows: Heat a piece of the largest size stock the hammer is supposed to work to a good forging heat, and draw it out under the hammer. If the end of the bar bulges out similar to Fig. 100, B, the hammer is large enough to do the work properly—if the end has the appearance of Fig. 100, A, the hammer is too small, being so light that the effect of the blow is not felt clear through the bar, working the metal only on the outside. Too light a hammer is apt to cause splitting, but too light hammering is very easily detected, as the end of the drawn-out bar will always be more or less concave. Too heavy hammering may also cause the work to split, particularly when rounding up work between flat dies.

The size of stock which can be worked under a steam hammer is limited. The blow of the hammer comes so suddenly, and is over so quickly that the effect is not felt in the center of large ingots, consequently only the metal near the surface is worked, and as the hammering continues, this outside metal tears away from the central part and spoils the forging. A striking example of trying to use too large a hammer—or rather trying to forge too large a piece of metal—happened several years ago when a prominent forge in this country put in a hundred-ton hammer. The result was as stated above. The stock worked was so thick that the effect was to split through the center. In other words, it requires a certain amount of *time* for the metal to flow under the hammer, and when the piece is too large, only the outside of the metal has time to flow, and the blow is over before the inside is affected. In the case mentioned the hundred-ton hammer was scrapped, and a large hydraulic press substituted in its place. With this press of course the "blow" is a gradual pressure which causes the metal to flow evenly—and no trouble is experienced in getting sound forgings—the size of the stock being practically unlimited.

There are several tools which are particularly useful in all steam hammer work—a cutter, a fuller, and a modification of a flatter; this last tool does not have as universal use as it should—but once used it will never be dispensed with. Straight cutters used under the hammer are generally of the shape shown in Fig. 101, and are of course made of tool steel, sometimes having a



Figs. 103 and 104. SHAPING STOCK UNDER THE HAMMER. A USEFUL FULLER.

mild steel handle welded on. These cutters should not be ground to as sharp an edge as ordinary hot chisels, but it is very convenient to have three cutters with the edges ground as shown in Fig. 102. A is used for ordinary cutting off, B and C for cutting up against shoulders, right and left. For ordinary work, the cutting edge may be from $\frac{1}{8}$ to $\frac{1}{4}$ inch thick, the back about $\frac{1}{2}$ to $\frac{5}{8}$, and the blade about three inches wide by three and one-half or four inches long.

In a previous chapter, the making of a crank shaft was described—the crank to be forged from a solid block. The stock was forged in the shape shown in Fig. 103, and the ends drawn out. To form the stock into the shape shown, cuts are first made with a hot cutter, as indicated by the dotted lines, and these cuts opened out with a special tool, a one-sided fuller. This tool is shown by Fig. 104, in elevation and cross section. The tool is used as indicated in the same figure, with one of the square edges against the straight

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shoulder, the rounding side turned toward the end to be drawn out. If it was attempted to draw out the end of

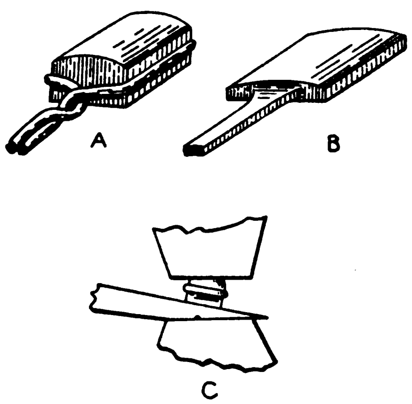
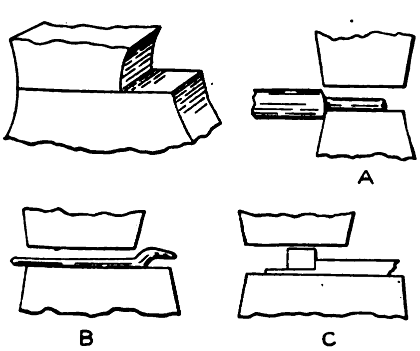


Fig. 105. TOOLS FOR TAPER WORK AND THEIR APPLICATION.

the stock without first widening the cut made by the cutter, the metal would be liable to double under and form a cold shut. With a tool of the above description there is no difficulty in keeping a straight side to the crank.

The faces of all ordinary top and bottom dies of the steam hammer are made flat and parallel with each other, making it impossible to forge a tapering shape smoothly with the bare dies. With a tool like Fig. 105, A, such tapering shapes as blacksmiths' cold chisels, track chisels, etc., can be as smoothly finished as on the anvil. The tool shown at Fig. 105, A, is for small work, but for larger work a shape like B is better. Fig. 105, C, illustrates the use of the tool; for tapering work, stock can be roughly drawn out into shape by turning the flat side of the tool up, and pulling out the stock with the rounding face. To smooth off, turn the rounding side up, and use the flat side on the work as shown. This rounding



Figs. 106 and 107. STEAM HAMMER DIES MANNER OF WORKING SHOULDERS.

face enables the tool to be turned through quite an angle; this has its limitations however, for if the angle is too great, the tool will slip out and not be held in place. The tool must of course always be used at right angles to the direction of the slant.

Steam hammer dies for ordinary work are generally made something like Fig. 106, that is, the top and bottom dies are flush on at least two sides (sometimes three), and the lower, or anvil die, projects beyond the upper or hammer die, on at least one side. When a piece of work is required with a shoulder forged on both sides, it can be worked down on the side of the hammer where the edges of the two dies are flush, Fig. 107, A, but when a shoulder is to be worked on one side only, as in making the eyes of tongs, this can be done as shown at B. The same thing is sometimes done by laying the work on the anvil, shoulder side up, and working in the shoulder with a block held on top as at C.

Cutting stock cold is sometimes done under the hammer, the stock being nicked with a cold chisel to the proper depth—held, by letting down the hammer on the bar with the nick on the corner of the anvil die, and broken off with a sledge hammer. The cold chisel for this work is made similar to Fig. 109, which shows the general outline and a cross section.

For finishing round work, swages should be used when possible. These are made double and fastened together with a spring handle which keeps the swages sprung apart far enough to permit inserting and turning the work. Fig. 108, A, shows one of these double swages. It can be easily made as follows: A piece of stock of the proper size to make the rectangular heads is taken, and the central part drawn out to form the handle, enough stock being left at each end for the square part, or two pieces, each a little longer than one of the square ends are used, a short stump drawn out on each, and a bar of flat stock welded on to make the handle. When this has been done, the handle is heated in the center and the two blocks bent together until they match up. The blocks are then heated to a good forging heat, a piece of cold round stock of the proper size placed between them, and then hammered together until they take the shape of the round bar. When hammering, the bar should be frequently turned to prevent flattening; use a tool steel bar. The swage should of course be made of tool steel. Sometimes it is necessary to finish a round shape tapering. If the taper is not very great, it may be done as follows: Place the work in the swages under the hammer as usual—but on top of the edge of the top swage place a thin strip of metal, as shown by the arrow in Fig. 108, B. When the hammer comes down on the swage, the thin strip will cause the blocks to come closer together on the side where it lies, giving the work a taper.

(*To be continued.*)

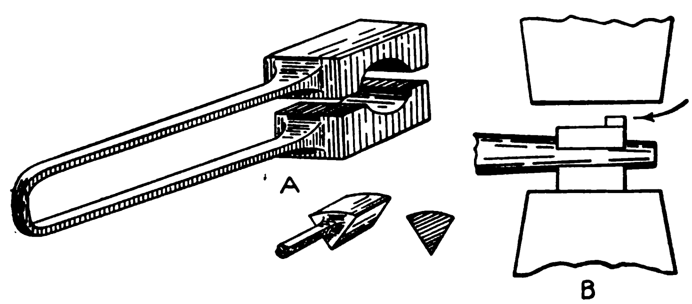


Fig. 108. A, DOUBLE SPRING SWAGE. B, FORGING A ROUND TAPER. Fig. 109. COLD CHISEL FOR STEAM HAMMER WORK.

The Clean Shop. Does it Pay? *

It is just as essential that we have a clean shop as it is that we have a clean life. We look to our superior officers sometimes for example: The General Manager's office is kept clean, why not the blacksmith shop? Many will, perhaps, consider this no comparison; why not? If it is good for one, most certainly it is for the other. We can well remember the days when we were taught to sweep out and keep the corners clean.

When you take into consideration how much is depending upon the blacksmith shop, you realize it is quite a corner. In a clean shop we find clean men, clean work, reliable work. A system prevails here that teaches a man to be honest. And by the way there is plenty of room for this kind of teaching, look in whatever direction you may, the world over.

Material used in railroad smith shops is expensive and must be handled with great care. Willful waste makes woeful want. Every piece of forging must be able to bear the strain laid upon it. Durability is economy; where good judgment is used, cleanliness teaches economy. Forgings to-day are made far more scientifically than in the past. The time was when the man who could wield the heaviest hammer executed the most work, but through the ever

* Report by H. R. Looker, Foreman Blacksmith, Ann Arbor Railroad. Read before the National Railroad Master Blacksmiths' Convention, Chicago, August 19-21.

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increasing ingenuity of the thoughtful smith, muscle has been discarded; steam and air have taken its place, and more work is being done to-day in five hours than could be done in five months a few years ago.

Many smith shops are dark places, mostly on account of dirty windows or skylights. Blacksmiths have not grown tender on account of living in greenhouses, but we know their lives could be made brighter, their faces whiter, if our shops had more light. Blacksmiths can live in glass houses for they throw the least stones; they strike best blows; they pile up, heat up, blow up, but never explode.

Many smiths could testify to the fact that when they had done their utmost to make a forging look complete and perfect, and as near to the required dimensions given them as it was possible for them to see; but when viewing it in a shop where there was more light, or upon seeing it outside, they were disgusted with their own work. Blacksmiths only die once, but they would prefer to do this than accept a "turkey" from an employer who expects good work done in a dark shop. Let our shops be kept clean, light and filled with pure air. We have heard of the air being made blue sometimes, not with smoke, nor the reflection of the blue sky, but from a dirty tongue—a foul mouth. A foreman loses all the respect men have for him when he gives way to this dirty habit of cursing and swearing. A shop is not clean where this exists.

In conclusion I would suggest that we let a little sunshine in.

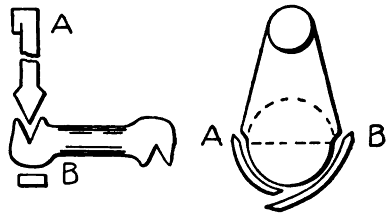
The Railroad Blacksmith Shop.—1.

Rockers and Rocker Arms.

W. B. REID.

Probably in no department of modern industry is more resourcefulness and ingenuity required than in the average railroad blacksmith shop. The grinding wear and tear, peculiarly incidental to railroad service, demand constant vigilance and effort to maintain efficient equipment of rolling stock. This implies, not only the repair of locomotives and freight cars, but everything, in fact, relating to the mechanical arrangements of the entire system. It involves a great diversity of work, constantly taxing the ability of the blacksmith to the utmost. In the following articles the writer designs to describe some of the methods observed and practiced in the course of many years' experience in the railroad blacksmith shop.

The method of making a rocker will often be determined by the material and tools at the disposal of the blacksmith.



Figs. 1 and 2. FORGING A ROCKER—A ROUGH AND READY METHOD.

In the average small railroad shop, a good serviceable rocker can be made as follows:

First Method: Take a piece of old car axle, of good quality and dimensions. Upset both ends roughly and scarf them by cutting out deep V pieces, as in Fig. 1. Scarf arm A, Fig. 1, to correspond. After welding these parts it will be necessary to weld a strip of 2″ x 1″ or other suitable size of iron around base of arm, to form the collar as shown in B, Fig. 1, catching points of arm where they extend beyond sides of shaft, Fig. 2. It will be best to weld this collar in two pieces, separate heats, working from points A and B, Fig. 2, to the center, where both pieces

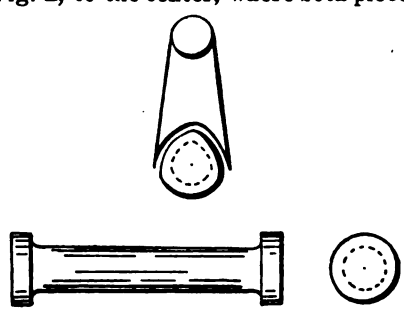


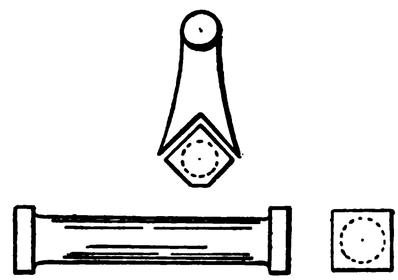
Fig. 3. SECOND METHOD OF FORGING A ROCKER.

meet and lap. Then take a finishing heat over all and drive home with sledges. In this way a good, strong rocker can be produced by an apparently make-shift method.

Second Method: Take a piece of car axle as before, allowing this time more stock to upset a full sized collar on both ends. This may be done under a moderate sized hammer by removing the bottom die. By cutting the ends squarely, and taking a sharp short heat, an almost perfectly shaped collar can be formed. Pinch the collar to a pear-shape as much as possible, scarfing the arm to correspond as in Fig. 3. With good, clean, initial heats followed by two slow, side heats a substantial weld is secured.

Third Method: This process requires the handling of a heavy, driving axle, or other piece of iron of equal size which will square up to 6½ inches. Forge the shaft from this, leaving a square head or collar on both ends. See Fig. 5. Scarf the arm to fit collar as in Figs. 4 or 6. Welded properly, these methods produce the most reliable of welded rocker arms.

The scarfs at acute angles secure a strong junction, and the points of contact, carried safely above line of shaft, permit of easy and thorough manipulation. The foregoing methods involve the forging of the arms in separate pieces. When an ordinary forge is used for this purpose, the following method



Figs. 4 and 5. THIRD METHOD OF FORGING.

produces a good piece of hammered iron for the purpose: Upset a piece of axle into an ingot at least two-thirds heavier than required for forging. Into this drive a short steel punch, 2 inches deep, so as to make a hole for a stout porter bar of 1½ or 1¾-inch round iron. Close the hole around the porter bar to hold it firmly in place until welded in forging. Heat slowly to secure a good uniform heat. In this way a piece of compact hammered iron, for a large variety of moderate sized forgings, can be made in shops having no suitable heating furnaces.

In Fig. 7 is shown shape of fuller used in checking down iron to form base of arm. Fig. 8 shows a forged arm. The scarfing of these arms for welding can be done principally under the steam hammer in one or two heats, as follows: With suitably shaped cutter, cut out a section of arm, smaller than required for scarf. Turn the arm upside down

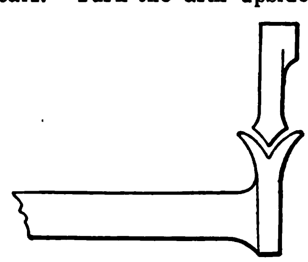


Fig. 6. ANOTHER COLLAR SCARF.

upon hammer die; insert a suitably shaped tool in cavity which will open it out and make a fin-shaped scarf at bottom. This scarf can be extended

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toward points with fuller or bob tool at the anvil. See Figure 9. A well-formed scarf, in every instance, always repays the pains taken.

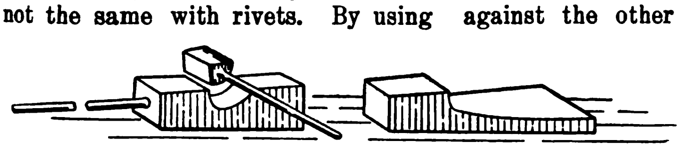
(To be continued.)

Frogs and Crossings.*

As chairman of the Committee on Frogs and Crossings, I beg leave to offer the following report of my experience in that line of work. As we are constructing a great many frogs and crossings at our shop, I will give you an outline of our way of doing the work.

I will first take the repairing of frogs. We cut out the worn and broken parts; when the guard rails are worn it is best to throw them away and replace them with new ones, as there is not much labor connected with making them. If the point is good and only worn at the point, we split the ball of the rail for a distance of six or eight inches back and insert a piece of cast steel in it and weld it with welding compound or borax. The point must be raised so that it will be of the same height as the balance of the rail, as the point of a frog always wears down first. The frog is then put together, using new bolts. The same filling may be put back if it is not too much worn. If no new filling is handy, liners can be put in with the old filling, so as to keep the rails two inches apart after being bolted together and lined up.

The frog is riveted on a plate—say a No. 9 frog has a plate 36 inches long, 16 inches wide at one end and 11 inches at the other end, and with twenty $\frac{5}{8}$-inch rivets. This plate is $\frac{1}{2}$ inch or $\frac{5}{8}$ inch thick and makes the frog much more rigid. It is impossible to keep bolts tight in frogs and crossings, but this is not the same with rivets. By using nut-locks on all bolts used on frogs and crossings, the bolts will stay tight much longer than with ordinary washers.



Figs. 7 and 8. METHOD OF FORGING A ROCKER ARM.

In making new frogs we cut the rail to proper length with the rail saw. Many railroad shops are not supplied with a rail saw, and in that case it must be cut with a chisel. There is but one right way of cutting rails with a chisel, and that is to use a sharp track chisel and cut the base of the rail all around, and the web on both sides. After this has been done, let the rail have a bearing at each end; set the rail up workways and then take the chisel and hold it on the top side of base of rail and hit one blow with an 18 or 20-pound sledge.

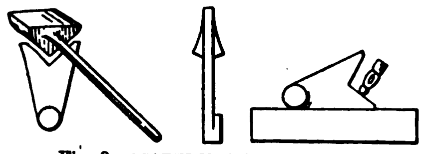


Fig. 9. SCARFING A ROCKER ARM.

You will find that one blow will break the rail in nearly every instance, without doing any cutting at all on the ball. Do all cutting of rail in the morning or evening in summer days when it is hot, or use cold water to break the rail after it has been cut.

We cut all points out in the blacksmith shop with the chisel, and shear the base of the rail with shears. To cut and fit five 7-pound frog points is a ten-hour day's work. We have templates for drilling all the holes. We use cast-iron filling in frogs and wrought-iron filling in road crossings, the cast-iron filling being much cheaper than wrought-iron filling. The planed frogs with wrought filling I find make the best job, but not by any means the cheapest.

The next thing I will take up is Railroad Crossings. We are constructing a great many of these, and I have had a great deal of experience in that line. In building crossings from—say 10 degrees up to 40 degrees I have them cut and put together the same as ordinary frogs and completed in the blacksmith shop. When the degree of curvature is 40 or 45 degrees we cut all the pieces the proper length and angle, leaving the part that fits up against the other rail $\frac{3}{8}$ or $\frac{1}{2}$ inch longer, to allow for making a good fit on the slotter, or some other machine in the machine shop, for doing that kind of work. When the degree of the curve is less than 40, I use cast-iron fillings with wrought-iron or steel plates at every corner. These plates should not be less that $\frac{5}{8}$ inch thick, with about 50 rivets $\frac{5}{8}$ inch in diameter in each plate. When the angle of the crossing is over 40 degrees, I use wrought-iron filling, forged and planed up to fit the rails of which the crossing is constructed. After the holes are laid off and drilled, the crossing is put together with corner iron and $\frac{7}{8}$-inch bolts, then the plates are riveted on every corner. This method of doing the work makes a good solid job.

In making a curved crossing, the rails are all curved before being cut. This bending may be done under a press or steam hammer, or it can be done with a rail bender.

In making a crossing for a railroad and a street car track, I simply plane out the ball of the rail side of the crossing to allow the flange of the street car wheel to go through it—say $1\frac{1}{4}$ inches wide, and $1\frac{1}{8}$ inches deep—shaped round at the bottom of the cut so it will not break so easily.

When a crossing is less than 45 degrees, I think it is better to make it in two or more sections, on account of the handling of it. A crossing too long in one piece is liable to be strained in loading or unloading, and I think they are easier to put in place in sections.

*Report by J. G. Jordan, Chairman of Committee on Frogs and Crossings, read before the N. R. M. B. A. Convention, Chicago, August 21st.

Farming Figures.

The agricultural interests of this country are so vitally related to the welfare of every community, that the prosperity of the farmer means a direct impulse to almost every line of industrial activity. Another evidence of unprecedented prosperity is seen, therefore, in the last census returns. In 1900 there were under cultivation 5,700,000 farms, as against 4,564,000 in 1890, a gain of 1,136,000 farms, or very nearly 25 per cent. in ten years.

Estimating five persons to each farm, this shows a gain of 5,680,000 in the farming population of the country. What is the industry that can show a like gain? As an indication of the growing wealth of the country, measured by agricultural production for home and foreign consumption, these figures are more than interesting.

A Western Wagon Trade Hint.

R. M. JONES.

For the Western trade, at least as regards Oklahoma where I live, the Eastern wagon is a complete failure, as it is very short-lived. The principal defect lies in the soft wood which is employed, and as the result, the hot winds cause the hubs to crack open and shell off, the felloes to shrink, the tires to get loose and the spokes to work in the hub. This makes it quite hard for the dealer. I have occasionally been obliged to shrink the tires on new wheels before the wagons left the dealer's store. As I said, this is a hard country on all wagons and vehicles. The Eastern wagon will not run here one year without the tire getting loose, and manufacturers should understand this.

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The Work of the Smith.

HERBERT DALLAS.

To fashion a sword on mail of might to hang,
Quickly shaped by the red fire's light, clang!
With eagerly gazing squire and serf,
Standing outside on the evergreen turf,
Watching the fire as it blazed
And hearing the sledge as it rang.

To fashion a chain for a dungeon drear and dank,
For a cowering carcass filled with fear. Clank!
Which shall keep him safe till the last dread hour
When deliv'rance comes from the tyrant's power;
And his corpse will be thrown in a hole
In the reedy moat's mouldering bank.

To fashion the fire-dogs, spit and "turn,"
For kitchen and hall, where the bright fires burn.
From the baby's cradle, bright and gay
To the coffin nail, 'gainst the Judgment Day.
To shoe light palfrey or charger grand;
To doctor them, too, at his lord's command.
This is the work of the smith. Clang!

HEATS SPARKS WELDS

Hustle while you wait.

Don't let winter take you unawares.

What improvements does the shop need?

Are you following collections up closely?

As the coal strike approached settlement, the blacksmiths were the first to be ordered back to work.

The blacksmith at Crayon, Ohio, has moved, leaving that locality without a blacksmith.

Work was recently started by the smiths of the New York, New Haven and Hartford Railroad in their new shop at Newport, Rhode Island.

There is no blacksmith at Walker, Indiana. Walker is not really a town, but rather a crossroads, but it is in a thickly settled neighborhood and would be a good location for a blacksmith.

Our folks—American blacksmiths—sleep well, eat heartily and are at peace with the world. Why? They are honest toilers, get fair prices for their work, pay their bills, and have a clear conscience.

Can you give a plain, shop-talk answer to any of the questions appearing further on in this issue under the heading, "Queries, Answers, Notes?" We always like to get the opinion of the every-day smith upon these questions.

If you could see Artist Beck in his studio at work on "The Village Smithy," developing all the details so true to nature, you would be as enthusiastic about the picture as we are. It is being admired by many, by all who see it, in fact.

The demand for competent farriers grows apace, despite the automobile. More and more shoeing is done every day. No machine promises ever to be able to take the place of the man who with bent back and hoof in lap, drives home the nails that bind on the shoe.

Have you renewed your subscription yet? We have heard from a great many of "Our folks" whose subscriptions ran out with the last issue. What they say about the paper is going to help us make it a great deal better—every number stronger than the last.

Leaks are bad. Whether they take the form of undesirable customers who don't pay their bills, wastes about the shop, poor work, or whatever they are, constantly seek to do away with them. Just remember there will be a better filled purse at the end of the year.

Meetings for discussion of methods are helpful. Why not let them be a regular thing, once a month at the longest? Invite all the apprentices and helpers to listen to and engage in the discussions. THE AMERICAN BLACKSMITH will present a free copy of the paper the first year to any new society organized for this purpose.

Shoeing conditions in the cities nowadays are far different than they used to be years ago, when dirt or wood pavements prevailed. Because of the rough cobbles or hard asphalt, shoes are speedily ground away and do not admit of sharpening and resetting several times before they wear out, as was the case in the olden days.

Let the boy try his hand at getting new subscriptions. A little effort after school or on Saturdays will be worth his while. The new subscriber gets the balance of this year and all the next year, for a dollar. A prize goes to the one who obtains the greatest number of subscribers between now and April 1st.

Thirty thousand subscriptions is the mark set for the second year's growth of THE AMERICAN BLACKSMITH. With your help they may be easily obtained. Will you lend us a helping hand and mention the paper to your neighbor smith when next you meet him? He ought to be a subscriber and would be if he knew the benefits.

A good shop in a nice little country village located in a prosperous section of the country can be rented for about $50.00 or $55.00 per year. Salem Center, Indiana, is the village, and there is no blacksmith there and no shop nearer than five miles. Any one who may be interested should write to M. B. Butler at that address for further information.

A Maryland blacksmith named John Wilkinson has just been paid for shoeing a troop of cavalry horses belonging to the Union army thirty-eight years ago. The officer in command gave the blacksmith a voucher for his work, which for some reason he did not present to the War Department, but kept in an old wallet until the paper was crumbling to pieces.

Is the boy in your shop being given the best chance to learn the trade? Is he receiving the encouragement which is due a youngster, and are you devoting the time to him which you ought? He should be made to feel the dignity and responsibilities of the trade which he is learning, and the ideas which he receives from his first master go far towards determining his future as a smith.

City shoeing shops display many evidences of ceaseless progress. One evidence of up-to-date methods is shown by many shops putting in telephones for the convenience of their customers. Employers must often use it to keep in touch with drivers who are waiting for shoeing to be done. Again the telephone is especially useful to patrons who may wish to find out how crowded a shop is at a certain time.

An Ohio blacksmith who recently indulged too extensively in the cup that cheers but also inebriates was taken in hand by his wife and marched to the police station. At the hearing the wife agreed to settle the charges necessary to secure the release of her prisoner. A peculiar if disgraceful episode going to show that blacksmiths may at times be subject to the frailties common to other human beings.

The publishers have an abiding faith that the blacksmith will take and read a paper which is filled with good, solid, blacksmithing stuff from cover to cover. They have every confidence in the quickness of the blacksmith to recognize, appreciate and adopt anything which will advance his knowledge of craft matters and increase his efficiency as a mechanic. The smith must have a journal which is as good in every respect as the periodicals representing other crafts.

A varied line of work is carried on by James Redpath & Co. at Grand Forks, N. D. They do a general blacksmithing business, making a specialty of fine horseshoeing and plow work. They have a carriage shop in connection, and do repair work. They also have a feed mill and grind feed for farmers and others while they wait. Have you considered what line you could add to your business to fill in the odd moments. It will help to fill your pocketbook also.

Tom Tardy. In Erie County, New York, is the big, progressive city of Buffalo, and also something else not of the hustling kind, a certain mechanic, a blacksmith by trade. The deed of his place does not give his name as Tom Tardy, but this is a very fitting nickname. We pass his shop frequently and have often wondered what was the matter with Tom (that much of his name is correct); so you will hear something of him from time to time. The other day one of our subscription solicitors called, and Tom said that he had no need for a craft paper. He had gained his knowledge of the trade from his father solely, and, in fact, described how he came from a family of blacksmiths for several generations back. Tom says there is nothing new to be learned or developed in the blacksmith field, and that apprentices should go to building air-ships and sub-marine boats, if they are not satisfied to think as he does about the blacksmithing business.

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The Village Smithy.

A Famous Painting by Raphael Beck.

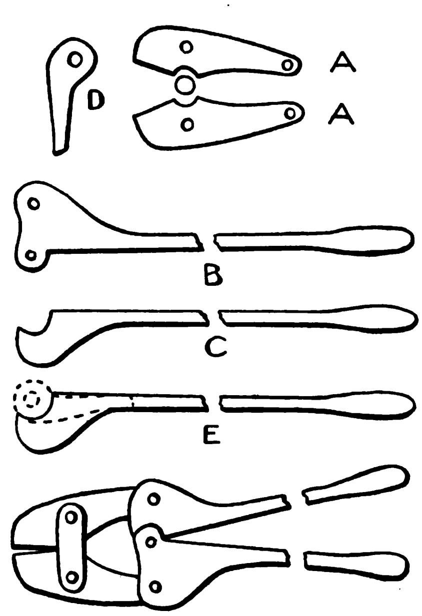
The following details regarding an exceptionally fine oil painting from the brush of Raphael Beck, will be of special interest to all AMERICAN BLACKSMITH subscribers, when they learn that an opportunity will be given them to possess a handsome reproduction of this most artistic painting. Raphael Beck, widely known as an artist who has attained success and recognition for his work, not only in this country but abroad, in Paris and London, has been engaged during the past two years in producing a magnificent oil painting, the subject of which is The Village Smithy.

We have been interested in blacksmithing subjects for a considerable number of years, even before starting the present journal, and have always been on the lookout for works of art which faithfully portrayed the smith and his picturesque sphere in the world's work. The services of other artists of note have already been called upon by us, though without producing anything which was entirely satisfactory. Mr. Beck's present picture more than meets our requirements in every respect. We have watched the development of the painting, and now upon completion, have purchased the original at great cost for the exclusive benefit of THE AMERICAN BLACKSMITH and its subscribers.

This work of Raphael Beck takes rank among the best that he has ever produced. It was developed slowly and carefully, the artist at the time visiting a great many blacksmith shops to gather the materials for his work. The principal figure of the painting is naturally a fine-looking blacksmith, standing at his anvil with hammer and work in hand. He is pictured as ceasing work for the moment to look up at some children, who have just entered the shop and are gazing at him and his work with the deepest interest. The various other details of the country shop are faithfully portrayed. In one corner stands the forge, and in the background is a handsome horse waiting to be shod. The whole picture is very true to life, and is pronounced by all who have seen it to be of the highest artistic excellence. The original painting, "The Village Smithy," will be entered by us in the principal art exhibits of this country, and will also be placed on exhibition at the St. Louis World's Fair in 1904.

"The Village Smithy" by Beck will not be cheapened by a promiscuous sale of reproductions. We intend to make use of the picture for our subscribers only. The copies which will be placed in their hands will be reproductions by the duotone process, executed with the highest degree of skill in the soft, sepia effect which is so characteristic of the original oil painting. All of the details and artistic merit will be preserved in the copies. The size will be 9 by 12 inches, making a handsome picture for framing.

It is our intention to place a copy in the hands of every person sending one dollar to this office in payment of a year's subscription when due, an inducement for prompt subscribing and a reward for prompt payment, as it were. This offer applies to all new subscribers, whether singly or in clubs and to all renewal subscribers; in fact, to all persons sending us one dollar in prompt payment of their subscriptions. It is entirely additional to the offers in the premium list. We are very glad to be able in this way to give our friends an opportunity of obtaining a picture of high artistic merit relating directly to the craft, and one which will be for them exclusively.



A HOME-MADE BOLT CLIPPER.

A Serviceable Bolt Clipper.

J. D. ARROWOOD.

The accompanying illustration shows a bolt clipper, which I easily made and find of great service and lever power. First I make the blades AA, cut notches as shown, and put in a round slug of steel to fit the notches. The blades are made out of tool steel ½ of an inch thick, 1½ inches wide at holes, and six inches long. Next I make handles, C, then two pieces like D, put the two pieces together, as indicated by dotted line at E, and weld. This gives me two handles B B. I then drill ½-inch holes and rivet with steel rivets. Great care should be taken in tempering. I temper only the cutting edge, first heating to a cherry red and plunging in salt water; draw to a sky blue and let cool. I make handles of ½-inch plow steel.

Some General Notes on Shoeing.

F. J. LEMSFORD.

There is room for a great deal of improvement and a deeper knowledge on horseshoeing. Interfering, knee knocking, forging, contraction and corns are the principal troubles that the horseshoer has to contend with, and they all demand patient and persistent study. Corns are caused often by shoeing. First remove the cause and you cure the corn. I go on cause and effect a great deal in shoeing horses. Pare the foot all that is necessary, but never pare one side lower than the other. Pare the foot as near as possible to old Mother Nature. Fit the shoe to the foot cold, or nearly cold, and do not fit the foot to the shoe. Leave a spring in the heel of the shoe, and do not have the binding on toe and heel as a great many horseshoers do.

For interfering, pare the foot level and as near natural as possible. I believe in keeping the foot level, and make a side-weight shoe, 16 to 24 ounces, from a bar of iron. I never have failed to stop any interfering horse that I have ever tried; sometimes it takes a heavy shoe and then sometimes a 12 or 14-ounce shoe is sufficient. What will stop one will fail on another. The blacksmith must use a little common sense when he goes to work on a horse's foot. In fact he ought to be a veterinary surgeon. Sometimes you can stop interfering in the hind feet with a trailer shoe.

As to contracted feet, I pare them whatever is necessary. I generally can tell when I pick the foot up whether he has thick sole or wall, and know generally how much to cut the foot. Never cut the frog. Nature knew what she was doing when she gave the foot a frog. I generally use a bar shoe on a contracted foot. I am governed according to the nature of the case. Contraction and corns are largely caused from, or by, shoeing.

Some of my craft have said that it was hard to keep a horse from getting sore, having corns and contracted feet, in cities where there were rough and

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paved streets. I have shod for paved streets and I have shod in the country, and I find it just about as easy one place as another. If you know how to shoe in one place you know in another. Theory and practice are all right, but *theory* will not stand alone.

For forging or over-reaching, I use a toe weight in front and a side weight behind, and I have good luck and give general satisfaction. I sometimes make a rocker plate and sometimes a rolling motion shoe for the front foot.

In shoeing a knee knocker, I make side weights for front feet and crease so as to let the shoe extend out, say a half inch on the outside of the hoof. Of course, the heavy side of the shoe is on the outside; this shoe has given good satisfaction with my patrons as well as myself. In all cases keep the foot level and what you remove take from the bottom of the foot. Rasp as little as possible off of the outside. Of course where a foot is out of shape and has a spur, I cut that as much as possible at a time. Sometimes it is not common sense to try to cut it all at once.

Use good judgment all the time. A horseshoer should know the anatomy of a horse's foot; if he does not, he has not got any business working on it.

The Machinery Building at the Louisiana Purchase Exposition.

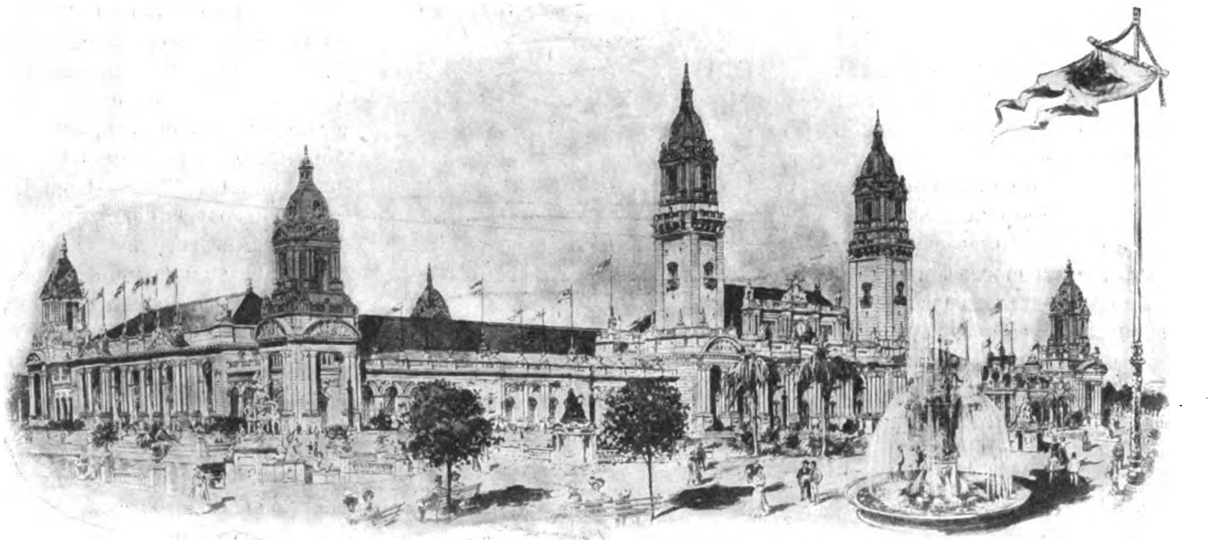
C. J. MALCOLMSON,

Superintendent Power and Transmission.

The Machinery Building is one of the group of buildings which forms the main picture of the World's Fair to be held in St. Louis, in 1904, and is so located as to be practically in the center of the Exposition Grounds. The Western facade forms the beginning of the street leading into the Midway, and along the northern side runs the main artery of travel between the two sections of the grounds divided by the Skinker Road. West of the Machinery Building and about 150 feet from it lie the boiler houses.

In general, the architecture of the Machinery Building is purely classic, bordering on Renaissance. Its dimensions are 1,000 by 525 feet, and it is flanked by four towers following out the general style of the building. The treatment of the entrances is such as to harmonize perfectly with its architecture and form quite a leading feature in the design. Owing to the central location of the Machinery Building, it adapts itself admirably to a function of far reaching importance, namely, center of distribution for all forms of energy. In the two large towers of the Western facade will be placed the receiving and distributing panels of the switchboards controlling electric current for all uses about the grounds. In the centre of the western wing of this building, between the main obligatory aisles will be placed the large electric generating plant purchased of the Westinghouse Company. This plant will consist of four direct-connected 2,000-kilowatt Westinghouse units. The engines are of the vertical multi-expansion type, running condensing, and the generators are 3-phase machines, generating 25-cycle alternating current at 6,600 volts. This current will be used to operate fountain and sewerage pumps, and for decorative and service lighting. Its boiler plant will be located in the boiler house and will consist of sixteen 500-horsepower boilers of the Babcock and Wilcox type, generating steam at 150 pounds pressure at the gauge. The boilers will be automatically stoked. All the accessories to complete this plant will be furnished under the contract together with the design of the plant and its installation.

The general divisions of the Machinery Building will be effected by two main obligatory aisles running longitudinally. The western wing of the building will be devoted in general to those exhibits illustrating the generation and transmission of power while the eastern wing will contain all machines for making machinery.



THE MACHINERY BUILDING AT THE COMING ST. LOUIS WORLD'S FAIR.

The subdivisions of the power division of exhibits will be so effected as to place in the section between the Westinghouse plant and the boiler houses all working units which will go to make up the Exhibitors' Power Plant. This plant will be composed of every representative type of engine and motor used in the generation of power. It will include steam turbines, reciprocating steam engines, gas engines, vapor engines and water motors of various designs. Foreign as well as domestic manufacturers will be represented. The third section in the western wing, running along the south side, will contain such accessories to generation and transmission of power as are not operative, general machinery and fire engines and apparatus.

Traveling cranes will traverse the western wing, the entire length of the

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building; all heavy machine tools will be placed in the northern end of the eastern wing in order to facilitate the handling of these exhibits, while the hand tools and smaller machinery will occupy the southern section.

As far as is possible there will be a logical arrangement of exhibits following the classification, and all exhibits will be installed according to their classification. Beginning with the building as indicative of the department, will follow the group and class divisions; each exhibit must be installed in its group and class, regardless of the nationality of its manufacture, in order to be considered for award.

One of the most interesting features to engineers and manufacturers will be the Exhibitors' Power Plant. The interest will be due chiefly to two causes:

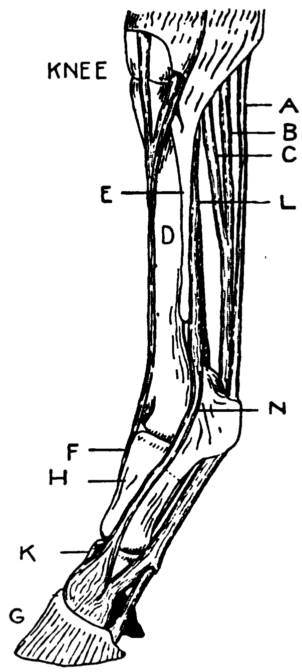
(1) The great variety of the prime movers, and (2) the working test covering the entire operating period, upon which will be based the awards.

A complete record, covering all the material elements of a test, of all boilers, engines, generators, pumps and other machines and apparatus installed in this Exhibitors' Power Plant, will be kept. This data will be collected under the supervision of a competent engineer and will be incorporated in the report of the Machinery Department to the United States Government, and will be published by the Government together with the awards. No such record has ever been accessible to the public before. This fact becomes patent when it is realized that in this plant shall be had:

(1) The latest practice in steam, gas and gasoline engines and steam boilers, gas generators, super-heaters, economizers, pumps and other accessories necessary to a complete plant. (2) A complete record that will be scientifically and carefully kept, regardless of the builder, and published with the one aim, viz., "accurate and complete information."

The wonder of the Centennial was the Corliss Engine, mammoth beyond expectancy for that period of our engineering practice. Chicago showed her 10-horsepower gas engine with pride. But the developments in size and efficiency of these classes of engines and of steam turbines in the last decade is phenomenal. It is not strange that increasing interest will be awakened in the student and layman alike. That the engineer will find here material for many hours of study in the greatest amassed exhibit and variety of types ever collected and installed as a working exhibit.

Europe is coming to the front and showing her interest in this great Universal Exposition by assurances of exhibiting. Gebr. Korting of Hanover, Germany, will install a 1,000-horsepower, 2-cycle gas engine; the De Laval Steam Turbine Company of Stockholm, a 3,000-horsepower



THE FRONT LEG. A, PERFORATUS TENDON; B, PERFORANS TENDON; C, CHECK TENDON; D, CANNON BONE; E, SPLINT BONE; F, ANTERIOR EXTENSOR TENDON; G, THIRD PHALANX; H, FIRST PHALANX; K, SECOND PHALANX; L, SUSPENSORY LIGAMENT; N, CONTINUATION OF SUSPENSORY LIGAMENT.

steam turbine, and Durr & Company of Dusseldorf, will put in 2,000 horsepower in water-tube boilers as working exhibits.

The excessive cost of fuel in these older countries has forced upon her engineers the necessity of high economies. We are prone to think that our apparently inexhaustible fuel supply will take care of our low efficiencies in prime movers, sacrificed on the altar of first cost. It is to this end that an international comparative working test of power generators will have exceeding interest to the purchaser as well as the manufacturer, for the trend of modern American practice is certainly towards better economy, in the operation of power plants. It is a safe generalization that she is as far ahead of us in the design of prime movers as we are in the efficiency of design in machine tools. It is felt that the comparative tests mentioned above will work greatly to the advancement of engineering practice. Expositions heretofore have been representations of progress, but it is intended that the St. Louis Fair shall be more than that, a factor rather than an exponent in the march of civilization.

Diseases of the Foot and Their Treatment.—10.

Sprain of the Tendons and Ligaments Below the Knee and Hock Joints.

E. MAYHEW MICHENER, V. M. D.

The anatomy of the front leg below the knee and that of the hind leg below the hock is very similar. The condition known as sprain or strain of the tendons and ligaments of these parts is rather common. In order to intelligently study conditions of injury, it is necessary that some knowledge of the anatomy of the part be obtained. The most satisfactory method of studying the anatomy is by means of dissection of the dead part. Another method by which fairly satisfactory results may be obtained is by the study of drawings or diagrams of the part. A sketch of the region of the cannon of the front leg is shown herewith.

While any of the tendons and ligaments of the part may be subject to injury from strain or violence, it is a fact that the most common variety of injury is sprain of the check tendon which is attached to the lower row of the knee or hock bones and which terminates below by attachment to the perforans tendon, at a point slightly above the middle of the cannon. The function of this check tendon is to prevent undue tension upon the perforans tendon, as well as to confine its movement within certain limits. The structure of the check-tendons is not elastic and tension beyond a certain amount causes laceration or pulling apart of its fibres. As the result of the laceration of structure of the tendon, all the symptoms of inflammation are made evident. The tendon is thickened, the part is hot and painful to the touch, and the animal is lame. Slight and not repeated injuries of the kind may recover with rest, assisted by measures calculated to relieve inflammation; but, as often happens, the injury is repeated at intervals, the condition becomes serious and is remedied with difficulty.

The cause of sprain of the check tendon is most commonly hard work, as in pulling heavy loads. Rough and slippery roads increase the liability by making the footing insecure. The accident is most commonly met with in heavy work horses, but is not rare in

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driving and saddle animals. An important cause for the consideration of the shoer is that of long toes and high toe calks. Neglected feet, in which the horn at the toe has become too long, cause undue leverage and the same may be said of the high toes which some consider as necessary in the shoeing of the heavy team horse. In the saddle horse the accident is most common in the front legs, and is commonly produced by galloping under heavy weight.

The symptoms of sprained check tendon are only obscure in the earliest stages or in very mild cases where enlargement and pain on pressure may be lacking. The lameness varies with the extent of the injury. A noticeable feature of the lameness is that the leg is carried abnormally straight both in standing and in motion. Pressure upon the part will cause the animal to show pain. The back tendons may or may not be involved in the same case; if not, then these tendons are not sore or enlarged.

As to treatment, in sprains of all kinds, the essential thing is rest. If the case is recent and the pain and swelling pronounced, the application of warm water or spraying with cold water is of great benefit. The toe of the hoof should be shortened as soon as possible and a high-heeled shoe applied. After the more acute symptoms have subsided the application of blisters, composed of Cantharides ointment, one part, and red iodide of mercury, one eighth part, is good treatment. In very severe cases the firing iron may be necessary. Most severe and obstinate cases of the kind are the result of repeated injury. These frequently show great thickening of the part and in some cases the thickening remains during the life of the animal. An unfavorable complication is contraction of the flexor tendons, causing deformity of the leg. The heel is drawn upward and the fetlock assumes the position commonly known as "knuckled." To a greater or less degree, the animal touches the ground with only the toe of the diseased limb and may be totally disabled by the extent of the deformity. In cases where the deformity is decided, it is advisable to perform the operation known as tenotomy, which consists of dividing one or both tendons. This is done in the middle region of the cannon, and subcutaneously only. A very small opening is made in the skin to admit of a specially formed knife with which the tendon or tendons are divided. Immediate correction of the deformity is the result of the operation upon favorable cases, but three to six months' rest are required in most cases following the operation.

In more favorable cases, where the deformity is not so great as to interfere with the animal's usefulness, much good may at times be done by careful attention to the paring of the feet and the application of the high-heeled shoe. Attempts at forcing the limb into a normal position by the application of shoes having a long turned-up toe is at best irrational and may result in additional injury.

Sprain of the Suspensory Ligament.

This ligament is located immediately behind the principal cannon bone and is bordered on either side by the small bones of the cannon commonly known as the splint bones. It is attached above to the lower row of bones making up the knee or hock, as the case may be, as well as to the upper extremity of the principal cannon bone. Extending downward behind the main bone of the cannon, it divides into two equal bands a short distance above the fetlock. Each branch thus formed makes a secure attachment to the sessamoid bone on either side, and also extends a band forward and downward to the front of the first phalanx, where it unites with the tendon of the anterior extensor of the phalanges. The suspensory ligament is an inelastic band the function of which is to prevent undue extension of the fetlock and to support the weight of the animal.

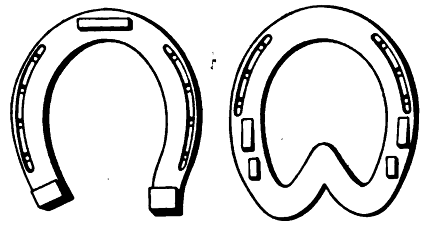
The causes which lead to sprain of this ligament are about the same as named for sprains of the check tendon. The symptoms resemble those of the above-named condition, but the swelling and tenderness may be found much lower down the cannon and below the lower termination of the check tendon, in which case it is easier to differentiate than when the injury is high. The treatment is essentially the same as outlined for the preceding lameness. In very intense injury to the suspensory ligament, the structure of the part may be completely divided or pulled loose from its attachment to the sessamoid bones. If this takes place in more than one limb the case is unable to stand for any length of time, and when attempts are made to stand the back of the fetlocks approach or even touch the ground. Such cases are incurable. When only one limb is affected however, some very severe cases have made partial or complete recovery. If the greatest efficiency is to be obtained from a horse, it is essential that all cases of lameness or evidences of sprain be not ignored.

(To be continued.)

Shoes for Interfering and Founder.

P. A. BOGARDUS.

As for causes, interfering may often be due to giving the horse too long drives and not enough feed, thus making him leg weary. Then it may be due to improper shoeing. First, I notice how the horse stands from in front to see if any portion of the hoof projects. If not, I look from behind to see how



SHOES FOR INTERFERING AND FOUNDER.

they stand. If they rock out they strike with the heel. In this case, I pare the foot level, and then fit my shoe, throwing the outside out and follow round in the inside, leaving it a little under at the heel. (See Figure 1). If they rock in, I shoe the opposite way, so as to rock the ankle out a little. A slight change often makes a great difference.

Founder is common with a great many of our horses. I pare the foot down just as low as it will stand, notching in at the heels from the front calk, so as to take the strain off the heels. Then I make a bar shoe like Fig. 2 with four heel calks, two on each side about ⅝ of an inch apart. I bevel the front ones towards the nail holes, leaving the rear ends as high as the rear calks. I start the calks at the third nail hole. When I nail the shoe on, I put only three nails on a side.

The Scientific Principles of Horseshoeing.—13.

Pathological Shoeing for Corns.

E. W. PERRIN.

Corns, the commonest ailment affecting horses' feet, consists in a contused condition of the tissues at the heels of the foot, Fig. 72, usually the inside, but it is not uncommon to find both heels affected. Fig. 72 indicates the foot denuded of its hoof. There is rupture of the capillary vessels, with extravasation of blood—hemorrhage—which stains the horn red in the angle formed by the bar—"the seat of corn"—Fig. 73. If the cause be not removed, irritation is soon followed by inflammation and the subsequent formation of pus.

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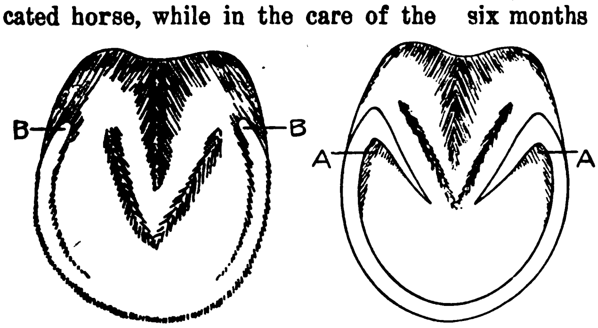
Corns often produce soreness or lameness without the formation of pus, but the presence of pus is indicated by acute lameness, and if not released through an opening in the horn at the seat of corn, it will break out at the coronet. As a general thing, when the pus is released, the lameness quickly subsides, but if a proper course of treatment and shoeing be not adopted, the lameness is liable to recur with or without the formation of pus.

About 70 per cent. of all street horses have corns in some stage of development.

Causes.

The most prolific cause of corns in the horse's foot is shrinkage—contraction—of the hoof superinduced by concussion and want of moisture. There are other causes, one or more of which may be working together to hasten the result. Most prominent among these is the increased concussion induced by the unequal distribution of weight over the plantar surface by the use of ordinary shoes. Such shoes deprive the frog of work, and impose the weight it would bear in a natural state upon the wall, and through the wall upon the coronary cushion, thus impairing healthy secretion. This abnormal condition is greatly aggravated by the unyielding substance of the road over which the animal may have to travel.

Let me say that the stock in trade bug-a-boo of old writers:—that "corns are the result of bad shoeing," has been made altogether too much of; every ailment to which the foot is heir is blamed on the shoer. That indifferent shoeing will produce foot lameness is readily admitted, but these ailments, such as corns, come in the domesticated horse, while in the care of the very best shoers the world has produced. It is the artificial—the domesticated—condition under which we work our horses in cities that is the primary cause of foot lameness. How did I arrive at that conclusion? I began to keep careful records of horses' feet some 15 years ago, while running a shop in Bath, West of England. I shod for three farmers in the dairy business, each having a farm a few miles outside the city, and each making two fast trips a day to the city with milk. It was a heavy-wearing place, and I found it difficult to make shoes forged from old stuff last a month on the horses that ran the milk carts, and with all the care and regular shoeing, most of these horses got corns in some stage of development. It was customary for these farmers to have the horses that worked on the farm shod about four times a year, and these horses' feet were sound.



Figs. 72 and 73. VIEWS OF HOOF SHOWING THE SEAT OF CORNS.

I have seen these plow horses come to the shop with four months' growth of hoof, and the shoe imbedded so deep that the wall had over grown and reached the ground outside of the shoe, the hoof all stuffed with mud or clay from the farm. Such neglect would ruin a roadster in a little while, but the natural conditions of moisture and normal distribution of weight afforded by soft, moist earth, obviates the dangerous effect that would result from such neglect in a street horse. I have frequently pointed out to my men the sound, excellent condition of such feet even at the age of eighteen years.

You will observe some degree of shrinkage of the hoof—be it ever so slight—in any hoof that has a corn, but since these changes take place gradually, they are not so readily detected. The way to find out the changes which occur in a hoof is easy. Next time you get a horse that has never been shod, stand the front feet on a piece of paper and draw a pencil line round the margin of the wall, write the name of the owner and date upon it and put it away for record. Measure again after six months street work, and note the changes which have taken place in the form and outline. Measure again in a year, and if he has not had a rest on the pasture, or been shod with bar shoes or rubber, or been wearing expanders, he will take a shoe at least one size smaller than at the first shoeing. Also the changes in form will surprise you. About one horse in every three of them will certainly have corns in some stage of development. It is impossible to over estimate the value of moisture in preserving the health of the horse's foot. It is not generally known, and yet how indisputable it is, that the horse's hoof in a natural state gets a wet bath of several hours' duration every morning. Horses, when free, will invariably be found where there is pasture, and where there is pasture there is dew in the warm season, and mud in winter. This explains the curative properties of the pasture so well known to all horsemen. It is the absence of concussion, the restoration of natural distribution of weight over the plantar surface, and the moisture cooling and expanding the shrunken hoof, thus relieving the vascular structure of pressure. In other words it is the substitution of natural for artificial conditions which often so rapidly recuperates and works like a charm on a sore, tender-footed horse.

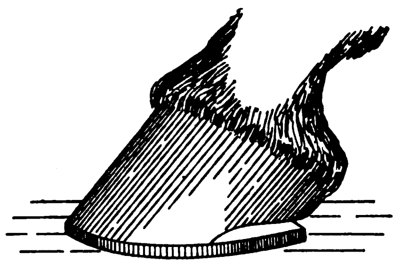


Fig. 74. SHOEING RECOMMENDED FOR CORNS.

But since we must work our horses under artificial—domesticated—conditions, then the closer we can imitate nature's plan in shoeing, the less corns and other forms of foot lameness; hence frog pressure with bar shoes or rubber, the frequent washing of the feet and stopping with clay at night, and the occasional use of expanders where necessary, are the best preventatives of corns.

Treatment.

The treatment will be suggested by the conditions of each case. If there be lameness and you suspect the presence of pus, cut down on the heel and give it exit, but don't dig a hole at the seat of corn unless for the purpose of giving vent to imprisoned pus. The idea that corns can be cured by digging them out is erroneous; in so doing you simply remove the blood-stained horn, —not the cause—and at the same time you weaken the support to the heels, thereby superinducing contraction which causes corns.

The use of cautery—the hot iron—and pouring corrosive acids into a newly opened corn is a cruel practice which has nothing to recommend it, and often causes serious injury. If the horse is lame he should be rested a few days. Remove the shoe, and poultice or soak the foot three or four times a day until the lameness subsides. Then shoe with a bar shoe, lowering the affected heel

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so that it sustains no weight, Fig. 74. The heel should be lowered well with the rasp, so that there is no danger of the heel growing up to the shoe before the next shoeing. If there be thrush in the frog also, treat and cure it, because frog pressure is very important in the cure of corns. If the inside heel be weak and shrunken, rasp off the wall from coronet to plantar surface of the affected heel, rasp down until close to the sensative laminae, then shoe with a bar shoe and apply a strong liniment to the coronet at the affected part about twice a week. Use plenty of friction in applying the liniment. After six or eight weeks you will see the new wall coming down probably $\frac{3}{4}$ inch wider than before the application of the treatment, and when this new growth reaches the plantar surface your case is cured. If there be contraction of both heels, get the hoofs thoroughly softened by soaking or poulticing. Then use a course of treatment with expanders, the application of which will be fully dealt with in an article on contraction. It is impossible to get some horse owners to take any care of their horses' feet. If to get them washed and stopped with clay is too much trouble, then leather soles with tar and oakum is a good substitute. The application of Charlier tips, Fig. 75, is an excellent remedy for corns in the few feet that are high enough and strong enough to stand the wear and tear of contact with the

Fig. 75. THE "CHARLIER" SHOE, AS A REMEDY FOR CORNS.

ground. For a few cases where frog pressure is not admissable, use a Goodyear rubber shoe.

I have seen corns put in appearance in the feet of young horses that have only done three months' street work. You cannot take too much care in shoeing city horses. Let it be understood that you may use all due care and diligence in shoeing a horse with the ordinary shoe, but if the owner drives far and fast on hard streets, corns will come.

(To be continued.)

Interfering and its Correction.

M. S. HEWITT.

The causes of interfering are numerous, deformity of the legs, weakness, kidney troubles, hard driving and badly adjusted harness, and dozens of other things. Sometimes it is hard to tell the real cause; nine times out of ten when it does happen, the farrier is blamed, for the horse was never known to do such a thing before. I have had horses strike their ankles that were never known to do so before. Rest and plenty of good wholesome food is one of the best remedies for interfering horses. Some cases need special shoeing, and for these I use a side-weight shoe. This habit of cutting down the outside of the hoof, making the inside high and the outside low, so that the ankles are inclined outwardly and out of the way, is an error. Always make the foot as level as possible, as a perfect balance is what you need first; then use a side-weight shoe, like Fig. 1, either with or without calks. You can forge the shoe or you can take two machine-made shoes, one light and one heavy, cut and weld at the toe.

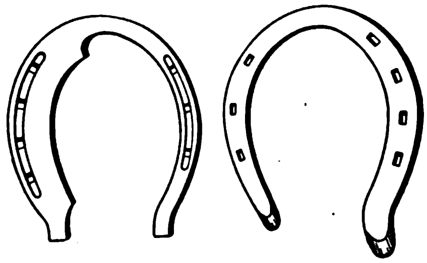
Sometimes it is necessary to try two or three times on a horse before you succeed in obtaining the desired effect. Take a horse that toes out, that is, the toes turn from a center or imaginary line outward with the heels close together. You should put the heavy side inside and the light side out; bear in mind that a side-weight shoe changes the center of gravity and widens the action. This rule applies to front and hind feet alike. If a horse toes in you put the heavy side out. Be sure the shoe is the same thickness all around. Sometimes the hind shoe has a piece extending backward and outward on the hind shoe on the outside heel like Fig. 2. This is especially good when the outside heel is run down, as it braces it up. I do not use this shoe much as it is so easily pulled off, and we have so much rock here in Texas. It is always a good idea to notice a horse's foot and if it has bloody spots on the hoof, just take a little off at that point and do not put in a nail close to it. What I have given in these lines is my actual experience and in most cases I have been successful.

There is perhaps no part of the farrier's work demanding better judgment than the treatment of interfering horses in shoeing. No two horses are precisely alike in gait and conformation, and nothing is more senseless than to imagine a rule of thumb will apply in all cases with any kind of success.

Suggestions on Wheel Repairing and Axle Welding.

JOHN L. LEFLER.

In refilling a Sarven hub my first step is to remove all the rivets from the hub. I then take my hammer and tap the flanges lightly to make them stand about $\frac{1}{16}$ of an inch wider at the outside than at the mortise. After having the hub ready, select the best of the old



Figs. 1 and 2. SHOES FOR INTERFERING.

spokes and dress or trim the new spokes. Drive every other spoke. Set the tenon in good glue or cement, and put aside until dry. Then drive the other eight spokes with glue or cement. The first eight will not draw or bounce back if the last eight are a little larger. This in my plan; it takes less time and makes a more solid job. Now put in new rivets, using a die in the hardy hole of the anvil with a seat for the rivet head to set in and a set punch on the other end of rivet, so as to swell a head on it. Make the die just as you would a hardy, but with a flat face, and bore seats, just to fit the heads of rivets, one at each edge of the face to fit different sizes of rivets. This will keep the head of rivet in good shape and furnish a solid bearing to rivet on.

As to welding axles, I make a diamond point scarf, after I have upset the axle and arms well. Then I make a shoulder by drawing to the front of the anvil and turning the scarfed side down. I shoulder both ends so that they lie when put together, nearly level. The shoulder is half way along the scarf. They never slip for me, and I never need a helper to weld an axle, no matter how heavy it may be. I have always taken a pride in perfect welding and don't want a customer of mine to be able to find where I weld an axle or other piece. On all welding, steel or iron, flats or rounds, I make a diamond point scarf with shoulder, and I find it, after trying other scarfs, to be the best ever used.

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Always upset the stock far enough back so that the lap and wasting will not reduce the actual size of the piece after it is finished. You will then have a good job.

The City versus The Country Blacksmith.

ROBERT BETZ.

It is often said that the blacksmith who has worked most of his time in a city, as a machine blacksmith in an industrial works, or in a horseshoeing or a job shop, is content, and that he does not long for the country.

A growing movement exists on the part of wealthy city people to establish country homes, and statistics show that instead of living there during the hot period only, they are gradually increasing the length of their stay, until hundreds remain in rural districts throughout the whole year, finally disposing of their city homes. This same longing for the country is also entering the minds of city mechanics, but the means to gratify it quickly are not usually in sight. The writer is country born, and moved to a city, owing to the greater amount of money to be made in the large town, but the day is coming when there will be one mechanic at least, going back to the country.

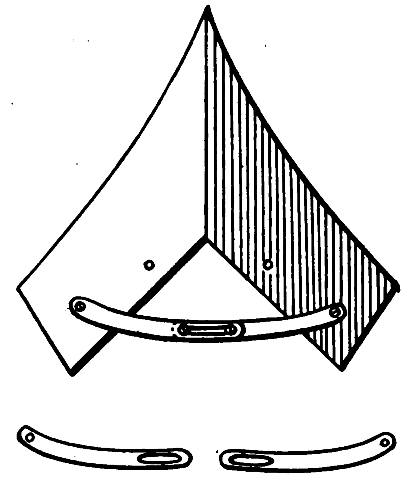
Money is by no means the greatest thing worth living for—perhaps it is one of the least. The smith who owns a country shop and has a good trade is a king, compared to his brother smith in the city, who either works for wages or rents a shop. At his home in the country his growing family has the advantage of pure, wholesome air, fresh farm and garden products, and if his shop be run on the proper basis, it shows a satisfactory margin of profit at the end of the year. This cannot always be said of the blacksmith shop in the city. Rents are high, the cost of living is constantly on the increase, and a thousand and one items of expense come up which do not arise in a small town.

Uncle Sam's rural free delivery system is making it possible for country people to be in constant touch with the world at large. The daily city papers are accessible, and if the smith is a craftsman worthy of his hire, he can keep pace with the mechanical world by reading such journals as THE AMERICAN BLACKSMITH. I have carefully thought out both sides of the question and my heart longs for the country again.

A Brace for Use When Sharpening Forked Lays.

A. BRUTON.

Accompanying is an illustration of a brace I use on forked lister lays, to keep them from springing together behind while sharpening. I never have to spring or fit a lay over after it is sharpened when I use this brace, which saves time and trouble. Again, my customers soon learn this and generally bring the lay without the lister, which saves lifting in and out of wagon and also the time for removing and replacing it. It takes a little time of course to adjust the brace to the lay and take it off, but



A HANDY BRACE FOR SHARPENING FORKED LAYS.

if it is kept tight while sharpening, the lay will be just as it was before sharpening and can be put back on lister without a punch and hammer, provided it fit in first place.

I use a strap of iron about one and one-half inch wide by one-fourth inch thick. Make a slot in one end, turn up the other a little to fit under the side of the lay. Then with two of these irons lapped at the slotted ends with two bolts through to hold them securely

WEIGHTS OF FLAT ROLLED IRON IN POUNDS PER LINEAL FOOT. TO GET WEIGHT OF GIVEN FLAT, MULTIPLY BY LENGTH IN FEET.

WIDTHS FROM 1 INCH TO 12 INCHES. FOR STEEL, ADD 2 PER CENT.

Widths in Inches	THICKNESS IN INCHES.															
	1/16	1/8	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	15/16	1
1	.208	.417	.625	.833	1.04	1.25	1.46	1.67	1.88	2 08	2.29	2.50	2.71	2.92	3.13	3.33
1¼	.260	.521	.781	1.04	1.30	1.56	1.82	2.08	2.34	2 60	2 86	3.13	3.39	3.65	3.91	4.17
1½	.313	.625	.938	1.25	1.56	1.88	2.19	2 50	2.81	3.13	3.44	3.75	4.06	4.38	4.69	5.00
1¾	.365	.729	1.09	1 46	1.82	2.19	2.55	2.92	3.28	3.65	4.01	4.38	4.74	5.10	5.47	5.83
2	.417	.833	1.25	1.67	2.08	2.50	2.92	3.33	3.75	4 17	4.58	5 00	5.42	5.83	6.25	6.67
2¼	.469	.938	1.41	1.88	2.34	2 81	3.28	3.75	4.22	4.69	5.16	5.63	6.09	6 56	7.03	7.50
2½	.521	1 04	1.56	2.08	2.60	3.13	3.65	4.17	4.69	5.21	5.73	6.25	6.77	7.29	7.81	8 33
2¾	.573	1.15	1.72	2.29	2.86	3.44	4.01	4.58	5.16	5.73	6 30	6.88	7.45	8.02	8 59	9.17
3	.625	1 25	1.88	2.50	3 13	3.75	4.38	5.00	5.63	6.25	6.88	7 50	8.13	8.75	9.38	10 00
3¼	.677	1.35	2.03	2.71	3.39	4.06	4.74	5.42	6.09	6.77	7 45	8.13	8.80	9.48	10 16	10.83
3½	.729	1.46	2.19	2.92	3 65	4.38	5.10	5.83	6 56	7.29	8.02	8.75	9.48	10.21	10 94	11.67
3¾	.781	1.56	2.34	3.13	3.91	4.69	5.47	6 25	7.03	7.81	8.59	9 38	10.16	10.94	11.72	12.50
4	.833	1.67	2.50	3.33	4.17	5 00	5.83	6.67	7.50	8.33	9.17	10.00	10.83	11.67	12.50	13.33
4¼	.885	1.77	2.66	3.54	4.43	5.31	6.20	7.08	7.97	8 85	9.74	10.63	11.51	12.40	13.28	14.17
4½	.938	1.88	2 81	3.75	4.69	5.63	6.56	7 50	8.44	9 38	10.31	11.25	12.19	13.13	14.06	15.00
4¾	.990	1.98	2.97	3.96	4.95	5.94	6.93	7.92	8.91	9.90	10.89	11.88	12.86	13.85	14 84	15.83
5	1.04	2.08	3.13	4.17	5.21	6.25	7.29	8.33	9 38	10.42	11.46	12.50	13.54	14.58	15 63	16.67
5½	1 15	2.29	3 44	4.58	5.73	6.88	8.02	9.17	10.31	11.46	12.60	13.75	14.90	16.04	17 19	18.33
6	1.25	2.50	3.75	5.00	6.25	7.50	8.75	10.00	11.25	12.50	13.75	15.00	16.25	17.50	18.75	20.00
6½	1.35	2.71	4.06	5.42	6.77	8.13	9.48	10.83	12.19	13.54	14.90	16.25	17.60	18.96	20.31	21.67
7	1.46	2.92	4.38	5.83	7.29	8.75	10.21	11.67	13.13	14.58	16 04	17 50	18.96	20.42	21.88	23.33
7½	1.56	3.13	4.69	6.25	7.81	9.38	10.94	12.50	14.06	15.63	17.19	18.75	20.31	21.88	23.44	25.00
8	1.67	3.33	5.00	6.67	8.33	10.00	11.67	13.33	15.00	16.67	18.33	20.00	21.67	23.33	25.00	26.67
8½	1.77	3.54	5.31	7.08	8.85	10.63	12.40	14 17	15.94	17.71	19.48	21.25	23.02	24.79	26 56	28.33
9	1.88	3.75	5.63	7.50	9.38	11.25	13.13	15.00	16.88	18.75	20 63	22.50	24.38	26.25	28.13	30.00
10	2.08	4.17	6 25	8.33	10.42	12.50	14.58	16.67	18.75	20.83	22.92	25.00	27.08	29.17	31 25	33.33
11	2.29	4.58	6.88	9.17	11.46	13.75	16.04	18.33	20.63	22.92	25.21	27.50	29.79	32.08	34.38	36.67
12	2.50	5.00	7.50	10.00	12.50	15.00	17.50	20.00	22.50	25.00	27.50	30.00	32.50	35.00	37.50	40.00

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against working edgeways, and bolted to the lay at each end with common plow bolts, you are ready to sharpen. You must keep bolts tight however while pounding, as this will naturally loosen them sometimes.

The Shrinking of Tires.

J. H. JENSEN.

As to setting tires, I handle from seven to eight hundred a year, and still learn something new every year. When I learn anything which I think might be useful to the rest of the craft, I don't believe in hiding the light under a bushel. We will take the case of a wheel needing to have the tire shrunk $\frac{1}{2}$ inch, which is not unusual out here in Utah. I put in a guide pin at one felloe joint. My first shrink I make one quarter of the way around the wheel, shrinking the tire $\frac{1}{4}$ inch as nearly as possible. Then I true it up and cool it off.

Now I shrink the tire directly opposite the first place, or in other words, the two points where I shrink are each half way between the two felloe joints. This second shrink is made so as to fit the wheel cold. A cold tire must fit a cold wheel. It is a great mistake which many smiths make to fit a hot tire to a cold wheel. When you weld a new tire you heat to scarf the ends, and heat to snug up the forks of the welds. In addition it takes one or two heats, say, to finish the weld, and by this time your tire is quite hot. If now you put on your traveller, you find the tire say $\frac{1}{16}$ inch too large, and you say, let that go. Upon cooling the tire and measuring again, it will surely surprise you to see how much it has contracted. Hence I say, make a cold tire fit a cold wheel, and then you won't have too much dish in your wheels. Guess-work won't do nowadays.

To return to the tire-setting question, by shrinking on opposite sides of the wheel, the holes come $\frac{1}{8}$ inch out of place. When you shrink all on one side, you must shrink $\frac{1}{4}$ inch from each side, and hence the holes nearest to your shrinks will necessarily be $\frac{1}{4}$ inch from their original places, and this is a great mistake.

A Brief Schedule of Prices from Montana.

Sharpening Plow Lay . . .	$0.40
Pointing Plow Lay	1.00
New Lays	$4.00 to 4.50
Setting Wagon Tires	4.00
Horseshoeing	.25 and .50
Wagon Spokes	.30
Felloes	.35

QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

Thin and Thick Stock—I should like to know whether thin stock should have a longer lap in welding than thick stock and why? JOHN L. LEFLER.

How Can Tight Spokes be Drawn? Will some reader of THE AMERICAN BLACKSMITH please inform me of a simple device for drawing the spokes from a wagon hub when they are very tight? M. W. RALPH.

Question About Soldering—Will some brother blacksmith tell me how to solder on gun thimbles, ribs and loops, with an ordinary soldering outfit, and if any chemicals are needed? J. W. W.

When Cut Oak and Hickory?—I should like to hear from some one who can tell me the best time of the year to cut oak and hickory to get the best results. I have had considerable loss caused by worms getting in it. J. E. GAINES.

A Question on Brazing—I should like to hear from some of the craft, from start to finish, how to braze properly; what to use and how to make the strongest and best work. I have had some trouble with pieces coming off, such as toe calks and the like. JOHN SHERWOOD.

A Knee Hitter—Will some brother shoer inform me how to shoe a horse that hits his knee with the side of his foot? His feet are very bad. The inside is very much lower than the outside, making him stand with ankles close together. I have tried to level his feet, but the next time I shoe him he is just as bad. He belongs to a doctor and gets a lot of hard driving. Please advise me what to do. J. C. TROSTER.

How to Measure Axles—Mr. M. D. Frable asks how to measure axles. My way for a double collar axle is to have it five feet from the face of the nut to the edge of the box. For loose collar axles, I make the measure five feet from the edge of the collar to the face of the nut. This measure is for five-foot track and will be just right, if you set your axles so as to have a plumb spoke. CHAS. D. BRIDDELL.

Wood-Sawing Work—I notice in the October number of your paper, an inquiry from Hans Hanson, asking for information as to the Weber Gasoline Engine on wood-sawing work. I have been using one of these engines for wood-sawing for the past year and find it a very satisfactory power. I use a 26-in. saw and a 100-lb. fly wheel and can saw from six to twelve cords per day into 16-inch lengths. The expense for gasoline does not exceed 25 cents for a day of ten hours. I have had no expense for repairs. JAY T. SMITH.

Interfering and Overreaching—In reply to a question in the October issue by T. C. Camfield, in regard to interfering and overreaching, I might give a method here which I have employed and which has worked with great success. I pare all the four feet level, and shoe the front feet with a heel and no toe, using a shoe of medium weight. Behind I use a light side-weight shoe, placing the weight on the outside. I fit the inside as close and straight as possible, removing some of the inside shell about the quarter. I find this method has worked very well for me. M. L. BEAL.

Chilling Iron—I noticed in the columns of THE AMERICAN BLACKSMITH the controversy as to chilling iron. When I want a hard surface, as for instance where a horse treads heavily on the inside, and yet does not need a steel calk, I take a small bar of cast iron, heat the shoe along with the cast iron to such a heat that by pressing or rubbing them together the cast steel melts and adheres to the wrought iron. The wrought iron is to be brought to a white heat, the cast iron not quite so hot. Withdraw the shoe, clean the sides and the bottom quickly, so as not to disturb the point where you wish the hardness to be. Cool it and a file will make no impression. G. STEWART.

A Tire Heating Furnace — Noticing a question in a recent issue as to how to make a tire heating furnace, I will describe the plan of mine. It is provided simply with a circular stone wall, eighteen inches thick and two feet high, with an inside diameter of five feet. I leave two gaps opposite each other, wider at the top than at the bottom, so as to have room to get the tire out when it is hot. My furnace takes all the common sizes of tires, holds the heat well and requires but little fuel. I generally use old scrap wood, old felloes and spokes for fuel. In building it it is laid up with a mortar of cement and sand. I may add that it works well in windy weather also. A. BRUTON.

What is the Best Tuyere Iron?— I wish to ask an opinion as to which is the best and most durable fire-pot, or tuyere iron. Less than a year ago, my competitor put in a Thompson Fire Pot and a short time ago it bursted into a thousand pieces. I think the reason was that he put wet coal in the fire, leaving it to form gas and that consequently caused the pot to blow up. The fire pot which I installed last spring, I have noticed has bulged so that I can't close or open it to regulate the fire. It is also cracked clear through on the right-hand side where most of the wet coal is used. I can get a good fire with it, but it is too short-lived to suit me. I should be glad to have the opinion of other blacksmiths upon this subject. WM. BALDWIN.

Soldering Aluminum — The following receipt for a successful aluminum solder is given in a paper read by Prof. E. Wilson before the Society of Arts. The constituents are 28 pounds of block-tin, 3.5 pounds of lead, 7 pounds of spelter, and 14 pounds of phosphor-tin. The phosphor-tin should contain ten per cent. of phosphorus. The following instructions should be followed when soldering aluminum: Clean off all dirt and grease from the surface of the metal with benzine, apply the solder with copper, and when the molten solder covers the surface of the metal, scratch through the solder with a wire brush, by which means the oxide is broken and taken up. Quick manipulation is necessary. B. B. B.

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Springs and Spokes—I would like to suggest my way of tempering small springs, such as gun springs, pistol springs, etc. After you have shaped your spring, bring it to a cherry red heat, and cool in linseed oil. Next place it on the fire on red coals, in which there is, however, no blaze. The oil will immediately catch fire, and then as soon as it burns dry, dip the parts in the oil again, using a small wire to hold it. Keep the heavy end lower in the fire and be sure to have a deep blue color. After a little practice you will never break a spring.

One other suggestion, as to the way I draw broken spokes from hubs. I take a half-inch lag screw and weld a crank to it shaped like a ship augur handle. I next weld a top on the shank to strike with the hammer. To remove the spoke, bore a hole with a smaller augur than the screw. You can then insert the lag screw and knock out the old spoke with the hammer.

R. A. WOOD.

An Axle Welding Criticism—I noticed an article recently on welding axles, by T. J. Wallace, which, to me, seems rather ancient. I always upset the material well, make a short lap, and weld with Climax Compound, and to take a second heat is unnecessary. I always have a good, clean fire, and my helper cannot give me too much blast.

The method mentioned of welding springs in the same article seems ancient also, as I have never seen a good job done where a second heat is necessary. I always prepare my stock that is to be welded, whether iron or steel, in the same way, using clean sand for iron and Climax or Cherry Heat Compound for steel.

Can any of the craft take a good weld apart? If they can, I should like to hear from them.

STRATEGE.

To Measure Axles—I noticed in the September number that Morris D. Frable wishes to know how to measure axles without using the wheels. I will give my method, as I think it is as good as any he can find. Place a square on the back end of the hub and measure with a rule from front of spokes to square, say 3¾ inches. Then measure from the square to the shoulder of box, say 1½ inches, and deduct this from one-half of the width of the tract, 2 feet 6 inches in a 5-foot track, and the result would be 2 feet 3¾ inches. This is where the outer edge of the collar should come. Now lay the axle and the short arm on the floor and measure carefully, allowing ½ or ¾ of an inch for swing, according to the dish in the wheels. Mark the axle at the end of the arm and cut it off. I have no trouble in getting axles the right length, or in getting the front and hind wheels to track, since I learned to measure in this way.

D. M. LOVE.

Shoeing for Contraction—In treating contracted feet, I make a shoe the heel of which is almost as wide in the web as any other part. The outer edge of the heel I make thin and wedge-shaped and perfectly smooth. In trimming the foot, I cut all I possibly can from between the frog and the heel so as to weaken that point slightly, but I do not touch the frog at all. I then set the shoe to the foot perfectly level, leaving the outer heel of the shoe projecting over the heel of the foot one-half an inch, according to the size of the horse. I am not afraid of interfering at this point, as the horse generally interferes at the widest point of the shoe. With this shoe as the horse travels he will spread his own foot, and after a few shoeings you will be surprised at the result.

JOHN JESSON.

Straightening a Turned-Under Foot—In reply to the question of W. Trammel, regarding a turned-under foot, I will give my method as follows: First, trim off the heel on the inside, bringing it up level with the toe, and then fit the shoe so that it will be as long as the foot. Heat the toe of the shoe, and open the shoe about a quarter of an inch or more. Next place the shoe on the foot, and put in all the nails on the turned-under side. Drive them up well. Then with a long pair of nippers in the hands of the helper, press against the shoe where nailed on and against the opposite wall of the hoof, spreading the latter. Then drive your nails while it is thus held in place. Drive the nails high, and have the owner of the horse let the shoe stay on until the hoof gets long. Repeat the process again, and as a result the foot will be soon in its normal condition.

ISAAC NEIGHBORS.

To Shoe a Vicious Horse—I noticed in a recent issue a question from a brother smith as to how to make a good, serviceable horse stock for vicious horses. When a smith does not have a stock for this purpose, the following method will very often answer: First, tie a large ring in the tail. Around the ankle of the foot buckle a strap which also has a ring in it. Tie one end of the rope to the ring in the tail, pass it through the ring in the strap and back through ring in tail. This is one way.

In case you should not have a strap of this kind, place the rope through the ring in the tail, make a noose in the end of it, let the horse step in the noose and tighten up around his ankle. By pulling in on the rope you can control his foot. By the first method you get more power, but the second way will answer very well, and I have often used it. By either of these methods you can pull up a horse's foot while the smith puts on the shoe without danger to the man or the horse.

A. BRUTON.

Contracted Feet.—After reading Mr. Bruton's way of shoeing contracted feet I will give mine. I would like to say that I have been shoeing for twenty years, although I do not pretend to be an expert. In the first place, in nineteen cases out of every twenty, contraction is caused by shoeing too high at the heel. If you keep building up the heel until you get the horse on his toe, you remove all the weight from the frog; it becomes hard and horny, and the heel begins to turn under. My idea is to pare the foot just as low at the heel as it will bear, being careful to trim the heel cuping well up the sides of the foot. Then I make my shoe just the shape of the foot, but projecting one-sixteenth of an inch all around. The inside of the shoe is drawn down thinner than is the outside of the shoe, leaving the outside the full thickness of the bar. This gives the foot a tendency to spread out all the time. I then file the shoe smooth, grease with tallow, use small nails and drive high. Reset the shoe every four or six weeks. About all there is to science is to assist nature, and with this kind of shoeing the foot gradually goes back to its natural state.

J. N. WOOD.

A Plea for Organization.—I have been reading several articles upon the subject of registering the shoeing smiths, and am very much in favor of this plan. I know of several farmers in my community who have small kits of blacksmith's tools and who do their own work, such as plow sharpening and shoeing, and work of this kind for their neighbors, at a reduced price. However, when they have a bad horse to shoe they always bring him to the shop for the blacksmith. In such cases I usually tell Mr. Farmer to shoe his own horse. Sometime ago a customer came to me and asked what the charge was for resetting old shoes. I told him forty cents. He told me that his neighbor farmer had a set of blacksmith tools and was doing it for twenty cents, and if I would not do it for the same Mr. Farmer would get the job. I told him to let Mr. Farmer have the job, and he did. In a few days, however, this man came back with a very lame horse, asking me to take off the shoes and reset them, as he thought his horse was pricked. On examination I found that the shoes had been set one inch too far back on the foot and the nails driven through the foot regardless of where they went, and the foot rasped down to the shoe. I think such cobblers as these should be prosecuted.

W. S. SMITH.

Interfering and Contraction—In answer to a recent question regarding interfering, would say that a great many cases require weighting, some on the inside and some on the outside. I have one horse which goes very close in front, keeping his ankle joints bruised and enlarged. He is too narrow and a little low on the inside. I shod him with weights extended one-half of an inch on the outside, heavy on the outside and light on the inside. I built up the inside with a padding of belting, and as a result the horse goes perfectly clear now. I likewise stopped one horse from interfering behind with the same kind of shoe. Fit close on the inside and follow the wall of the foot to the heel. This horse was base wide.

For contracted feet I use what is called a convex shoe. Pare the inside of the heel well, trim as wide as possible, bevel the wall on the inside, fit the shoe to the wall of the foot around to the heel without calks. Turn the heel out on all sides so as to give wide bearing. This shoe properly fitted will press the wall out when the bearing comes on the shoe, and will gradually spread the heel and frog. I have always found it to work very satisfactorily.

M. MINOR.

Measuring Axle Lengths—I will try to give Morris D. Frable a rule or two that will save him some time and trouble in finding the length to weld axles. First, we will say that the track from center to center of wheels is five feet. The hub or spindle is six inches long from shoulder to inside of nut, or we will say that the shoulder of axle is even with butt end of hub and that the spokes are in the middle of the hub, three inches from the center of spokes to the collar of axle, or six inches on both wheels, would leave four and one-half feet net from collar to collar, or from butt of hub to butt of hub, allowing nothing for lap at welds. The length of an axle, either wood or iron, depends on the location of the box in the hubs. Suppose we had a standard width, say five feet from center of one wheel to center of other wheel, with boxes ten inches long, hubs ten inches long, spokes in center of hub, box even with the butt of hub, wheels to stand on a plumb spoke. Then we would have to take ten inches from five feet to find where the shoulder would be, or the length from shoulder to shoulder, which would be four feet two inches. Of course, this applies to straight axles only, and is net.

JOHN L. LEFLER.

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To Fill a Sarven Hub—I will try and tell how I fill a Sarven Patent Hub. I have a large bolt that will go through the box, long enough to have a large washer on each end. Fit the spokes all around, not too tight, as one would crowd the others out. If the flanges are loose, I place sheet iron around the hub and put the flanges on so the rivet holes will come right. The bolt is then run through the hub with a washer on each end and the flanges drawn snug to the spokes, although not too tight. Put the rim on, leaving it open three-sixteenths of an inch. The tire should be tight enough to draw the rim together. As the tire cools, drive the spokes down solid in the hub, and as there are no rivets through the spokes, they can be driven down tighter than before the tire is on. Draw the flanges up very tight, bore the holes and put in the rivets. Lay the wheel with the heads of the rivets (one at a time as they are riveted down) on the anvil, take a big punch and strike on each side on the flange, which will drive the head of the rivet tight to the flange. As the flanges are what hold the wheel, the rivets must be put in well. Take a light hammer when riveting, so as not to bend the rivets as that spoils the job. By having a screw or bolt through the hub the flanges will be brought tighter to the spokes than can be done with the rivets alone, and by not having the screw too tight when the tire is put on, gives the spokes a chance to settle down solid in the hub. This is why I think my way is the best. EDWIN A. STONE.

A Varnish Question—Will some one tell me the best varnish to use and how to apply it to make it stand and look like a factory job? I do painting with my line of work and have considerable trouble varnishing. It may be the material or the paints which is used. Also would like to know what is the name of the glue which is usually employed in wagon wheels and wood work. C. D. BRIDDELL.

Reply—To the practical man the attached query presents numerous difficulties. The best varnish and the best paint will not alone suffice to make a job of painting stand and look like a factory job.

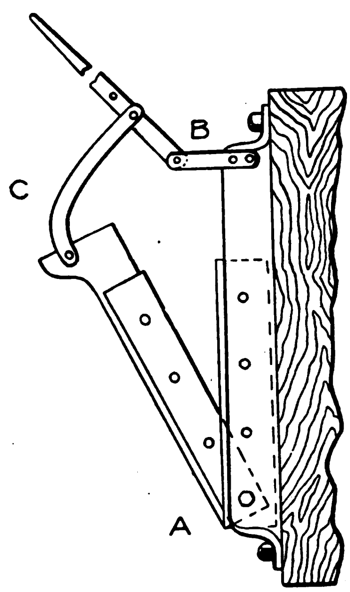
Exceptional skill — the skill of the trained and practiced specialist—is necessary to give a finished carriage the depth and brilliancy, and mirror-like surface of the first-class factory job.

The best varnish and the best colors to use in carriage painting and finishing is a matter of individual opinion, both in the factory and the jobbing paint shop.

Color manufacturers regarded by the trade in general as standard and thoroughly reliable are as follows: C. A. Willey, Hunter's Point, N. Y.; Murphy Varnish Co., Newark, N. J.; Valentine & Co., No. 57 Broadway, New York, N. Y.; Edward Smith & Co., New York, N. Y., and Sherwin-Williams Co., Cleveland, Ohio. Leading and reliable varnish makers are, among many, Valentine & Co., No. 57 Broadway, New York, N. Y.; Murphy Varnish Co., Newark, N. J.; Edward Smith & Co., New York, N. Y.; John W. Masury & Son, New York, N. Y. (color grinders also); Standard Varnish Co., New York, N. Y.; Victorson Varnish Co., New York, N. Y.

How to use and apply varnish is worthy of an article in itself, but, broadly speaking, if THE AMERICAN BLACKSMITH reader will get his surface smooth and clean before applying his varnish, and will *flow* on full, heavy coats of varnish, both rubbing and finishing, and keep them *clean*, his finished work should prove satisfactory, both in appearance and durability. M.C.HILLICK.

A Home-Made Shears.—In answer to the question of Mr. M. W. Ralph, as to how to make an iron shear at home, I would give the following method: In making the shears which are illustrated on this page, and which I find to be a very convenient and useful tool for cutting iron or steel, hot or cold, I attach a plate of half-inch iron about two and one-half or three inches wide to a bench, bending and bolting the ends as shown. This piece is about eighteen or twenty inches long over all to start with. The movable arm is formed of the same size of stock, and its upper end is conveniently shaped, as indicated in the figure. To these arms, one stationary and one movable, I now fasten the blades by bolts which are



A HOME-MADE SHEARS.

countersunk on the inside. The knives, of course, are made of steel and are ten inches long, two and one-half inches wide, and three-eighths of an inch thick. These pieces are then fastened to swing on a bolt A, at the bottom, the two knife edges working together on the inside as indicated. At the upper end of the stationary leg, I fasten two small links, each two and one-half inches long, one and one-quarter inches wide, and one-quarter of an inch thick. Between the two outer edges of these links B, the handle or lever is fastened to a pivot. This handle I made out of a beam of an old cultivator. The links B have an offset to the left, so as to bring the lever or handle directly in the same plane with the knife. Running from the movable leg of the handle are two links C. These are nine inches long, three inches wide, and a half inch thick.

The steel knives, are of course, to be shaped, ground, hardened and tempered, and then adjusted so that they will work nicely and closely together. More power may be obtained by attaching the lever end of the links C nearer to the stationary end of the handle, and if desired, a variation of power may be obtained by means of several holes in the lever, as shown, for the purpose of adjustment. C. W. SMITH.

Recipe for Tempering Steel—Will some one give me a good recipe for tempering a brand of steel called Superior Steel, as I have a great deal of trouble with it in large sizes to prevent it from cracking. THOMAS MCKUMMIE.

In general, to prevent steel from cracking in the process of hardening the great secret lies in having the same of a uniform heat throughout the piece when it is plunged. In other words, the steel should be heated slow enough, although not too slowly, to make sure the piece has the same heat throughout. The corners or edges should not be hotter than the other parts, nor should the interior be cooler than the outside. Cracking is caused by unequal contraction in cooling and this in turn is due to an uneven temperature of the different parts of the steel. If the steel is heated by mistake to too high a temperature for the purpose of hardening, it should be allowed to cool and again heated to the proper temperature and plunged. In other words, the steel should be hardened on an ascending heat and not a descending one.

For the purpose of best uniform heating a good muffler furnace is preferable, and where there is much of the work to be done it is almost absolutely necessary. However, a smith can get good results by attention to details in the heating. One way is to use a large fire, placing a large section of pipe in the same so that the steel within the pipe is protected from direct contact with the blast or flame. In this way, by turning the piece constantly, a high uniform heat may be obtained. B. B.

Power for Sawing Purposes.—In reply to an inquiry in the October issue, an engine of three actual horse-power is capable of pulling a 22 or 24-inch wood saw in sawing ordinary cordwood. Some of our customers are sawing from ten to thirty cords a day, according to the kind of wood, its condition, etc. Soggy, knotty wood saws hard, and it would be possible to install even an eight-horsepower engine at times, if the operator has no consideration for his work. As a rule, a customer wants the manufacturer to guarantee that the engine will pull this or that, regardless of the manner in which he performs the work. Where a man has any consideration for the saw at all, a two and one-half horsepower engine will easily pull a 22 or 24-inch saw, and do good work. The size of pulley on engine is fourteen inches in diameter and on saw shaft about five inches. This speeds the saw in good shape. A balance wheel on saw shaft, weighing about fifty pounds, steadies the motion.

Our Junior two and one-half horsepower engine consumes about one gallon of gasoline per horse-power per day of ten hours. If on a full pull all day, from two and one-half to three gallons. If pulling only half a load, the consumption will be only half. The consumption is proportional to the pull, as the gasoline supply is regulated by valves, and the speed of the engine controlled by a governor. If a man is running a power hammer which requires one or one and one-half horsepower, the engine is capable of pulling this hammer and the line shaft at the same time, with the hammer at work, or the other machines may be switched out, and only about one and one-half horse-power used, which saves the consumption of gasoline the other one and one-half horsepower would occasion, if the engine was under full regulation.

We recommend a two and one-half horsepower engine for 22 or 24-inch saw for ordinary cordwood or pole wood. On a larger saw it is better to have five horsepower. Some of our customers are making a business sawing wood, by mounting the engine on a wagon with the saw and moving the outfit from house to house.

WEBER GAS AND GASOLINE ENGINE CO.

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Holiday Greetings.

Before the next issue of THE AMERICAN BLACKSMITH reaches its readers, the holiday season will have come and gone. We therefore take this opportunity of wishing our many friends a very Merry Christmas and a happy entering into another year of welfare and prosperity. May "our folks" never lack for work, may they never have any bad debts, and may the sun of prosperity shine on them now and always.

What's New in the Shop?

What new kinks have you recently put into practice in your shop which would interest the readers of THE AMERICAN BLACKSMITH? If you have run across or schemed out anything of this kind recently, please write it down, explain it if necessary with rough pencil sketches, and send it in. The editor will be glad to get it, and put it into shape for publishing, and will omit your name if desired. We want to hear from the practical, every-day-in-the-week craftsmen. Many a brother smith will be grateful if, as a result of your ingenuity, you can show him some way of doing a portion of his work quicker or better. Photographs of interesting pieces of work are always acceptable, but we would prefer to hear from some of the craft about odd repair jobs with new wrinkles in them, or about unusual pieces of work which they have recently done.

The Manufacture of Electro Steel.

Of recent years considerable thought has been put upon the process of manufacturing crucible steel by the aid of electricity. Excellent results have already been obtained, and it is thought that in Sweden, where ample water power is available, the process should have a considerable future. As far back as 1879, an electric furnace for the manufacture of steel was constructed by Sir William Siemans, a prominent electrician and experimenter. At that time, however, the method employed was found too costly for practical use. Within the past few years, however, considerable advance has been made in Sweden towards putting the process on a commercial basis. It is said that the steel is of a superior quality, with less tendency towards cracking in hardening than ordinary steel. Freedom from gases incident to the process of manufacture is thought to be one explanation of its high qualities. The furnaces employed are simple in construction and easily manipulated, and a claim is made that the steel can be produced more cheaply than by the present crucible process.

What is One Horse-Power?

The term "horse-power" is not as clearly understood by the general public, or even by a large number of mechanics, as one would suppose, and since most of the latter have frequent occasion to use this word, it may be well to explain somewhat in detail exactly what a horse-power is.

To start at the beginning, work is said to be done when force or resistance is overcome through any distance. Work is measured by a unit called the "foot-pound," which, as the name suggests, is that amount of work done in raising one pound to a height of one foot, or the work done in overcoming a resistance equal to a pound's weight through a space of one foot. Work does not take time into consideration, or in other words, the total work done in raising two pounds ten feet high, twenty foot-pounds, is the same whether done in one minute or in one hour.

A horse-power is a definite unit for measuring, not the amount of work, but the rate of doing work. Rate of course involves the element of time, or in other words, the quicker a given amount of work is done, the higher the rate. An engine or machine is said to be developing one horse-power when it is doing work at the rate of 550 foot-pounds every second. If it does 1,100 foot-pounds of work in one second, it is developing two horse-power. Therefore a horse-power is the equivalent of raising 550 pounds one foot high in one second. We will suppose for instance that an engine does 550 foot-pounds in one second, or, in other words, is working at the rate of one horse-power. If now another engine accomplishes the same amount of work in one half the time, it will be developing two horse-power. Again, a one-horsepower engine working at its rated capacity, *i.e.*, one horse-power, will do the same total amount of work in twelve hours that a twelve-horsepower engine does in one hour. From this it will be seen that the term horse-power does not refer to the total amout of work done, but to the rate at which it is accomplished.

Estimating Costs in Carriage Shops.—4.

Calculations in a Small Shop.

BY D. W. M.

We have given some idea of system in a small as well as a large shop, and how to estimate costs, but on one point we have not touched, except to mention it, viz.: How to make the first step toward getting at a correct estimate.

System is necessary of course; without it nothing reliable can be accomplished; one is always "at sea." But

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the foundation of system and of all correct calculation is a working draft. Most small shops get along without, and some large ones do. One who has not learned what can be saved by having accurate working drafts has not learned the first principles of economy in running his business. That is a remark that will be sneered at by a good many honest and successful shop proprietors, because they have made a living, paid their bills, and have something left over and feel satisfied. But this feeling of satisfaction is only another name for a species of laziness. The man who gets along without a working draft does so from a desire to avoid the trouble which he thinks a working draft will cost him, or from inability to make one, which means a desire to avoid the trouble of learning how. The man who gets along without it ought to be ashamed to own it, and simply confesses that he does not know how much he has thrown away.

Any one can understand that it costs less to experiment on paper than with wood, iron, and paid labor. If getting one's idea into exact shape is essential to the perfect performance of any piece of work, by all means put it down on paper or blackboard. Many an idea which seemed clear enough at the start will soon show itself impracticable when it is so drawn out that accurate shapes and measurements can be seen.

A young mechanic wanted to turn the front axle of an automobile on a center king bolt, by means of a chain attached to the ends of the axle and passing over a sprocket wheel on the upright shank of the handle. Instead of putting it on paper and demonstrating there whether it would work, he went ahead to make it, and only discovered its impracticability when he had it completed. All his work and material were wasted. You can hardly enter a shop where you will not find someone has not made a mistake in calculation, because he had forgotten to reckon on some factor which a paper draft would have revealed.

If a spring is to be ordered, make a drawing of it just the shape you want it. If an axle, do the same. Always keep patterns of wood plainly marked, so that they may be referred to for the curves of lines of springs, axles, axle-beds, rockers, top-rails, posts, shapes of hubs—everything in which care is demanded and shape is important. Do not entrust these to chalk marks on a blackboard, much less to memory. Always have the wooden pattern, with the reference number stamped on it, and in addition have the paper draft properly named, numbered, and put away in a clean place. A rack with compartments large enough to hold each draft rolled up is a good plan.

A cleanly made paper draft, showing all the parts, joiners, irons, bolts, screws, etc., of body and gear, will save its cost many times over, and is the foundation of all correct estimating, and the only possible means of correct calculation.

LAMPS ORNAMENTING THE ALEXANDRA GATES, QUEENS PARK, TORONTO.

Examples of Some Canadian Ornamental Iron Work.

Three engravings in this issue show some very tasteful pieces of ornamental iron work from the forge of the George B. Meadows Toronto Wire, Iron and Brass Works Company, Limited, to which firm we are indebted for the photographs of the specimens in question. The engraving on page 54 represents a window grill, designed by Architect F. S. Baker of Toronto for the show rooms of the Nordheimer Piano Company of the same city. The frames are of 1 by $\frac{1}{4}$-inch stock with scrolls of 1 by $\frac{3}{16}$-inch iron, combining to form a very pleasing design. Another of the views shows a very handsome piece of gate and fence work, ornamenting one of Toronto's handsome residences, and indicates what the possibilities are in work of this nature.

The third engraving shows the lamps and standard made by the above firm for the Alexandra Gates in Queen's Park, Toronto. These gates were erected to commemorate the visit of the Duke and Duchess of Cornwall to Toronto, and are from designs by Mr. Beckitt, of the firm of Chadwick & Beckitt, Toronto.

A Good Welding Compound.

HARRY LENHART.

The following recipe was given me by a tramp, who claimed it was patented, but even if it was patented, a man would run no risk in making as much as he wanted for his own use, as long as he did not undertake to sell it:

Twenty parts of pulverized borax and one part subcarbonate of iron. Use the same as borax.

I have repeatedly heated the end of a piece of tool steel almost hot enough to crumble when brought from the fire, put some compound on, taken a welding heat, upset and drawn it down to a cold chisel edge, and it stands the work as well as an unburnt piece. I very seldom need any compound for welding iron, but if I do, I use the plain borax.

Jobbing Paint Shop vs. Factory Paint Shop Results.

M. C. HILLICK.

Readers of THE AMERICAN BLACKSMITH, and others, have at various times expressed anxiety to know how the jobbing shop painter can succeed in making his work stand and look as well as the factory carriage painter. To make the surface painted and finished in the jobbing shop wear as durably as that painted and finished in the factory should prove an easy task for the painter versed thoroughly in all the intricacies of the trade. To make the surface look as mirror-like and brilliant is not so easy.

Good materials, plenty of time for each coat to dry, and a rigid observance of certain plain rules of trade practice, will develop a painted and finished surface, that under ordinary conditions of service should hold fast and wear tenaciously. This same surface, however, may in respect to depth and brilliancy of finish, in freedom from blemishes, dirt motes, etc., prove far inferior to the factory-finished vehicle. A different turn

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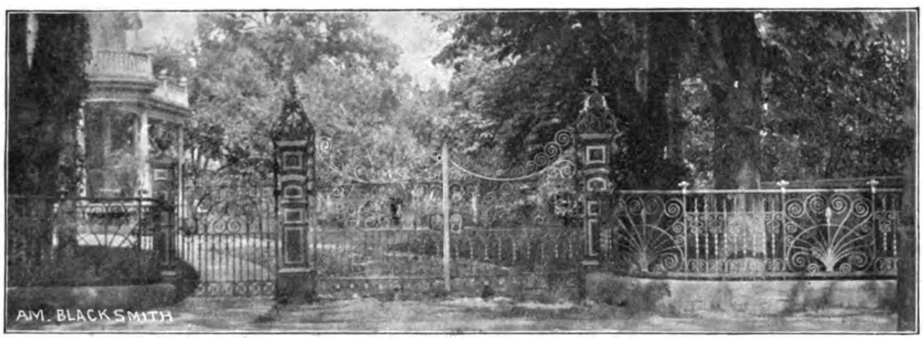
of skill, the touch of a real artist's hand, is necessary to develop the matchless and mirror-like surface fresh from the factory of repute. In the factory, every process from priming the wood to applying the final coat of varnish is accomplished by a specialist, a mechanic who does one particular branch of the work, and only one. As an example, A colors the carriage body, B applies the first coat of rubbing varnish, C rubs the body out of varnish, D stripes it, if striping is in order, E flows the second coat of rubbing, F the third coat of rubbing, if a third coat is in order, and G finishes the job. So the various processes are divided among various mechanics. These people become very expert in their specialties. Skill, tools and materials fit the work to a nicety, and with the precision of the rigidly-disciplined soldier, each painter of the factory is able to maintain a certain daily standard of results. He works in clean apartments, warmed to a certain temperature, ventilated with especial reference to his requirements, and all contributing agencies are the very best to be had.

To successfully compete, in the matter of surface perfection and elegance, with the factory mechanic, equipped and fortified as above, is a well-nigh impossible task for the many-sided and oftentimes much harrassed jobbing shop painter to undertake. How he can, in some measure at least, approach the high average of the factory painter and finisher, let us herewith briefly attempt to see.

Good materials, as we have said, are among the first essentials. Colors of the best depth of lustre, fine in texture, score an important point in favor of surface beauty. The striping of the factory carriage is, as a rule, harmonious and pleasing to the eye. Secure pencils made by some reliable and skilful factory striper, and practice with the view of becoming an accurate and fine straight-line workman. Even a few lines, if perfectly drawn, are telling factors in bringing the surface up to the right finish. Once you have secured a good kit of striping pencils, aim to keep them in proper condition. Keep them carefully greased and laid away, when not in use, in a dust proof box. The pencils are best kept by laying them, after cleaning and greasing, upon a piece of glass. The hair is thus made to retain its natural shape and elasticity. Mutton and beef tallow, equal parts, is a good pencil preservative.



SOME HANDSOME CANADIAN FENCE AND GATE WORK.

The handling and application of the rubbing and finishing varnish is probably the most difficult problem, all things considered, that the jobbing shop painter has to deal with. The first and greatest aid is a thoroughly reliable, free-working, fine-flowing, sure-drying varnish, one that is as non-sensitive as it is possible for the cleverest varnish making skill to produce. The highest priced varnish is often the cheapest in the end. To get the mirror-like surface, granting, of course, that the work has been rubbed out of roughstuff absolutely smooth and level, the varnish must be flowed, not brushed, on. At this point the jobbing shop painter is likely to encounter his greatest difficulty. The thin, skimpy coat of varnish, which it is natural for the mechanic not quite confident of his ability to apply, is a sure forerunner of the frail and shallow finish so characteristic of the jobbing paint shop. Depth and fullness of the varnish fabric, with richness and becoming lustre, are common only to heavily flowed on coats of varnish from first to last. On all light carriage bodies, easy to handle, it is advisable, and a usual factory practice, to tip the bodies so they offer a flat, upturned surface, upon which to flow the rubbing varnish coats, except perhaps the last coat of rubbing. Flow one side and one end, and when this has flowed out and set slightly, turn over and flow opposite side and end. In rubbing, do not cut through at any part of the surface. Rub to a clean, uniform depth of film. Use clean sponges, chamois skins, pails, water, etc. Use 00 pulverized pumice stone and perforated blocks of felt, obtainable of the paint supply people, in rubbing the varnish. Keep the varnish, both rubbing and finishing, in a warm, dry location, over which the temperature is quite uniform. Have two sets of varnish brushes, one for rubbing and one for finishing. Keep one set in rubbing and one set in finishing varnish. Have an air-tight, dust-proof brush keeper. Maintain the varnish brush equipment absolutely clean. Likewise, chamois skins, sponges, wash brushes and dusters. These are keys to real success in finishing. Keep the varnish room clean, well lighted and fully ventilated. Study some method of ventilation, even if only the commonest sort. Pure air more directly promotes the drying of varnish, and the development of its greatest brilliancy, than other aids with bigger titles.

Then in applying the finishing coat seek to have perfect confidence in your varnish and yourself. Cowardice in the varnish room invites defeat. Go at the work in a bold, free, skilful way. Flow the varnish on in plenty. Cross brush it, then straighten out, and, a uniform depth secured, let the varnish do the rest.

How to Weld Steel Axles.

J. GOOGERTY.

Take for instance 1 or $1\frac{1}{8}$-inch axles. First bend them to fit the axle bed piece. Then to get the length, hold the axle in place on the bed piece, and with a piece of chalk, draw a line across both axles. Next take your cutting chisel and one axle, and cut on the line. On the other, cut about $\frac{5}{8}$ of an inch longer. This will mark them, so that when they are hot, you can see where to cut them off. Lay them in a clean fire, well rounded up, with an opening in front, and take a fair heat. Take one out and put it on the anvil so the mark will come even with the outer edge of the anvil. Take a thin and sharp hot chisel and cut it off square from one side, upset with the same heat, back up with hand hammer, then turn it over on inside of anvil and scarf with sledge. Draw it to you a little after each blow, working a series of steps when scarfed. Point it sideways and turn up point of scarf a little, forming a cup to hold the compound. Repeat same way with other axle. Then lay them in the fire with scarfs up, heat slowly until they are at a good red heat, shut off wind and put on some "Cherry Heat" Welding Compound. Then begin to heat slowly until the compound sticks nicely to the scarf, after which turn it over and put on wind till you get a heat. Have your helper take out one and hold it until you get it stuck with a hand hammer. Then come on to it with the sledge. Finish up with a flatter and fit to the axle bed. Axles should be welded with one heat. The same weld can be made by using marble dust, which is cheaper.

The Elements of Blacksmithing.—13.

JOHN L. BACON.

Instructor in Forging, Lewis Institute, Chicago.

Duplicate Work.—Bending Dies.—Jigs.

There is much work in the forge shop which can be done quickly and cheaply with some simple form of jig, particularly so when there are many pieces to be made alike. The bending jigs described here were made for and used under a 200-pound steam hammer, and illustrate the possibilities in that direction.

The bent piece shown at A, Fig. 110, serves as a good example of work that can be done in this way. This was a hook, bent from $\frac{3}{8}$ x 1-inch stock, to fit around the flange of an "I" beam.

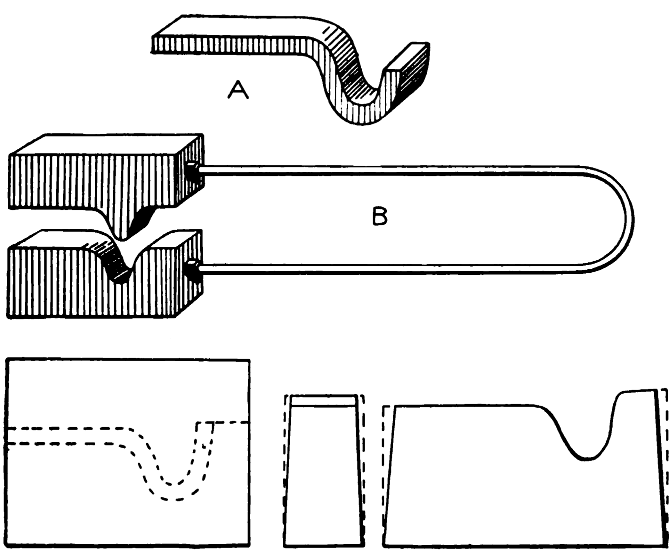


Fig. 110. A BENDING JIG AND HOW IT IS MADE.

The hooks were about 6 inches long when finished. To bend the hooks, two cast iron blocks or dies were used, shown at B. These dies were rough castings, the patterns for which were made by laying out the shape of the hook on a piece of 2-inch white pine block, and then sawing to shape with a band saw. The sides of the block were first planed smooth, and the laying off was done as shown in C, the sawing being done on the dotted lines. This left the block of such a shape that the space between them, when they were placed together with the upper and lower edges parallel, and just touching each other on the right-hand end, was just equal to the thickness of the stock to be bent. After the blocks were sawed out they were sandpapered slightly to leave them perfectly smooth. When making patterns of this kind, it is a good plan to give them a little "draft." This can be quickly and easily done by planing the sides and ends, after the blocks are sawed out, so they taper slightly, as shown at D, where the dotted lines show the square sides before planing off for draft, as indicated by the solid lines. (The draft as illustrated at D, Fig. 110, is somewhat exaggerated, in order to better illustrate the principle). About one-eighth of an inch per foot is a good allowance for draft.

When the castings were made a $\frac{13}{32}$-inch hole was drilled in the end of each and tapped to $\frac{1}{2}$ inch. A piece of $\frac{1}{2}$-inch round iron, about 30 inches long, was threaded for about $1\frac{1}{2}$ inches on each end and bent up to form a handle for the blocks, and locked by screwing nuts up tight, making the finished dies as shown at B, Fig. 110. The handle was bent in such a shape as to spring the dies far enough apart to allow the iron to be placed between them. There was spring enough in the $\frac{1}{2}$-inch bar to open the dies automatically between each two blows of the hammer.

When in use the dies were laid on the anvil of the steam hammer, the iron previously cut the proper length, heated, and placed between them, and one light blow of the hammer would bend into shape. Dies of this kind can be easily and quickly made to cover a variety of work, and are very inexpensive. The dies in question, for instance, required about one-half hour's pattern work and about the same amount of time to fit the handles. Calculating shop time at fifty cents per hour, castings at five cents per pound, and allowing for the nuts and handles, the entire cost of these dies was less than $1.25. The

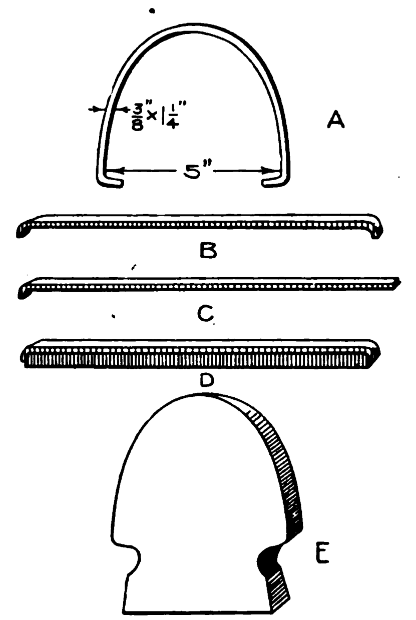


Fig. 111. DIE FOR BENDING A SPECIAL PIECE AND THE PROCESS.

same handles could be used for a number of dies of about the same size, as they are easily screwed off or on. If a die should break it could easily be replaced at a trifling cost. Cast iron dies of this character will bend several hundred pieces and show no signs of giving out, although if slightly defective they may snap at the very first. On an important job it is generally wise to have an extra set of dies cast to replace the first if they should prove defective. Almost any simple shape can be bent in this way, and dies of this kind have the advantage that they can be used on any ordinary steam hammer that has flat forging faces on the hammer and anvil. Not only this, but not requiring to be fastened in place in any way, they may be placed under the hammer or removed without interfering with other work.

For larger work it is often better to have a die that can be fastened in the place of the lower die of the hammer. This can be done by having a dovetail cast on the base of the bending die the same size and shape as the dovetail on the anvil die. A die of this sort was used in bending the piece illustrated at A, Fig. 111. The stock used was cut to the proper length, and the ends bent at right angles, as shown at B. To bend all alike, one end of each piece was first bent like C, in a vise. The other ends were then bent to the same length by hooking the end already bent, over a bar

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of proper length and bending down, as shown at D. To make the final bend into the "U" shape, a cast iron form was used like E. This casting was about $2\frac{1}{2}$ inches thick, the dove-tailed base made to fit the slot in the anvil base of the hammer. When the form was used the anvil die was removed and the form substituted in its place.

The strips to be bent were heated and laid on this form, and a heavy piece of flat stock, 1 by 2 inches, bent into a "U" shape to fit the outside of the forging, was placed on top. A light blow of the hammer would force the "U"-shaped piece down, bending the iron into the proper shape. Fig. 112 shows the operation, the dotted lines indicating the position of the pieces before bringing down the hammer. It is not necessary to have the "U"-shaped piece of *exactly* the same shape as the outside of the forging, it being sufficient if the lower ends of the "U" are the proper distance apart. As the strip is bent over the form, it naturally follows the outline, and it is only necessary to force it against the form at the lower points of the sides.

Two large dies are necessary for much work, and if such is the case the upper die can be made to be keyed in place of the hammer die on the ram of the hammer, the dovetail of the bending die being cast the same shape and size as the one on the hammer die.

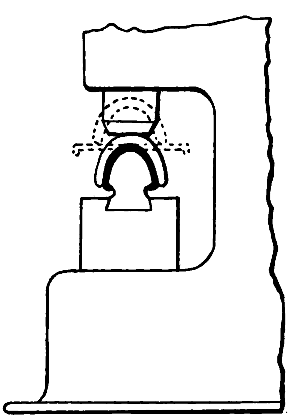


Fig. 112. BENDING WITH DIE UNDER THE HAMMER.

Very convenient tools to have for bending right angles in stock, $\frac{1}{2}$ inch or less in thickness, are shown in Fig. 113. The lower one is made to fit easily over the anvil of the steam hammer, the projecting lips on either side preventing the die from sliding forward or back. The upper one has a handle attached as described for the dies first mentioned. Both of these bending tools are made of cast iron, the patterns being simply sawed from a 2-inch plank. Cast iron dies of this kind should be made of a tough gray iron rather than the harder white iron, as they are then much less liable to break.

Many of the regular hammer dies, that is, the dies with flat faces for general forging, are made of cast iron. The iron used for them is of another quality, chilled iron, the faces being chilled, or hardened, for a depth of an inch or more.

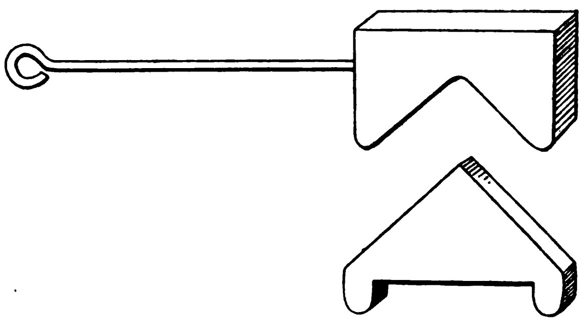
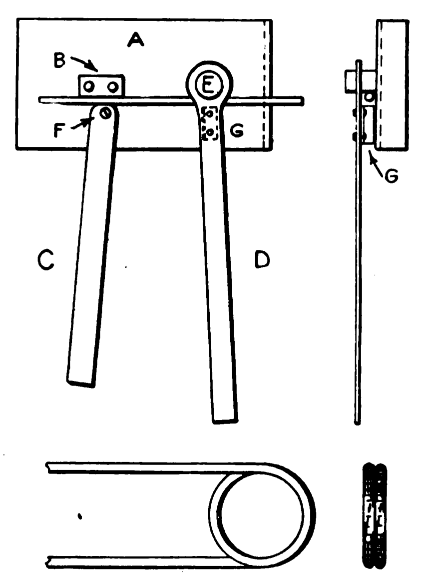


Fig. 113. TOOL FOR BENDING RIGHT ANGLES.

Much drop forging is done with cast iron dies, and for rough work that is not too heavy they are very satisfactory. The cost is very small as compared with the steel dies for the same purpose. Drop forging can be done in this way with the steam hammer, by keying the dies in place in the dovetail slots made for the upper and lower hammer dies. Welding in particular is done in this way, as the metal to be worked is in such a soft condition that there is little chance of smashing the dies.

Another easily made and very useful tool for coiling small springs, or circular bending of that nature, is the jig, illustrated in Fig. 114, shown with a piece of stock in place ready to be bent. This jig was built up on a base plate A, about $\frac{3}{8}$ inch thick, having one end bent down at right angles for clamping in an ordinary vise. The post E was simply a 1-inch stud screwed into the plate. B was a piece $\frac{3}{8}$ by 1 by 2 inches, riveted into the plate with two $\frac{1}{4}$-inch rivets, and served as a stop for clamping the stock against, while bending. C was a lever made of a piece of $\frac{3}{8}$ by 1-inch stock, about 10 inches long, having one end ground rounding, as shown. This lever was made to turn on the screw F, threaded into the base plate. D was the bending lever, having a hole punched and forged in the end large enough to allow the lever to turn loosely on the stud E. On the under side of this lever was riveted a short piece of iron, having one end bent down at right angles. This piece was so placed that the distance between the stud E and the inside face of the bent end, when the lever was in the position shown, was about $\frac{1}{64}$ inch greater than the thickness of the stock to be bent.

In operation, the stock to be bent was placed in the position shown in the sketch, the lever C pulled back to lock it in place and prevent it being pulled forward while being bent, and the bending lever D dropped over it in the position shown. To bend the stock, the lever was pulled around in the direction of the arrow, and as many turns taken as were wanted for the spring, or whatever was being bent. By lifting off the bending lever and unloosening the clamping lever the piece could be slipped up off the stud, and the tool was ready to bend another piece. The jig described above was made for bending cold spring steel wire, about $\frac{1}{8}$ inch in diameter, into the shape shown in Fig. 115. This jig could also be used for hot bending, and could easily be made



Figs. 114 and 115. A COILED SPRING AND TOOL FOR BENDING.

to cover a variety of sizes. For bending different size stock and different circles the only changes that need be made would be to vary the size of the stud E, and change the bending lever D.

(To be concluded.)

Tar Paint as a Wheel Preserver.

J. P. MULRONY.

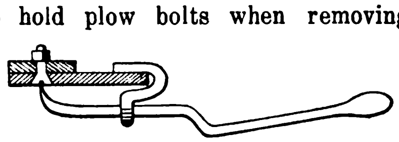
Tar as a paint for wheels is very valuable for preserving the wood, and is a tire tightener in hot weather. When the tar paint softens by the heat of the sun, it penetrates every pore of the wood carrying the fine dust with it into every crack and bad joint, and from the squeezing and racking of the joints with these deposits of tar and dust, the cavities are filled solidly with a formation resembling asphalt pavement. This filler becomes set, and is as enduring as the wood saturated with tar paint when first painted. It is slow to set, but if the wheels are run on dusty roads for a few days, the fine dust adheres to the surface, dulls its soft gloss, and forms a scale which gradually sets and thickens.

The tar can be handled pleasantly by first wetting the hands and putting on a thin coat, the tar to be as hot as the bristles of the brush will stand. Spread it thin and repeat every June or July until your wheels are painted and preserved to your satisfaction. In wet weather the tar paint sets, and by striking it with a punch on the spoke, it will crack and fly. Cut into the wood in the wet muddy weather and you will find the wood dry and preserved from the effect of sun and rain. It is a cheap paint, and properly used will dispense with tire setting, and the life of the wheels will be much longer than without it. I recommend its use, and in many instances that I have kept track of, it has given the desired result under hard service. This is a matter of economy and durability. I sometimes, when setting tires, cool them off with water until the tire will not make the wood rim smoke. It is then ready to be hung on a pin, while the rim of the wheel is covered with tar in a pan. Turn slowly, letting the tar drain back until you make the circle of the wheel. This preserves the part of the wheel needed. I get good substantial results from tar paint as a preservative. Tar paint is a very common idea, and in the long run, its effects are commendable.

A Tool For Holding Old Plow Bolts.

C. A. McCOSH.

The accompanying illustration shows an extremely useful tool which I have made, and which comes in very handy to hold plow bolts when removing



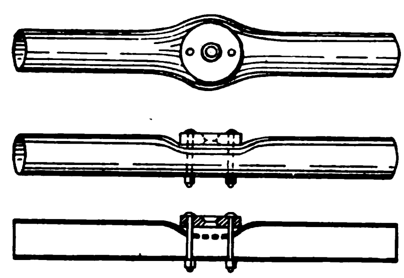
A USEFUL PLOW-BOLT HOLDER.

the share. On old plows coming into the shop, the bolts are rusted and turn when you try to remove the nuts. To overcome this difficulty, I took a ⅝-inch rod for the lever, and welded a piece of steel on the point, drawing it to a chisel edge to bear against the bolt head. This lever rod can slide in the ring hook, so that the device will fit any share, old or new. From the figure it will be seen that bearing down on the lever forces the sharp edge tight against the bolt, and securely holds it from turning.

A Home-Made Tuyere Iron.

WILLIAM DUFF.

My plan of making a tuyere iron is to take a piece of two or three-inch gas pipe (boiler flues are even better), long enough to reach two or three inches out on each side of the hearth of forge. Heat it up in the middle, or where the center of chimney comes, lay it on the anvil and hammer until flattened, say for twelve inches. Then drill several ¼-inch holes on the flat side. Get a big cast iron washer with about a ¾-inch hole in the center and ream it out on both sides, so that when the air comes to these holes it will be thrown out as well as up. Two holes in the flange of the washer must be



A HOME-MADE TUYERE IRON.

drilled clear through the pipe to permit its being bolted on. The end of the pipe that slips over the thimble of the bellows may be heated and enlarged on the horn of the anvil, so as to get a better fit on the bellows thimble. In the other end fit a plug of soft wood. If the pipe is flattened down ⅝ or ¾ of an inch deep, it will give plenty of space for the air. When cinders sift down into the pipe, pull out the wooden plug and work the bellows a little, which blows the fine cinders out. You don't need a scraper to remove them. The washer is to protect the pipe and spread the wind.

Repairing Locomotive Frames.

The work of repairing engine frames without removing them from under the heavy structures in the Pennsylvania Railroad shops at Sunbury, Pa., under the direction of the foreman of the blacksmith department, Mr. C. A. Sensenbach, is a striking feature of the work at those shops, and Mr. Sensebach with several assistants are doing some fine work in this line.

Engine No. 3068 was in a slight wreck, and had both frames bent and the front end on the right side broken off. The next morning, Foreman Sensenbach with several assistants started to work on the job. In five hours he had the frames straightened, a new front shoe welded on, and the engine was ready for duty by six o'clock the same evening. This is fast work, and was a saving of several hundred dollars for the company over the old way of doing this work, by removing the frames from under the engine.

Engine No. 1781 was sent to the shops with the front frame on the left side broken off between the two pedestal legs. This was a bad break, and was at a place where the frame was 4¾ by 4 inches thick. A furnace was built around the frame the same evening, and the next morning the blast was turned on and in fifty-five minutes the heat was taken. By the use of a pair of clamps around the pedestal legs and a heavy ram, which was used by several men at the rear end of the engine, the weld was made in five minutes, and was a perfect success. This completed the job in the remarkably short time of one hour. This is the twenty-fifth engine that has been repaired at the Sunbury shops in this way.

The Power-Driven Shop.

BILLY BUNTZ.

For the benefit of those smiths who are thinking of equipping their machines with power feed, I here give the practical experience of a few smiths who are running their shop with an engine.

In the shop of W. L. Paul, of Davis, N. C., who is manufacturing brackets, balustrades, oyster tongs, etc., the 1½-inch line shaft, 48 feet long, runs down the center of the shop, and drives a wood lathe, planer, rip saw, blower, drill, and two grind stones. The 2½-horsepower engine is located in a small closed engine room in the center of one side of the shop, and drives the line shaft at 300 revolutions per minute. Mr. Paul says that nearly all of the machines are of his own make, and that since putting in power he has increased his trade quite a little, and expects to have all he can do.

Mr. O. O. Goodenow, Portis, Kan., who is engaged in blacksmithing and wagon-making, has a three-horsepower horizontal gas engine. He says his engine pulls the trip hammer, double emery

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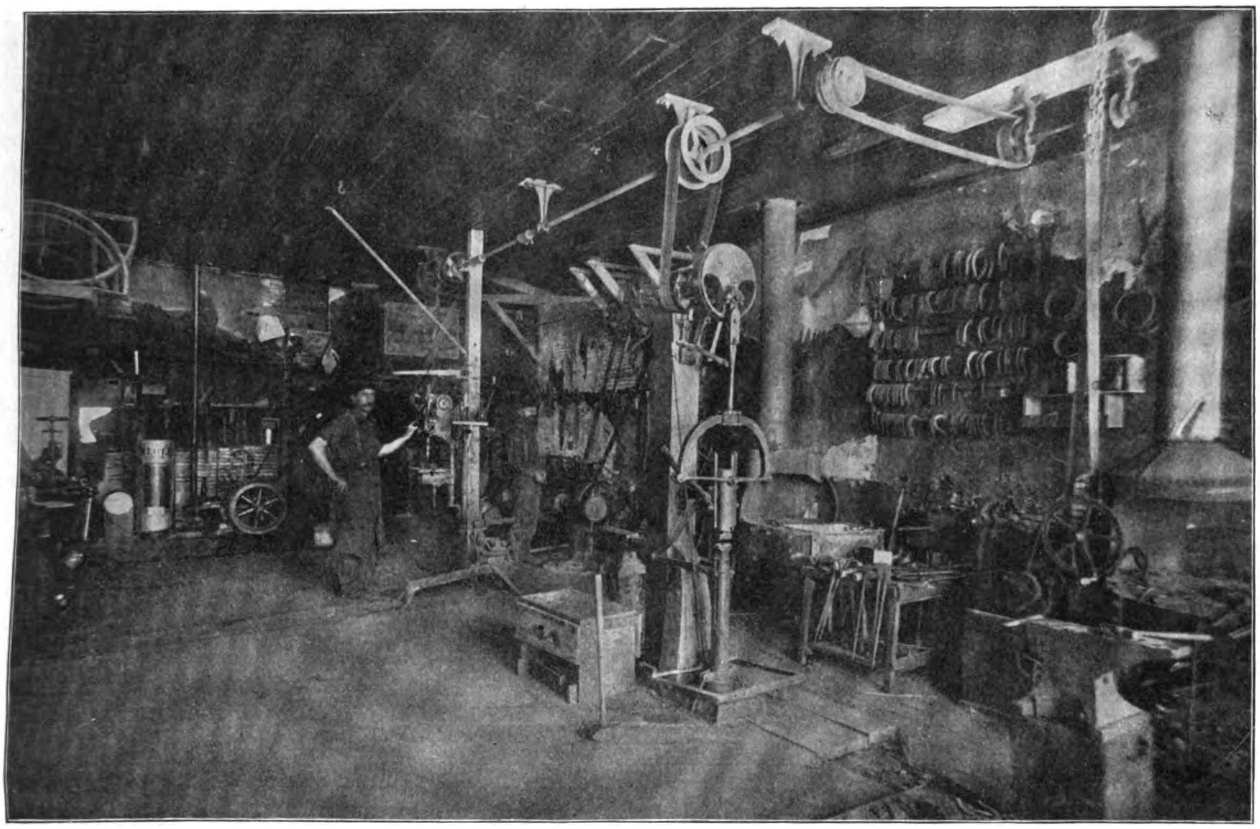
wheel and grindstone with ease, with a man working at each machine. In addition to these machines, a blower is also driven. An eight-inch pulley on the engine belted to one of the same size on the shaft, gives 375 revolutions per minute to the latter. A three-inch pulley on the line shaft belts to a ten-inch pulley on the grindstone. A 36-inch line shaft pulley drives a four-inch pulley on the emery wheel; a 24-inch pulley drives a three-inch blower pulley.

The smith shop of Ben Shopenski, Ashley, Ill., who is making a specialty of repairing wagons, buggies and machinery, contains a number of different machines driven by a $2\frac{1}{2}$-horsepower Weber gasoline engine. These are a No. 3 drill press, made by the Silver Manufacturing Company, Salem, Ohio, an emery wheel, power hammer, and a 16-inch blower, made by the Buffalo Forge Company, Buffalo, N.Y. Also a grindstone, six-foot Star iron lathe, made by the Seneca Falls Manufacturing Company, Seneca Falls, N. Y.; a circular saw, a buzz saw and a spoke tenoning machine, made by Dole and Deming. In this shop a shaft, fourteen feet long and $1\frac{1}{4}$ inches in diameter, runs along the short end of the room, and drives by means of a bevel gear a twenty-foot shaft of the same diameter, running down the long side of the shop.

Waugh & Modlin, Esbon, Kan., are engaged in general blacksmithing, and are also manufacturers of a well-boring machine. The front of the shop is used for shoeing and blacksmithing, and the rear for bench work, while the machines are in the middle. The machines, which are arranged for driving by the three-horsepower engine, are a disc sharpener, rip, cross-cut and tank saws, drill, power hammer, grindstone, emery wheel and feed mill. The engine has a pulley on either side of it, one being used for running the feed mill. It could also be used for running a wood saw. The line shaft makes 350 revolutions a minute, but the speed is considerably reduced when all of the machines are switched in. These gentlemen think there is nothing better than a gas engine for the smith shop.

The half-tone engraving shows the blacksmith shop of Frank Davis, Beloit, Kan. The line shaft is 28 feet long, and drives a Bailey drill and a home-made trip hammer; also two countershafts, one of which runs an emery wheel and an eight-foot lathe, the other a blower. Near the engine, which is a three-horsepower Weber, running on gasoline, is a pulley pump on a 33-foot well. The rear of shop is partitioned for woodworking. Mr. Davis says that he and his helper work at the machines at the same time and have plenty of power.

As to the use of engines for driving feed mills, the experience of the following smiths is of interest: Mr. C. R. Haymond, of Burdett, Kansas, states that he is using a three-horsepower gasoline engine for running a five-inch buhr full capacity, and says he finds the engine easy of manipulation, in fact, simplicity itself. Mr. J. T. Smith of Vliets, Kansas, has a similar outfit, and is grinding about fifteen bushels of chop an hour. His grinder has a nine-inch buhr. "I am grinding from eighteen to twenty bushels an hour," says Mr. Bentley Carr of Basehor, Kan. A $2\frac{1}{2}$-horsepower engine is pulling his mill. Mr. A. Leas of Rossville, Iowa, has about the same outfit as Mr. Smith, and says he runs his mill and corn sheller at the same time.



INTERIOR VIEW OF BLACKSMITH SHOP OF FRANK DAVIS, BELOIT, KANSAS, SHOWING GASOLINE ENGINE AND LINE SHAFT ARRANGEMENT.

Corns, Contraction and Forging.

A. J. MCDANIEL.

A corn in a horse's foot is a bruise of the sensitive secreting sole, caused often by contraction of the foot. The question, is how to cure them. I never dig out a corn unless it has gathered, and then I make a very small hole with the small blade of a pocket knife, or a small bit, $\frac{1}{8}$ or $\frac{3}{16}$ of an inch, and let the matter out. I use a shoe, as shown in Fig. 1, with calks welded in front of

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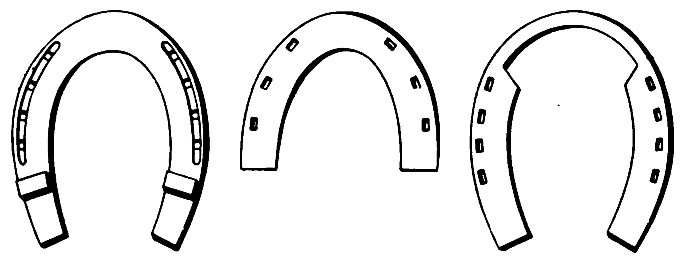
the corn. Never cut a corn out to the quick, for it leaves the wall without a support. I have found this simple treatment a success. Many shoers and good ones, too, advocate digging to the bottom of a corn, but that seems wrong to me. The foot is weakened to a great extent, for it needs the part that is cut out to hold the wall in place, and when a corn is cut out, generally the frog bar is cut into.

I have had quite a success with the following treatment for contraction: If the horse is used every day, I shoe with a bar shoe, as that holds the wall of the foot out and gives frog pressure. If convenient for the horse to be turned out and not used, it is best then to shoe him with tips; three nails on each side is sufficient. The tip is made to extend about two-thirds from the toe to the heel, tapered to the heel, and must be thin so that it will not make the horse lame. This shoe is shown in Fig. 2.



Figs. 1, 2 and 3. SHOES FOR CORNS, CONTRACTION AND FORGING.

I have had considerable success with a simple method of shoeing for forging. I make the hind shoes with a short roll at the toe. I make the front shoes as shown in Fig. 3. A great many good shoers make the hind shoes square at the toe, set them back, and then the hoof hits instead of the shoe, wearing the hoof down to the quick sometimes. If a horse does not forge badly a concave roll at the toe will stop it.

I object to calks except in icy weather, or in case they are required on working horses. Where the calks rest on the heel it makes the foot very hard, and will finally injure the foot of the horse constantly on the road and make him lame. A shoer should never use a pressed nail, for in driving it will split and prick the horse. He should use the hot forged nail.

The Railroad Blacksmith Shop.—2.

Rockers and Rocker Arms.

W. B. REID.

In some contract and railroad shops, rockers are sometimes forged in two halves, in dies under steam hammer, and welded afterwards in the centre of the shaft, as at Fig. 10, A. Our experience of this method has been unsatisfactory. It places a weld at the point of greatest strain in rocker. In a railroad shop known to the writer, a large number of rockers of this description were "scrapped," from time to time, fractured at the point of weld. The fracture, in every instance, showed clearly the conformation of the original male and female scarfs, into which the oil had slowly found its way, effecting their disruption as stated. While this might be attributed to inferior workmanship in the first place, due probably to the slender margin of piece work prices, still, the weight and unwieldy shape of the rocker itself, rendering quick and thorough manipulation difficult, argues strongly against this method of making rockers.

Another equally questionable method is the welding of rocker shaft, dab-scarf fashion, directly into an arm forged full length for the purpose, as in Fig. 10, B. In repairing rockers made in this way, we frequently have the parts fall apart at original weld. Could this weld be made under the steam hammer in a die having a sunken impression of arm, the scarf in the arm deeply formed with a hole punched clear through its center, the scarf in shaft to correspond, Fig. 10, C, then a substantial weld might be effected. But, where, as in the case of rockers, the entire surface is removed in finishing at the machine, flat dab scarfs driven in with sledges cannot accomplish satisfactory, reliable results. Where no better facilities of manufacture are available, the welded rocker arm may meet all reasonable requirements.

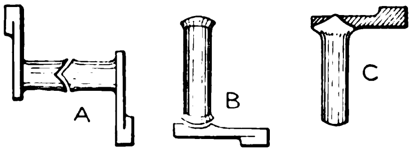


Fig. 10. WELDING ROCKERS AND ARMS.

But positively the best and ultimately the most economical rocker is that made in the solid. In shops provided with reasonable forging facilities, rockers should always be made in this way. At best, a weld is always an uncertain quantity, a weak spot that is very liable to prove troublesome in the day of future repair. In this respect a rocker made in the solid will prove invulnerable, in service, or in the hands of the smith undergoing repair.

The method of forging is here illustrated. The bending of the arms is the

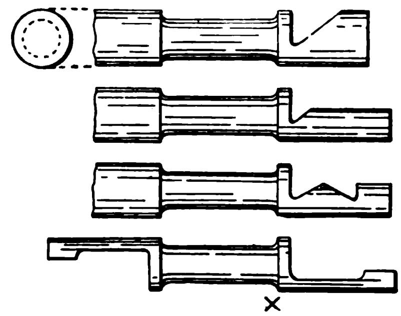


Fig. 11. FORGING A ROCKER FROM THE SOLID.

only real difficulty involved. Where no better means are available they may be bent over the anvil block with sledges; in which case, a good short heat at right place, X, Fig. 11, will render the operation comparatively easy; a long dull heat making it correspondingly laborious. The difficulty, in either case, to be avoided, is the formation of a coldshut inside of the arm at the point of bend. This can only be done by forcing the stock well backwards with a set hammer at the point, X, Fig. 12. If

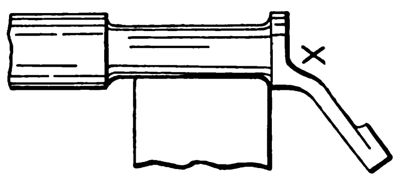


Fig. 12. BENDING THE ARM.

convenient, a ram can be used very effectively in this operation.

This method, at best, will be found of a hard and laborious nature. To overcome this, and to accomplish the work more expeditiously, many tools and appliances for bending arms at the steam hammer have been devised. From their cumbrous shape and weight, however, most of these are unwieldy, requiring a good hammer of considerable stroke for use.

A comparatively light, conveniently made and easily handled tool of this kind is here shown in perspective, Fig. 13. Its construction is simplified as follows: A piece of 9 by 2-inch stock is bent around, as in Fig. 13, A. One side two inches shorter than the other is cut out fork-shaped, Fig 13, B, large enough to receive the rocker shaft. This forging is then welded roughly to a straight slab of iron of the same size, 9 by 2 inches, Fig. 13, C. In use, this tool is laid across the die of hammer. The rocker

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with a good, short heat, at the point of bend, is laid horizontally across the tool, Fig. 14. Two or three small blocks support the rocker, and are removed as the shaft is driven downward.

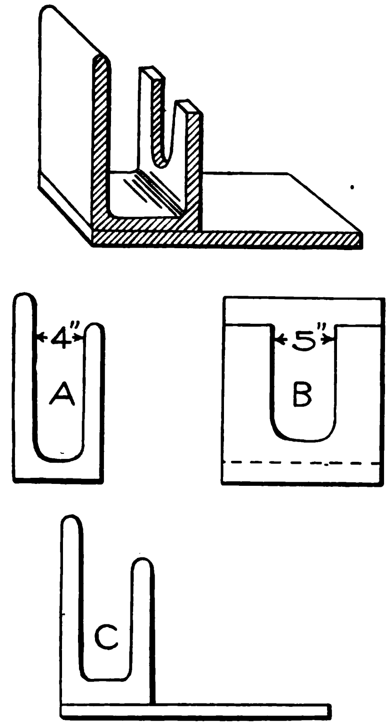


Fig. 13. TOOL FOR BENDING ARMS UNDER THE STEAM HAMMER.

Another block, swage-shaped, of suitable radius, rests upon the rocker shaft at point A, Fig. 14. Light blows upon this block by the steam hammer drives the shaft downwards between the prongs of the fork, thus bending the arm as shown. The fork catches the collar and prevents the shaft slipping backwards.

While this tool does not complete the bending operation perfectly, it does it so as to render completion of rocker

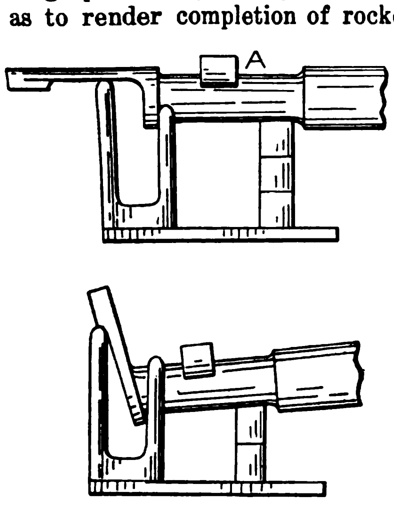


Fig. 14. METHOD OF BENDING.

under the hammer or at the anvil, subsequently, a comparatively easy matter.

Having described some different methods of constructing rocker arms, it will be in order to consider the problems to solve when it comes to repairing broken ones. This will be treated of in the succeeding chapter.

(To be continued.)

A Convenient Mode of Anchoring Posts.

GEORGE NABLO.

Any smith can make the foot irons for posts which I here describe, as they are simple and inexpensive. They obviate the necessity of digging large, deep pits to fasten posts so they will not draw out of the ground when wiring is stretched on them, and so they will not raise by the action of frost, being thus suitable for gate posts, or in fact any posts that are planted. They consist simply of two irons bent at right angles, and spiked to the post. The hole is bored down to the required depth, say two feet, and notched to admit the post with irons attached. When the post thus planted is ready, a lever is fastened to it with a chain, or a cant hook used, and the post given a half turn. Fill in the earth, packing it well around post, and that is all that is required to hold it there for years to come. I use 2 by $\frac{5}{16}$-inch iron, ten inches in length before bending, allowing the feet to extend about four inches. I also thin the edge on one side, the edge that is to cut the earth, so it will be easier to turn the post. I cannot say how it will work in stony or gravelly soil, but wherever the ground is such that the post can be turned, it will be found highly satisfactory.

The Village Smithy.

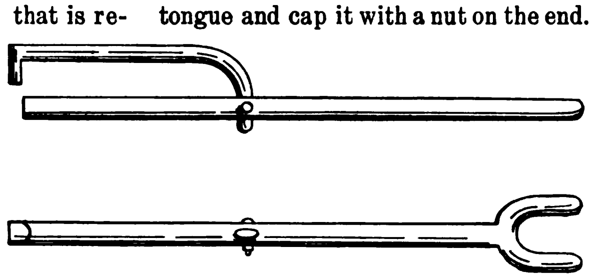
The oil painting which is being executed for THE AMERICAN BLACKSMITH by Artist Raphael Beck of Buffalo, New York, has had the finishing touches put upon it. Numbers of our friends who have been in Mr. Beck's studio to look at the picture, pronounce it one of Mr. Beck's finest productions, and hence we count ourselves fortunate in securing this excellent picture for the benefit of our readers throughout the blacksmith world. As mentioned in a former issue, this picture shows the interior of a village blacksmith shop. The central figure is a big, brawny blacksmith, who is engaged in the process of forming a shoe for a horse which stands in the background of the picture. The smith is represented as looking up from his work at a trio of children, who stand in the foreground gazing with evident interest at him, his work and the shop. The whole picture is remarkably true to life, and was painted by Mr. Beck after frequent visits to various blacksmith shops in order that he might be able to faithfully portray such a scene.

It is the intention of THE AMERICAN BLACKSMITH to have "The Village Smithy" copied by the latest duotone process, which gives a remarkably handsome reproduction. As we have before promised, a copy of the picture will be mailed, a Christmas present as it were, to all of our subscribers, and to every person sending $1.00 to this office between now and January 1st., in payment of his subscription. The picture will be 9 x 12 inches, and will make a handsome one for framing.

Two Useful Devices.

A. W. DUBOIS.

I find exceedingly useful the following device for strengthening buggy tongues: Run a truss rod ($\frac{1}{2}$-inch iron) from the bolt, just ahead of the doubletree bolt, out through the end of the tongue and cap it with a nut on the end.



A COMBINED BUGGY WRENCH-CLIP.

Then place a bridge two inches high in the center of the tongue, between the tongue and the rod. Tightening the nut will straighten the tongue. We find many buggy tongues that bend down in the center until they are useless, and this arrangement will fix them at a small expense.

I also use a wrench for buggy clips that is very handy, and which may be of some service to others. It is shown by the accompanying figure and will be clearly understood.

Tempering Mill Picks.

EDWARD NORTON.

I have seen numbers of smiths who seemed to think some special process was necessary to temper mill picks successfully. I do not find it so. The only thing I use is water. When dressing the pick, I do not give the steel any higher heat than a red. I temper with a low heat and draw the color to a dark yellow, getting excellent results in this way right along.

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The Song of the Forge.

ANONYMOUS.

Clang, clang! the massive anvils ring;
Clang, clang! a hundred hammers swing—
Like the thunder-rattle of a tropic sky,
The mighty blows still multiply—Clang, clang!
Say, brothers of the dusky brow,
What are you forging now?

Clang, clang! we forge the coulter now—
The coulter of the kindly plough.
Sweet Mary mother, bless our toil!
May its broad furrows still unbind
To genial rains, to sun and wind,
The most benignant soil!

Hurrah! cling, clang—once more what glows,
Dark brothers of the forge, beneath
The iron tempest of your blows,
The furnace's red breath?
Clang, clang—a burning torrent, clear
And brilliant of bright sparks, is poured
Around, and up in the dusky air,
As our hammers forge the sword.

The sword! a name of dread; yet when
Upon the freeman's thigh 'tis bound—
While for his altar and his hearth,
While for the land that gave him birth,
The war-drums roll, the trumpets sound—
How sacred is it then.

HEATS SPARKS WELDS

A Merry Christmas to "our folks."

What blacksmiths advertise locally and how? Does it pay?

A new painting of note in the art world—"The Village Smithy," by Raphael Beck.

Bear in mind that we invite you to ask for articles on any subject you wish further light upon.

The American blacksmith's motto: The best work, the highest pay. This applies alike to the wage earner and the shop owner.

How about your books? Another year will soon be ended. Have you collected all the money due, and paid all your own honest debts?

Do you agree with all that is said in the column "Queries, Answers, Notes?" If not, what are your views upon the particular subject in question?

There is a shop at Hugo, Jackson County, Iowa, but no blacksmith to run it. It is a good site for the right man. For further information write M. J. Noonan.

Don't talk about the poor work of a competitor's shop. Let the good jobs turned out from yours do the advertising and make him hump for business.

A good trade in the wagon business exists at Mount Pleasant, Ohio. No one at present there to take it up. The party who had this trade before has retired from business, leaving a very good opening.

An equine shoeing college is to be started in Flint, Michigan, for the education of scientific horseshoers. Saginaw capital has been invested to some extent in the project.

Are you busy—shop full of work? Then make arrangements to be busier. Power, tools, and improved methods help fatten the purse if used judiciously—fact, but Tom Tardy doesn't believe it.

Provide clean, wholesome reading for your children and family. The American Blacksmith clubs with all standard publications and can save you money by ordering through us. Write for club prices.

Time was when ancient smith shop methods were tolerated in the large industrial works. Time is when they are not. Ask the smiths to whom is given the particular work—the one who draws the fattest envelope at the end of the week.

"**After reading** a copy of your paper, I find it would be of great interest to me, as I am a young man in the business and would like to learn how the different smiths work. My business is principally horseshoeing and I would like to find out all I could about it." So says a wideawake ambitious smith of Kennet Square, Pa.

A good year's growth should be one's portion every twelve months. What have you accomplished since this time last year? What advances or improvements in your condition have you made? Not everyone can be satisfied with the material progress of a year, but the feeling of having done one's best is a source of immense gratification.

How is this for a varied use of the gas engine and hence a strong recommendation in its favor? R. I. Parkhurst, Amherst, N. H., writes that he is using a 2½-horsepower gas engine, sawing wood, cutting ensilage, running a churn, and also a threshing machine. Have you thought of how many different uses there are to which you yourself could put an engine?

What legislation will be of benefit to the blacksmith fraternity? Let the subject have wide expression through these columns. Then we can get together and set our Representatives and Senators to work. That is what they are paid for. When corporations, manufacturers, farmers and everyone else are getting bills enacted to help their cause, why shouldn't we?

Secrets of the jury room do not often leak out, but one came to our ears the other day. A horseshoer, who conducts an orderly and business-like shop, by his sound reasoning turned the entire opinion of a jury on which he was serving in an important criminal case. The high compliment paid to the jury by the Supreme Court judge for the verdict rendered was due to the horseshoer personally.

It is often difficult when welding iron or steel to prevent the flux from melting and running off the weld. To obviate this difficulty a flux has recently been devised consisting of a borax compound in which a fine netting is incorporated to hold it together. It is rolled out into fine sheets and separated into squares which may be easily torn apart for use. Recent tests of the flux shows a very high efficiency to the weld, the flux being held in place and performing the function of covering the surfaces of the weld very perfectly.

Figure out the weight which a large dray horse must lift in the course of a long day's work with excessively heavy shoes on his feet. The energy consumed in raising these heavy masses of metal, aggravated as they often are by rubber or leather pads, amounts to a considerable figure. Such weight is especially trying to the animal in hot weather. The primary function of the shoe is simply to protect the hoof from too rapid wear, and shoes should be made as light as practicable. Lighter shoes and more frequent shoeing should be the rule.

A reward for your effort. The American Blacksmith does not believe in work without pay. Following our conviction, we offer a good reward for a little effort expended in getting new subscribers for us. Look over the premium offers in our advertising pages. We do not offer premiums for renewal subscriptions, to keep our present friends, so to speak. Our idea is to get those who don't understand how much help a paper like The American Blacksmith would be to them, to try it for a year. We are willing to stand a loss on the first year's subscription, for we believe that once a reader, always a reader, applies to our subscribers.

Tom Tardy's shop is not a tidy shop. When we stopped in there this morning to pass the time of day, we had to scramble over numerous heaps of scrap and rubbish to reach our friend. Tom believes time spent in straightening up is just so much time lost. When asked what was in a big rubbish pile over in a dark, far corner, Tom said he didn't know, as he hadn't seen the bottom of it for more than a year. Why didn't he clean it out? Didn't have time. Yes, he had closed his shop at noon the day before, but then Tom explained that a man must have some relaxation, so he had shut up shop and gone to the races.

A recent visit to a blacksmith shop by a representative of The American Blacksmith revealed a very peculiar state of affairs existing there. Of course we can mention neither name nor place. It seems that the foreman of this large shop, having under him a great many smiths, young and old, was himself a subscriber to The American Blacksmith, and outside of the shop read the paper regularly. He was, however, unwilling to allow any of his men to see or know of the paper. He was apparently fearful of having his men obtain any new information, perhaps because he lacked it himself. Such cases but rarely come to our notice. The foreman blacksmith who has any regard for the standing of his craft will not frown upon any attempt of the men under him to obtain a fuller knowledge of their trade, but will aid in every possible manner any increase of the knowledge on the part of his subordinates. Such is the typical master blacksmith, the kind we usually met.

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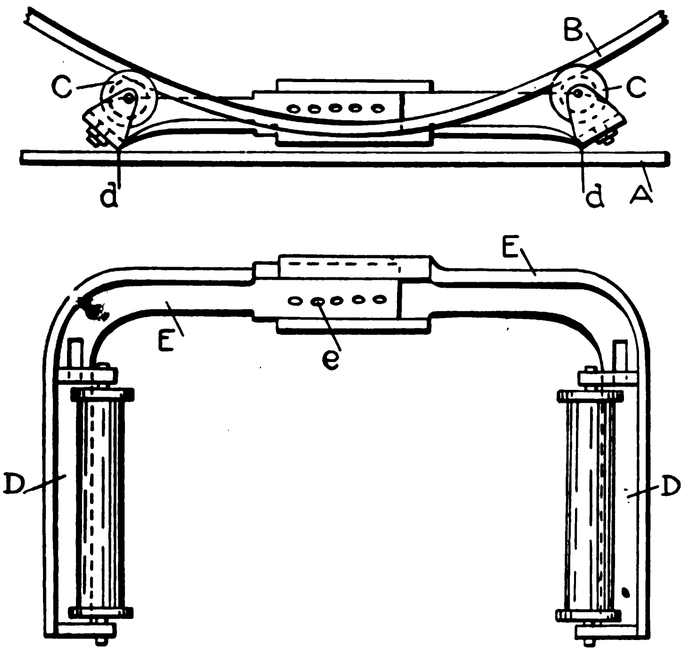
A Support for Wheel Tires.

J. S. DUQUETTE.

The accompanying drawings show a support for wheel tires recently invented by me, the object being to hold



A USEFUL DEVICE FOR SUPPORTING TIRES WHILE HEATING.

the tire while it is being heated in the fire on a blacksmith's hearth. Referring to the drawing, A represents the top plate of the hearth, and B a portion of the tire which is being heated. In order that the tire may be rolled on its axis over the fire, it is supported on two flanged rollers C, which are journaled in brackets D. These are arranged at an angle so that one edge only, as D, rests on the hearth. This sharp edge prevents slipping on the plate and no cinders can lodge underneath it. The arms holding the rollers are curved, one of them being provided with a dovetailed socket in which the other arm is slidable. The slidable arm is provided with a series of holes and the other arm with a catch for engaging these holes, preventing the slipping of part of the arms after being properly adjusted.

This device is simple, and will be found very useful to those who have considerable tire work to do.

Examples of Die Forgings.

BY RAM. ENGLAND.

In the accompanying examples of die forgings there is a similarity, and in the articles illustrated by Figures 1 and 4 a sameness in the method of manipulation. Fig. 1, A, is plan and elevation of a ring plate. The usual way of making this is to make the eye and scarf it, and then by means of a dab weld attach it to the plate in its proper position. A cheaper, quicker, and more reliable way is the following, assuming there are a quantity to be made: Make a steel block (See Fig. 1, B, for plan and section.) Then take a piece of iron 2½ inches in diameter, by about 5 inches long, and flatten a portion of one end as illustrated in Fig. 1, C. By placing a ⅞-inch plate on the bottom hammer block, the correct thickness is assured, and they can be thus shaped as rapidly as conveyance from the furnace to the hammer will allow. Next put them back in the furnace, and bring them to a good welding heat, taking care not to burn the flattened portion off, and stamp them in block B. A little oil or water placed on the block will be an advantage. There will be a thin fin all round the article, which is readily cut or sheared off; it will also leave a corner at M, Fig. 1, A, which will require cutting off, and cleaning up. You have thus a good, clean, sound and cheap job.

I make the article illustrated in Fig. 2 much the same way, only in this case I use stock 2 by 1 inch, of a convenient hand length. I draw about two inches of the end down from 1 to ⅝ inches, and then heat it in the fire the required length. Holding it edgeways on the die block, the flattened end will thus form the eye, and the thick part of the stock makes the plate.

In the case of Fig. 3, an eye plate, we have a more difficult article to forge. I make these from scrap bars drawn down to about 4½ by 4½ by 6 inches (one bar cuts several). I next heat these to the welding point, and hold them endways over the block, Fig. 3, B, and let the hammer beat them down to about 1¼ inches thick; by this time the slot 2⅞ inches deep is nearly filled up. Then take a second welding

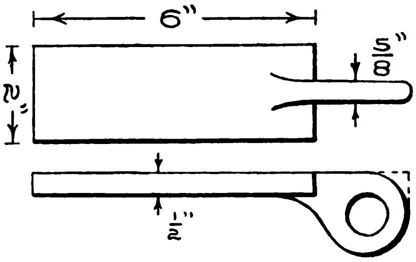


Fig. 2. EXAMPLE OF DIE FORGING.

heat and repeat the process, stopping the hammer when the plate is the required thickness. The block, Fig. 3, B, is chamfered off all round, to allow the surplus stock to get away, otherwise there would be some difficulty in getting them thin enough. In this case, the article is all that could be desired. When sheared and drilled it is ready for use.

In the above cases, the die blocks can be forged nearly to shape, so that very little chipping is required. As there is a similarity in each, I will only explain my method with regard to one,

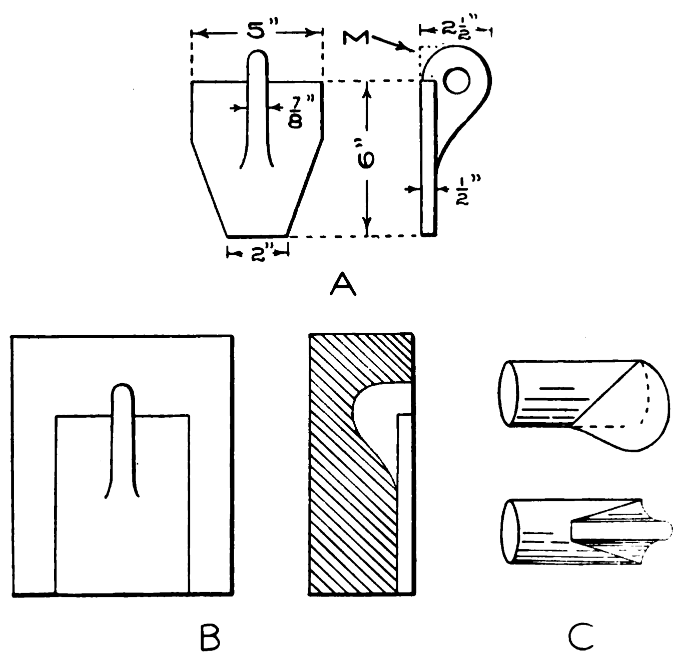


Fig. 1. RING PLATE AND METHOD OF FORGING.

say Fig. 1, B. I take a piece of steel, 2½ by ⅞ by 3½ inches, cut the corners off one end with a set, and make it the required radius each way. Next forge the steel block 10 by 8 by 4 inches, and

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while it is quite hot drive the rounded end of the punch into it to the required point 2½ inches, thus leaving one inch projecting. A few light blows on each corner of the piece will loosen this so that it can be pulled out with the tongs. Then I take a plate, say 4¾ by

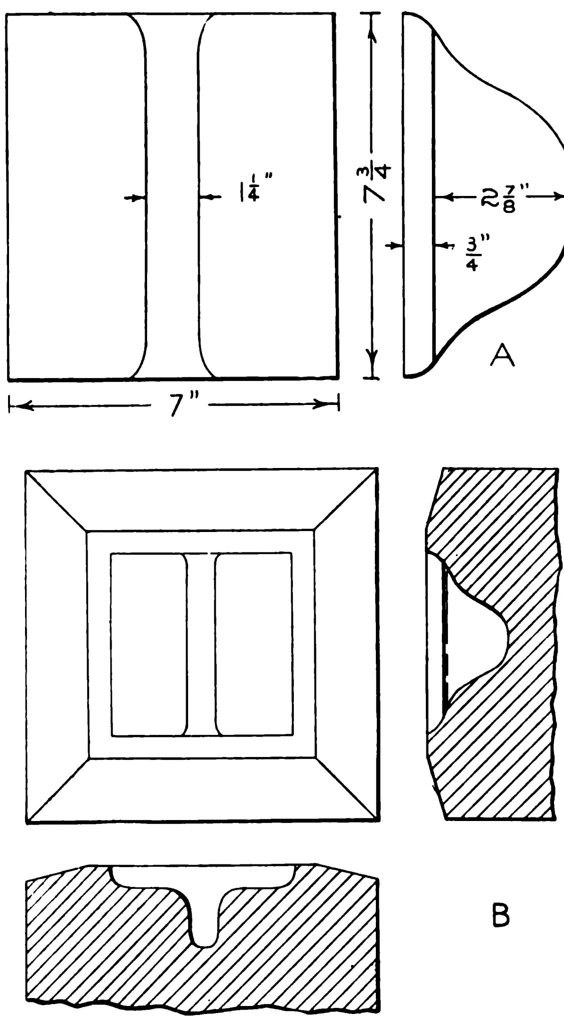

Fig. 3. EYE PLATE AND DIE FOR SHAPING IT.

⅜ inches, and any length, place on the hot piece, so that one end stands half way over the imprint already made (taking care that the one is parallel with the other), and beat it down level. It only takes a little fitting or chipping to complete the tool.

In the case of Fig. 3, B, I use an eye-plate for this purpose. It is advisable in each instance to slightly harden the blocks when complete. The sketches of Fig. 3, B, are from a cast iron block which I use under a 2,000-pound hammer.

The Oil Furnace.—Best Form.

Papers read before the National Railroad Master Blacksmiths' Convention.

Paper by J. G. Jordan.

I find the use of oil as fuel very satisfactory in turning out the work. The cost of the oil is only about one third that of coal, and the output of work very much greater. I should say that we can do about as much work again with oil as we could with coal, as it heats much quicker and makes the iron better than it would be if worked with coal.

We will take for an example the work required for a lot of new cars. With oil as fuel, and using a bulldozer or steam hammer tools for bending all car work, it is very seldom that a piece breaks at the corner, even though the iron is poor in quality. In making up a lot of 4,000 "U" bolts I used to break from 150 to 200 when we used coal for heating, while since we have been making them with oil fuel it is very seldom that we have one to break.

In our bolt furnaces we use water fronts, with two-inch water space. They have a ⅜-inch feed pipe at the bottom, and ¾-inch waste pipe at top. The inside space is 7 inches wide 3 feet long and 2 feet high, with a four-inch wall all around. The opening for bolts holds about 150 ⅝-inch bolts. We fill this space up with bolts and heat them. The blast and oil are then partly shut off, working the heat off in that way. We make from 3,000 to 3,500 three-quarter and five-eighth bolts per day on one bolt-header, and the only trouble we have is that of lining up the furnaces on the front about once every two weeks, as, you will understand, where the fire escapes it eats the bricks away in a short time.

For heavier forging or bending we have a heating furnace with no water front. The furnace is 3 feet long in the clear and about 10 inches wide inside, with two ordinary pipe burners, one at each end. The furnace is 24 inches high in the clear inside. We bend all our transoms from this furnace. The iron is 1 by 7 inches, with a double bend on the ends. We put three of them in at a heat, and it takes only three or four minutes to heat it from a cold to a white heat. In this way we bend 160 ends for ten hours' work under steam hammers, and if we tell the men they can go home after they have completed that many they will go home in about seven hours.

The next furnace I will mention is the spring furnace. This has two burners at the end. It is built on the same style as a scrap furnace, with the stack lined with brick, and with two partition walls every 24 inches, having a double row of holes every four inches—2 by 4-inch openings for the blaze to go through. In the first part from the burner we make our archbars, break levers and all other work commonly made with a bulldozer or a steam hammer. This compartment has a sand bottom. The next compartment is used for spring making, and has a brick bottom. We also do all our case hardening and annealing in it. As the furnace is located in the center of the shop, the door of the spring furnace is on one side and the door of the bulldozer on the other side, which makes it work very nicely, and makes good headway with very little oil—perhaps 50 gallons to each burner in a ten-hour day.

The next furnace is the axle furnace, which is the largest furnace we have. It is located near the center of the shop and is divided into two parts, with one partition wall 24 inches high in the clear, with a door 18 inches square. This furnace has a sand bottom. It has three pipe burners at the end of the furnace near the top. The arch in that part runs across the furnace and is 20 inches high. There are 4-inch openings in this partition wall every four inches all the way across the bottom of the furnace. The blaze goes through these openings and heats up the other part of the furnace. In this second compartment we heat pieces of locomotive tires and make claw-bars, and lining-bars cut of it. The heating door to this compartment is placed opposite the axle furnace door, so that men working at one compartment of the furnace do not interfere with those working at the other compartment. There is a hammer and crane on each side of the furnace. We have made about 45 driving axles so far and none of them have yet been returned. Some of them were nine inches in diameter.

The oil is a success in our shop already, and we are learning more about using it for blacksmith work every day. It is only about two years since we first commenced its use in a small way, but we have been gradually increasing its use and have had very satisfactory results from the start.

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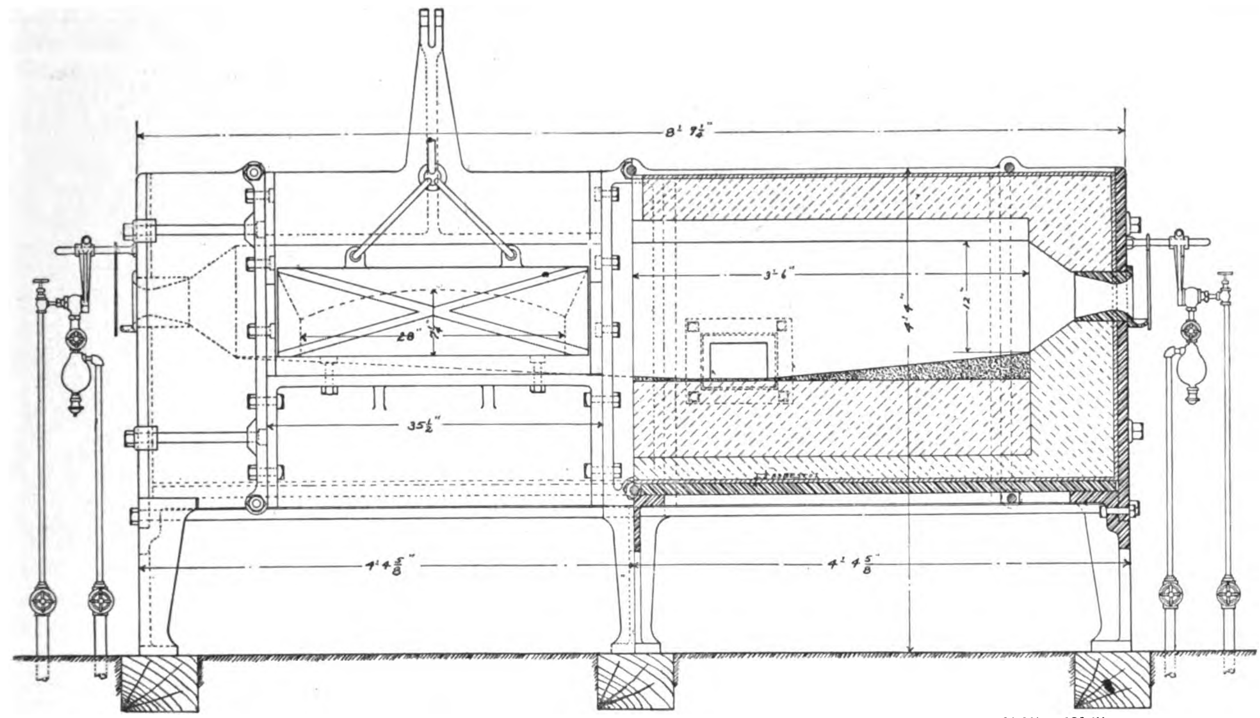
This pretty well covers my experience up to this time, but should I learn anything more of importance in the near future I shall be glad to furnish the Association with the facts.

Paper Read by George Lindsay.

The designs of furnaces are many. There are big ones and little ones. The largest I have seen was at Homestead, used for harveyizing armor plate, which would admit a locomotive into the door of it. The smallest I have seen was for tempering fish hooks.



FUEL OIL HEATING FURNACE AT PULLMAN CAR WORKS, PULLMAN, ILL. INSIDE DIMENSIONS, 7' 0" x 18½".

I suppose it will always be that designs of furnaces will vary with the men in charge, and often with the surroundings of them; perfect combustion being the most important aim, and that is sought by some with steam, others with high pressure air and others with fan blast, which should be at least 7 or 8 ounces per square inch. If less and you have a compressor in the plant, mix compressed air with fan blast by spraying the oil with the high pressure. I have not had any experience with steam, but it looks feasible; it will expand more than the compressed air. Mr. Judy informs me he uses it in plate work on pressed steel cars, and speaks well of it. He doesn't require welding heats. Whether he could get them or not I don't know. I, myself, failed to make a success of it with compressed air alone, and being hurried to get some few hundred flues welded I made a few changes and used coke; after the fire was cleaned and all supposed to be done I was again called to get some twenty-five more, when it occurred to me I might try both together. I covered up the fire hole and kept the fan blast as it was, for coke, and made a hole for igniting tube for oil, and it worked first rate; merely stumbled on it; now I feel satisfied at present. But one burner is used, and we are now using this in designs of furnaces, all the other details being right. The conditions around them sometimes determine the style, whether one side or both, or extension so as to utilize all the heat made from the oil used. By grouping the forging machines and furnaces, often the surplus heat can be used to advantage.

I show here a number of drawings, very kindly given by Mr. E. Corlson, Pullman Car Works.

Mr. Corlson's furnaces are so arranged he uses compressed air, 80 lbs. per square inch, which he says is better than steam; also more economical, giving better results. One of the furnaces is 7 feet by 18½ inches inside with two burners. The other is smaller, as will be seen by the figure. For the comfort of the operator he has ½-inch asbestos outside, and on the smaller one ¼-inch asbestos. There are many devices for the purpose of holding the heat from the operator; perhaps the water jacket is the most elaborate; but where a double wall is practicable I believe this is the most effective. Another device which is used is a perforated blast pipe in front to throw the heat upward.

I believe a great many of the failures with oil furnaces are due to not enough blast. The pressure should be at least 7 or 8 ounces per square inch. The internal lining should be so built that it can be renewed without tearing all the furnace down, avoiding projections that will retard the free course of the flame; easy round curves or bevels are not objectionable to obtain an objective point. These things will suggest themselves to a close observer. There should be a uniform heat throughout, with that soft white flame that every blacksmith knows only by experience. The outward walls of a furnace ought to be substantial and bound together with plates and bolts; it will pay; the less fire clay the better, if a close joint is made.

I believe the general method adopted by all for conveying the oil to the furnace is by gravity, 12 to 14 feet being ample. I have found that forcing the oil if the opening be small will give trouble by stopping up. Where practicable why not heat the oil as well as the blast? The winter weather makes it pretty stiff to flow well.

Paper by H. A. Folk.

Oil as fuel is insurpassable for heating furnaces, for bolts, springs, flues and all kinds of medium size forging. All car work can be heated with oil far better than with coal or coke.

I can't say how gas would work, but my experience with oil is in the first place a quicker and more uniform heat,

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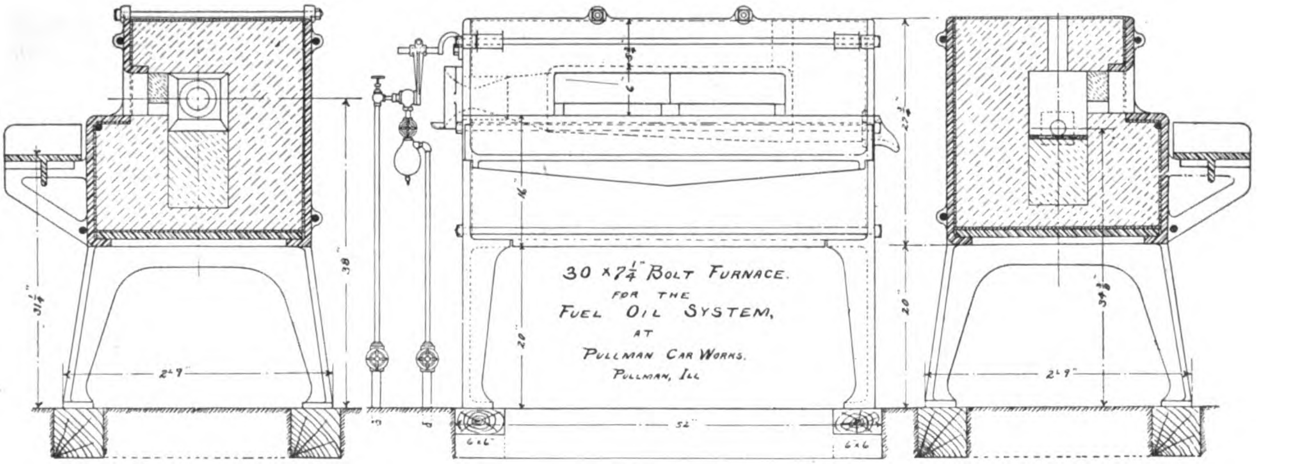
making the iron much softer, pliable and without injury, and the life of a set of steel or cast iron dies is two-thirds longer than with either coke or coal. Iron can be heated in oil that soft in a

ORNAMENTAL IRON GRILL WORK FOR SHOW WINDOWS.

4-inch lineal length of ¾ or ⅞-inch iron that 2 inches of the end will drop off without wasting the body of the material. In shearing the iron off it will leave a sharp edge on the iron; this sharp edge will not waste away. We do all our springs with oil, and it is far superior to coal or coke for spring making; it can be handled so much better and easier than any other fuel; it is always under control of the operator; simply by the turning of a small valve you can have a great volume of heat or reduce it down to a mere blaze.

We use oil for all our flue welding, and find it far ahead of any other fuel,



ELEVATION AND SECTIONS OF A SMALL FUEL OIL BOLT FURNACE.

the heat seemingly being so much softer and more pliable than with coal or coke, and no waste of material. We do all our bending of arch bars, carrying irons, truck stays and draft yokes with oil fuel; it saves time, expense and labor; no coal or coke to handle, no ashes to handle, no scoop, shovel, poker or rakes to handle; simply turn on your blast and then your oil, and your heater's hard work is done.

Four-fifths of the advantage in heating with oil is in the general construction of the furnace. If the furnace is not built right the oil will not heat right. Every blacksmith knows, or should know, just how to build his fire to take a heat just as he desires the heat to be, and if he is not a competent heater he is not a blacksmith, for two-thirds of a blacksmith's job is done in the proper heating of his material. If he can't heat he is no mechanic. And it is just so with oil; if your furnace is built right it will heat right, and if not built right it is far worse than no furnace at all; I would tear it down and throw it out and stop the worry.

Diseases of the Foot and Their Treatment.—11.

E. MAYHEW MICHENER, V. M. D.

Splints.

By the above name is known the disease of the bones comprising the region of the cannon, or, in other words, the parts situated between the knee of the front leg and the hock of the hind leg, above, and the fetlock joint, below. Splint formation is characterized by primary inflammation of the periosteum, or covering of the bone, and at times of the bone itself. As a result of the inflammation, the circulation of blood in the inflamed area is increased, and as the periosteum has for its normal function the formation of bone, the increased amount of blood in the inflamed part causes bone formation to proceed to an abnormal degree, and a piling up of bone material is the result. The enlargements are generally circumscribed and visible to the eye of the experienced person, and are readily detected by passing the hand along the cannon.

While lameness even of a serious character is sometimes the result of splints, yet it is the exception. Very many animals have one or more splints and yet are at no time rendered the least lame thereby. A very high percentage of horses have splints between the ages of three and eight years. Animals older than the last named age frequently show splint enlargements, which have been acquired at an earlier age, and not rarely, these enlargements remain for life. Occasionally, however, an adult animal, or even an aged one, may have a splint form. The most common situation of splints is on the upper third of the inside of the front cannon bones; next in frequency is the outer side of the same bones; the middle third of the cannon is more rarely troubled, and the lower third very rarely so. Splints of the cannon of the hind leg are so rare that many writers do not mention the occurrence at all, yet the condition sometimes does exist.

Not uncommonly splint enlargement is noticed upon both inner and outer sides of the cannon at the same height. In such cases, if there can be detected a band of enlargement connecting the two points, the condition is commonly known as "pegged splint," and is generally considered as liable to cause lameness. If the splint is quite high

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and threatens to involve the articulation of the knee joint, the case may be of serious importance. While all splints are strictly an unsoundness, yet only in a small percentage of cases is the condition such as to impair in the least the usefulness of the animal. The presence of splint lameness in an animal past the age of eight years does not, as a rule, offer the most encouraging prospects. The presence of splints upon a stallion or brood-mare may in some instances be an objection to their use as breeding animals, as it is noted that some families of animals seem to be predisposed to splint formation even without any of the recognized existing causes being operative. In judging animals of the above class, the influence of conformation as a cause of splints should receive careful consideration. Animals which have their feet too far apart as well as those of the directly opposite fault are predisposed to splints, on account of the faulty distribution of the body weight upon the limbs.

Causes of Splints.

These may be defined in general as such conditions as lead to the inflammation of the bone of the cannon, or its covering, the periosteum. Direct blows to the bone is sometime a cause. This is sometimes noticed in animals which strike themselves in traveling. The most frequent cause, however, appears to be a laceration of the periosteum along the attachment of the short inter-osseous ligament which binds the small metacarpal bones to the principal or large metacarpal bone. Hard work and fast work on solid or rough roads is a recognized cause of such injury. Bad conformation, as noted above, renders the liability greater. Failure to properly level the foot in shoeing may be a contributing cause, for by this means either the outer or inner side may receive more than its proper proportion of weight.

Splints from direct blows are generally situated well forward, and generally involve the large metacarpal bone alone, while those arising from other causes, commonly are situated at the line of junction between the large metacarpal and one of the small ones, and involve both bones to about equal extent.

Symptoms of Splint Lameness.

Lameness from splint may be noticed before the enlargement has formed to any considerable extent. The amount of lameness varies greatly according to the case. It almost invariably increases with work or exercise. A marked feature in splint lameness is the fact that the limb is carried outward as it is moved forward in traveling. At the point of injury the usual signs of inflammation are more or less apparent; heat, pain upon pressure, and more or less swelling may be detected.

A word of caution in the diagnosis of lameness is not out of place here, and can be included in the following: Splints *are* common, splint lameness is *not* common. Do not hasten to name splints as the cause of a case of lameness, until all other possible causes have been excluded.

Treatment of Splints.

In general the prospects of recovery from splint lameness are good, although some few cases are troublesome. In the case of high splint, the new formation of bone may involve the knee either by the inflammation extending to the surface of the knee joint or by the enlargement, limiting the free joint movement, or both. The blemish of the enlargement of splints frequently disappears altogether with nothing whatever done in the way of treatment, and unless there is good reason to apply remedies for the reduction of the enlargement, such procedure is questionable, and is condemned by some good authority. Some splint enlargements remain for the life of the animal, even after continued treatment is applied for the removal. In cases of lameness, however, it is advisable to apply treatment according to the nature of the case. If the cause is an unbalanced condition of the limb, possibly much may be done by proper paring of the hoof and the application of a shoe calculated to remedy the defect. If from striking in traveling, the shoer must endeavor to prevent the occurrence by proper shoeing.

Rest is essential in the treatment of splint lameness. If the part be hot and sore, the application of the cold water spray is good treatment. Irritating liniments or blisters should rarely be used at the start, but blisters of cantharides ointment, plain, or with one eighth part of red iodide of mercury added, is a good blister for old cases of splint lameness, and may assist in the removal of the enlargement. The use of the fine cautery point is advised by many, and is often followed by rapid absorption of the enlargement. Friction applied to the enlargement by means of rubbing the splint with a piece of bone, or smooth hard wood, is a common remedy, and is of some use and easily applied. Pressure applied by bandageing a small plate of lead, or other hard material shaped like the surface of the enlargement, is sometimes used with great benefit, but care must be taken to have the pressure evenly distributed and the bandage changed two or more times daily, else the skin covering the part may be killed and a painful wound caused. Removal with the bone chisel has been practiced to some extent, but the risk involved is considerable, and the results decidedly uncertain, as the enlargement may be increased instead of diminished by the procedure.

(To be continued.)

The Scientific Principles of Horseshoeing.—14.

E. W. PERRIN.

Fracture of the Hoof, Split-Hoof or Quarter-Crack.

Fracture of the hoof, as its name implies, is a split in the wall, given a different name according to its location. For instance, a fracture at the toe is commonly called a toe-crack; a similar split at the side of the hoof is called a quarter-crack. It is the front feet that are generally affected, either at the toe or inside quarter; sometimes we see a case of split hoof in the toe of the hind foot, but I don't remember seeing a case of quarter-crack in a hind foot, except in the few cases where a foot has been weakened by injury to the coronary cushion from a tread or wire cut.

Causes.

The predisposing cause is a dry, weak condition of the hoof, the result of a deficiency of that glutinous element in its composition, which in a healthy condition binds the fibres of the wall firmly together. This glutinous element may be deficient as a result of a deranged condition of the animal's health. The coronary cushion being a mucus membrane, its function may become impaired through sympathy with some other organ of the body—by a shifting of the seat of inflammation from one part of the body to another. As for instance, we may have laminitis as a result of pneumonia or gastritis. But concussion upon hard roads, the use of seated shoes, too much sole paring and too much rasping the outer wall of the hoof, are among the common causes of fractured hoof.

A fracture of the hoof may commence at the coronet and extend to the plantar surface, or vice versa; a fracture may be but one half an inch long, but if early treatment be not applied it soon extends to the full extent of the wall.

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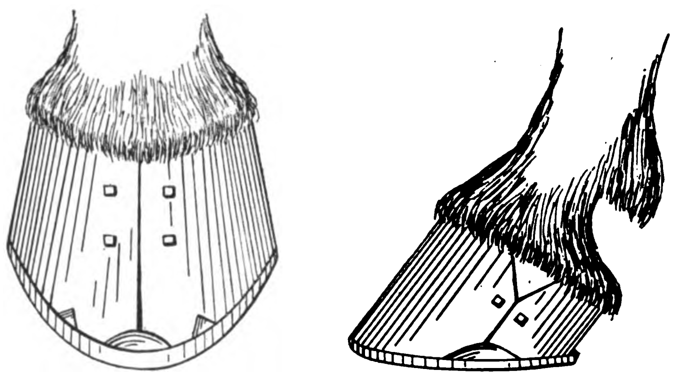
Every blacksmith knows that a split in the end of his hammer handle if not bound will soon spread the full length of the handle, as every blow on the anvil extends the split in the handle. So every foot fall extends the fracture in the hoof. As soon as the split reaches the vascular structure the edges of the split pinch the sensative laminae, rupturing the capillaries and causing blood to ooze through the crack, which condition is accompanied by acute lameness. Sometimes dirt gets into the crack, setting up irritation, inflammation and the formation of pus.

Treatment.

Since prevention is better than cure, the importance of keeping the foot as healthy as possible is apparent. The early treatment to prevent the fracture spreading to the full extent of the wall is very important. If there be lameness, the horse must be laid up, and the foot poulticed to allay the inflammation, or to remove such foreign bodies as sand, dirt, etc. The after treatment consists principally in keeping the edges of the crack together until the new hoof grows down solid.

To accomplish this, various methods of clinching the fracture together so as to prevent its opening with the expansion of the hoof are in common practice. A simple, but effective, way of doing this is to clinch the split by driving one or two nails through the wall from one side of the split to the other—that is, nailing the crack together. Having driven the nails —which requires skill, for they must have a hold deep enough to insure them not breaking out, yet not driven too close to the laminae—then nip off the points and heads of the nails; take a strong pair of pincers, place one jaw on each end of the nail, use strong pressure to bring the edges of the split together, and then clinch. These should be undisturbed; simply allow them to grow with the hoof, unless you fear they are loose, then put new nails in the old holes, or, if they be not sound, repeat the operation in a new place. But this method is not practicable in a weak, thin quarter. In such cases where the fracture extends to the coronet, make a V-shaped cut in the wall at the top of the fracture; then dissect the wall from within the V as close as possible without injury to those structures. I would not advise a shoer who is not a student of anatomy to attempt this operation, on account of the danger of injury to the secretory apparatus. This being done, clinch the fracture beneath the V; in addition to this, especially where there is any contraction, use an expansion spring. The benefit to be derived by the use of a spring in quarter-crack is very marked. Of course, the hoof must first be softened by soaking, and if this be done, when the spring is released you will see the effect of its expansion in closing the crack.

Shoe with a bar shoe and leather sole, or a rubber pad, taking care to leave the bearing off the wall at the seat of the crack. In a toe-crack, a clip on each side of crack does much to keep the edges of the crack together. Now bear in mind that curing a split hoof is a slow process, for you cannot heal the fracture; you have to bring about such a condition as will insure the new hoof growing down solid, hence in all cases where the split extends the full extent of the wall, the horse must grow an entirely new hoof to effect a cure. You cannot be too careful when the new hoof is coming down. When there is about $1\frac{1}{2}$ inches of solid hoof grown down from the coronet fire deeply across the crack at right angles to the fracture, and in the solid growth, this, if properly done, does much to prevent the extension of the fracture through the new growth. I have known a case of split hoof where the horse got loose and went for a gallop, and when caught it was found that the split had again extended up through the new growth to the coronet; thus the labor of three months' treatment was lost.



TOE AND QUARTER-CRACK TREATMENT.

I never have any difficulty in curing fracture of the hoof in a draft horse—they walk—but in road stock it is often difficult to effect a cure in a weak quarter while the animal continues at fast work. You may get an inch of solid growth, when the driver will put the horse to some extra or violent effort, the concussion of which will start the fracture through the new growth, and then the treatment must be started anew; for all your work is thus undone.

As much depends on the care taken of the horse by owner or driver, if you cannot secure their co-operation, you had better rest the horse until you get $1\frac{1}{2}$ inches of solid hoof, which will take about three or four months. As the fractured hoof is generally in a weak condition, owing to an impaired condition of the secretory organs, the coronet must be stimulated with a mild blister, say twice a month, or the application of some embrocation well rubbed into the coronet twice a week.

There are a few cases of fractured hoof, that result from a loss of a portion of the coronary cushion over the fracture, from a wire cut, a tread, a quittor, etc. Wherever a portion of the secretory apparatus is lost, the wall does not grow. Hence there is a fissure in the wall at that part, usually causing a fracture that is incurable.

(To be continued.)

The Brazing of Cast Iron Successfully Accomplished.

Up to within a short time ago, it was considered extremely difficult and costly to mend castings which had become broken. The brazing of wrought iron or steel is practicable, but it was thought that a strong, tight union of broken cast iron could not be made. The difficulty was probably owing to the impurities of the cast iron, or the large amount of carbon present. At any rate, until recently, a practical process of brazing cast iron was unknown.

Previous methods of mending castings were cumbersome in the extreme. A common plan was to rivet a strip of wrought iron to the casting on each side of the break, so as to hold the pieces in place. This of course was only a makeshift. In addition, great care had to be taken not to break the casting while riveting it. By this method no attempt was made to chemically reunite the broken surfaces. In the foundry, and elsewere, broken and defective castings are sometimes mended by the process of burning, or pouring on molten iron, but this is very laborious and uncertain at best.

A new brazing process is now being introduced by means of which, as it is claimed, broken castings can be perfectly mended by any mechanic; a

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blacksmith's fire and a few chemicals only being required. The process was discovered in the year 1901 after much patient research by Fredrick Pich, a German chemist, and has been largely introduced in Europe. It is now being developed in this country by the American Brazing Company, Philadelphia, Pa.

A successful process of brazing cast iron carries with it great possibilities. When one stops to consider the enormous number of castings, some of them of great value, which are each year thrown on the scrap heap by reason of some small break, it is easily understood what a great benefit to the industrial world a process would be, by means of which broken castings could be speedily and surely mended. It often happens that the real value of a broken casting itself is not very great, but delays arising from replacing the broken part with a new casting might mean large money losses to a manufacturer. By this new discovery, such delays may be prevented.

Realizing the importance of this discovery to the craft, THE AMERICAN BLACKSMITH Company has been investigating for some time the properties of Ferrofix, the new brazing material. It was our purpose to learn if the process would do the work, and whether it could be handled successfully by mechanics not specially trained. We sent a Ferrofix brazing outfit and directions for use to a blacksmith, and requested that he test it for us. He reported that he was unable to successfully braze the piece he undertook to mend. Believing, however, that his failure might be due to not following the directions, we had several more tests made, this time personally supervising the same. The success of these tests showed that the previous failure could not be laid to any fault of the process, but rather to not heeding the directions. One of our tests consisted in placing a ten-inch bar of cast iron, one square inch in section, in a testing machine, and breaking it by flexure with an application of 2,800 pounds at the center of the bar. The bar was then brazed, following the directions, and half an hour later was again placed in its restored condition in the testing machine; fracture occurring this time with a load of 2,400 pounds. The fractured section showed that the bar had not been brazed along one edge, which accounts for its breaking at a less strain. Failure to braze at this portion was due to the fact that the clamp used to hold the pieces of the bar together was inefficient, and left a crack of considerable width at the edge where the brazing failed. Another test was then made with a similar bar, using a better clamp. Much better results were obtained, the bar breaking under practically the same pressure before and after brazing. In both these tests the second fracture was at a new place, a film of cast iron at least $\frac{1}{16}$ inch in thickness covering the original break. In our test, the bar breaking in new places showed, strange as it may seem, that the fractured section was stronger after brazing than before. This may be due to burning out the carbon and weakening impurities during brazing, leaving a film of iron on each side of the reunited break, purer, and hence stronger than the original metal.

It has been reported to us that tests were conducted under similar circumstances at the Altcona Laboratory of the Pennsylvania Railroad. An attempt was made to fracture a brazed joint on some heating sections. The piece was broken under a strain of 14,000 pounds, but the fracture was from $\frac{1}{2}$ to $1\frac{1}{2}$ inches away from the braze. The second piece was broken under a strain of 22,000 pounds in like manner, only that for the space of about one inch along the length of the joint (which was a cast iron pipe about four inches in diameter), it was almost on the brazed joint, a thin film of cast iron only intervening.

From the investigations which we have pursued, we feel no hesitation in saying that any mechanic, by means of Ferrofix and careful attention to instructions, can successfully braze most broken castings. It would seem to us to be one of the most important discoveries of its kind in recent years.

The American Blacksmiths and Horseshoers' Association.

A Proposed Movement of Vital Importance to Every Blacksmith, Horseshoer and Wheelwright.

The business condition of the blacksmithing, horseshoeing and wagon building craft has long been receiving the careful consideration of THE AMERICAN BLACKSMITH. The various items and published articles dating from the initial number of this journal have brought forth a multitude of letters from the craft everywhere, with regard to the several great evils which affect the welfare of "our folks." We need hardly mention of what these consist: Bad debts, slow collections, low prices and poor mechanics.

Many methods of solving the problems involved have been suggested. These have been carefully investigated from every view point. As this issue goes to press, we are able to announce that within a very short time the incorporation of an association under New York State Laws will be completed to take up organized, systematic and persistent effort to bring about a number of radical reforms throughout the entire country. The movement is to be organized under the name, "The American Blacksmiths and Horseshoers' Association."

It may be said here, that the primary and most important object in view is the passage and rigid enforcement of a lien law in every State, which will legally protect each member of the craft and insure prompt payment for every piece of work done. This is something every smith recognizes the need of; it should have been brought about long ago. There are many other questions which mean much benefit to the craft which may be championed by the Association. These subjects will be taken up later.

THE AMERICAN BLACKSMITH has been requested to become the organ of this movement, and this it gladly does. The aims and purposes have been presented for our consideration, and meet with our hearty approval for their honesty of purpose, and clean-cut, systematic effort for the advancement of the craft. It is high time for every one of "our folks" to get into line to secure that legislation which is almost absolutely necessary for the profitable conduct of their daily business. Other trades have secured it—why not ours? It cannot be accomplished in a day, and for early success, the movement must enroll the sympathy and concerted action of every blacksmith, horseshoer and wheelwright in the United States and Canada. At this time correspondence is earnestly solicited, and suggestions are in order. The services of an organizer will be needed in all counties. The plans proposed are broad and wholesome, so that no craftsman can have any hesitation about lending his support. The influence of the large army of blacksmiths and wheelwrights, if unitedly enrolled under one banner and working steadfastly toward one end, by their numbers alone will go far toward securing that which we so much need. Attention is called to the blank on page XI of this issue. Every man of the craft is invited to join in the movement, and to keep in touch with its progress, as will be outlined in succeeding issues of this paper.

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If it has expired, we hope you have found the paper so valuable to you in your work that you will remain with us another year, and for many years to come. Thousands of subscribers have written that a year's subscription to THE AMERICAN BLACKSMITH is worth a great deal more than a dollar to them, or to anyone interested in blacksmithing, carriage-building or horseshoeing. Many say one issue alone is worth that much. This, however, is a matter for you to decide.

It is our purpose and endeavor to put out a paper worthy of the craft, and we would appreciate the aid and encouragement of a prompt renewal subscription from you. At the same time, also, tell us how we can make the paper more valuable to you.

We have constantly in mind the effort to make THE AMERICAN BLACKSMITH better this year than last by far, to make each issue better than the preceding one. The preceding article shows how deeply we have the interests of the craft at heart. We do not wish to take your name from our lists at the present time, and hence hope you will send us the money at once. No renewal subscriptions will be taken for less than one dollar per year.

Remit by money order, express order, registered letter or stamps. Do not send checks, as we cannot collect face value on them. Let us hear from you.

Address THE AMERICAN BLACKSMITH COMPANY, P. O. D. 974, Buffalo, N. Y., U. S. A.

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

How to Temper Stone Hammers—Will some one give me a good recipe for tempering stone hammers? JAMES DAVIS.

Tempering Copper Springs—Will some brother blacksmith tell me how to temper copper springs? FRED BARNEY.

Tempering Mill Picks—Can any brother blacksmith give me a first class recipe for tempering mill picks to be used in country grist mills? E. SAGER.

A Shoeing Inquiry—I would like some brother smith to tell me some way of shoeing a horse that knuckles over in front and whose feet are contracted also.
B. F. FRENCH.

A Question on Hardening—I would like to know a good way of hardening the inside of anything in the shape of a cylinder, without hardening the outside also. How is it best done? FRED BARNEY.

Tire Furnaces—I should like to ask through the columns of THE AMERICAN BLACKSMITH how to construct a cheap tire furnace for heating tires, five feet in diameter and smaller. O. M. BERRY.

Season to Cut Timber—If J. E. Gaines will cut his timber in July or August, and according to the old superstition in the dark of the moon, he will never be bothered with worms in the timber. B.B.MALLORY.

The Shoe Knee Hitters—In replying to Mr. T. C. Troster's question about knee hitters, pare the foot level and use a side-weight shoe, putting the heavy part on inside. I have never failed by using this shoe. W. L. G.

Cracking of Steel—I would like to know the cause of steel cracking when cooled off quickly, that is, when tempering drills and tools of that kind. They sometimes chip off. Does it show the wrong kind of steel? FRED BARNEY.

Treating a Thick-Soled Foot—I would like to hear from some of my brother farriers, as to how to treat a horse whose foot is very thick in the sole and very lame. When I pare it out well and apply tar, oakum and leather, he goes all right for two weeks. I would like to fix him up, as he is a fine horse. J. K. AKINS.

A Question on Forging—How can I shoe a line trotter that forges? In the first place I don't want to widen the action of the hind legs with side weights, and second, I don't want to shorten the stride with heel weights. The horse is not intended for the track, but is only a driver, and he has this bad fault, which I wish to correct. M. S. HEWITT.

Removing Old Spokes—I think M. W. Ralph will find a very simple and effective way for removing spokes in the following: Having the wheel solid on a wheel-jack, cut a notch in the spoke. Place a brace or block under the spoke directly under the notch, and then give a quick, sharp blow in the notch. This will remove almost any spoke. B. B. MALLORY.

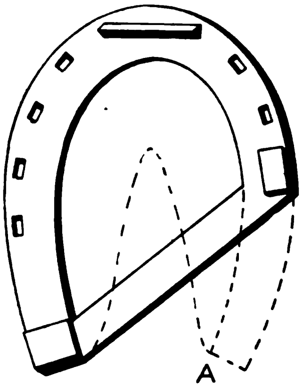
An Experience with Gas Engines—In answer to the question of Hans Hanson in the October issue with regard to a 2½-horsepower Weber Engine for wood sawing, I would reply that I have used one since last spring, sawing wood, cutting ensilage, running a threshing machine and a churn. I can saw two cords of wood an hour with a ninety-pound fly wheel, using a twenty-four-inch saw.
R. I. PARKHURST.

A Few Questions for the Boys—I would like some of the craft to tell me how to build light metal wheels for pony carts, tricycles, etc., using thick gas pipe for hubs; how to braze the flanges on the ends to fasten the spokes in. Also the best way to make molds for casting spur, bevel and interval gear wheels. I am going to give the boys my plans at an early date for making a lathe for metal work. The material costs only a few dollars.
WM. DUFF.

Shoeing for Interfering—For interfering hind feet I always use a light rocker toe shoe. Rock the foot out all you dare, place the toe calk on the inside, and make the inside twice as high as the outside, so that when the foot breaks over it will rock out. My advice would be to put on a shoe of this kind and then watch the action of the horse from behind. If this fails, try a side-weight shoe. C. A. GARY.

Gather on Wooden Axles—In the October issue, the question was asked by H.O. Walker as to how to get the gather on a wooden axle with skein. Center your axle at the large end of the hub, also at the small end. Then drop the centre point ⅜ of an inch down and ¼ of an inch forward of the first center, and work from this last point for the center of the axle when finished. G. D. GILLIS.

A Good Shoe for Bad Corns—Noticing an article by Mr. William W. Peters, I wish to give a diagram of a shoe which I used on a festered corn; the letter A shows the seat of corn. The horse was very lame.



SHOE RECOMMENDED FOR CORNS.

This shoe was put on and the horse was used on a butcher's wagon and never lost a day. This is an original shoe, as I have never seen or heard of one like it, but it works well. J. H. DIETRICH.

Case Hardening—I noticed in the September issue that some brother smith asked about case hardening. I claim that I can take a piece of ordinary hoop iron, draw it to an edge, and harden it so that it will cut the toughest wood without bending. This process is good for buggy axles and the like. Take prussiate of potash and pulverize it finely. Heat your iron to a cherry red and then roll in the prussiate of potash, or sprinkle it on until it melts. Then plunge into cold water, and you have a good hard surface.
WILLARD MANN.

An Interesting Question—I hold respect and a feeling of sympathy for one that will try to glean knowledge through reading. One to be up-to-date today must devote a certain amount of time to educate himself. I can only say, study the anatomy of the foot and limb, and then pathology, and I am sure we all will do better, give perfect satisfaction, and be a godsend to the noblest and best of dumb animals, the horse. I want to ask this one question. Wherein lies the seat of pain in a horse in front? And if the methods of shoeing the past hundred years have been right, why do our horses go wrong?
H. N. MUDGE.

Plow Lay Tempering—For tempering lays without warping, heat to a cherry red, and dip straight up and down into a solution made of three pails of salt, one pound of salamoniac, one pound of blue vitriol, one-half pound of cyanide of potassium to one barrel of rain water. Have a tank that will contain six barrels or more. Sink it in the ground so the top is nearly flush with the ground where it will keep cool during the summer. This

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will cool your lay quickly, the slow cooling being the chief reason for warping. Have your lay right before dipping, and you will have very little trouble.

T. K. HANSON.

To Make Shoes Stay On—To W. H. Hahn's question "How can shoes best be made to stay on?" my answer is as follows: Pare the feet down perfectly level, but not too close. Make the shoes to the feet. Be sure the heels of the shoe get a full bearing on the quarters. Leave the rim as wide as possible. Set your nails slanting and high. There is not much danger of pricking, even though high, if they are driven out at the right angle. Star and Capewell horse nails are the best in my estimation. By this method, I have had shoes stay from two to four months. As a common thing, farmers as a rule leave shoes on as long as they are solid, and I never had a kick on their not staying.

T. K. HANSON.

A Plow Work Answer—Noticing some inquiries in the October number, I will submit the following to Hans Hanson, Jr., on "A Plow Work Question:" Make your lay level on the bottom of the landside and no more. Make the edge of the level to suit the landside and roll up a scant ¼ of an inch on the heel, extending gradually for about five inches. This throws the bearing of the right-hand side of a plow, which in nine cases out of ten is where the trouble comes in. For hard ground, finish the same as in the first case, but only before hardening give it a tap on the point downward so it will hug the ground hard. This is for sulkies or gangs. For easy draft in either case use good, soft, center steel and temper. Avoid any hollows along the center of the lay.

T. K. HANSON.

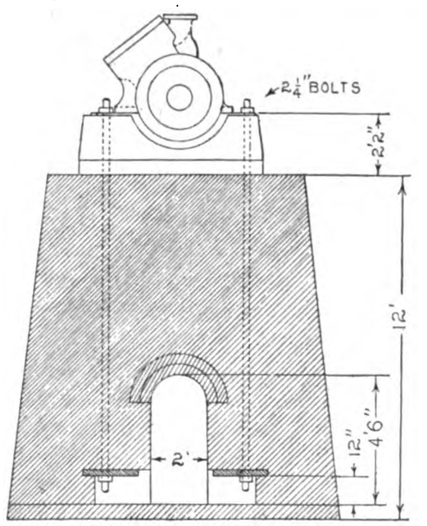
To Make Shoes Stay On—I would like to answer W. H. Hahn's question. To make the shoes stay on, use the Capewell nail. For No. 5 shoe and a good, strong foot, I would use No. 9 nails, "City" head, as the "Regular" head sticks out, and coming in contract with the cobble is driven up and of course the clinch raises. Next I would say, make the foot level, and fit the shoe full to the outside of the foot. Give a toe and heel bearing and have the shoe to fit slack on the quarters both outside and in, but more so on the outer quarter. Drive the nails high and strong, cut the clinches short. File under well, but not too much to finish. I use a Bryden shoe and while there is any shoe left it will not get loose. Always use a good, stout nail, and point it toward the toe and never back or straight. The more a nail points forward, the more hold it has.

J. H. DIETRICH.

A Good Scheme for Shoeing Bad Horses—Noticing in your August issue that a smith asks for a plan for shoeing vicious horses, I will give the plan which I use as it may help him and others. I take a one-half inch rope, about twenty feet long, and make a loop in one end large enough to slip over the under jaw. I then run it under the collar, between the front and between the hind legs, and bring it around by his side. I then twist it around the piece between his front and hind legs about three times. Draw it up tight. Let one man hold on to the end of the rope, and the blacksmith is ready to begin operation. The horse will not kick many times, but the rope should be kept on all the while, as it will not be in the way of the smith. I have shod lots of bad kickers in this way, and have always had great success.

B. R. SLACK.

An Interesting Problem—I show here a drawing of a cylinder and bed plate of an engine, the bolts of which 2¼ inches in diameter, broke off just where they were welded (lap weld). The bolts in setting were put inside of a wooden box and cement poured all around. As the figure will show the broken bolts have to come up, and cannot be driven down as there is no room for this. Three bolts are broken, all in the same place, about five feet from the top of the bed plate. It was a very poor weld in each case, as it showed the scarf. I would like to hear from some of my brother blacksmiths and mechanics as to how they would remove the bolts. I am the head blacksmith in the National Steel Company's Mill, at Columbus, Ohio, and the Master Mechanic called on me to help him get these bolts out. They had to be



BROKEN BOLT TO BE REMOVED FROM AN ENGINE FOUNDATION.

replaced before the mill could run, as it was not safe to run the engines without them. I would like to have some of the boys tell me through the columns of this paper how they would take them out. Then I will show how we did the job.

GEORGE GARDNER.

How to Make Shoes Stay On—To shoe a horse to make the shoes stay on long requires care in several steps of the work. First, in fitting the shoe the nail holes should be punched slightly slanting, so as to follow the slope of the foot. Also punch them just large enough to take the nail required and no larger. Next fit the shoe to the hoof all around, taking care to fit it full at the quarters. Before proceeding to drive the nails, or better, before selecting the shoe and fitting it, examine the wall of the foot to see whether it is thick or thin. If it is a thick, strong wall, the nails may be started deep and be driven low, but if the walls are thin and weak, the nails must be driven shallow and consequently high, in order that they may have a good hold. In drawing the clinches, be careful with a tender, weak foot not to draw them too tight. In cutting off the clinches remember that a clinch one-sixteenth of an inch long properly done will hold as well as one three-sixteenths of an inch long. HARRY LENHART.

Remedy for Knee Hitting—In reply to a question in the November issue by J. C. Troster, I will give here a method of my own, which has worked successfully on knee hitting. Take a front shoe and turn the heels as usual, leaving the inside heel calk just a very little higher than the outside one. Weld a toe calk on the inside fully as high as the heel, and draw it down to a feather edge on the outside of the shoe. Then draw a little of the outside of the shoe up, as you would a toe clip. Begin at the toe calk and turn up as far back as the second toe nail hole. Then level the foot as near as possible, and set shoe as full on the inside as the gait of the horse will allow. By taking off as much of the outside as it will stand without injury, you aid nature a little, which is all that is necessary. This gives the foot a tendency to roll to the outside toe. If this is repeated about three times, the horse's feet will naturally level up, and he will never hit his knees. That is my experience. If Mr. Troster can understand my meaning, this method will be of good use to him, and if properly done cannot fail.

M. L. BEAL.

Plow Laying—Referring to the matter of plow laying, I would say that I think Mr. Green's article on page nine of the October issue is in the main correct. I do the work in about the same way, except that I do not use clamps in fitting. I first fit the short landside in line with the plow. Then I cool it off, place it in position with my hand, lay on the share, and change it if necessary to lay down all along the line. When the landside is in position, take a pencil and mark on the outside edge of both lay and landside. Then mark the place with a chisel, place the point of the share in the fire and bend the point under. Place the landside between, hammer it down solidly and commence to weld, always keeping the marks together, and a perfect fit is guaranteed. The grand secret is in welding and in taking the heat. This must be done evenly all through the landside, not allowing a heat on the top corner with a third of the bar cold. Use a light, broad-faced hammer. Practice in this line is necessary for success: Theory is very well to have, but alone it is worthless. I have a pair of tongs, such as Mr. Green shows, but I have not used them for years except on old lays where the bar has broken off. I think Mr. Green is all right on long landsides, except that I work to a mark to avoid taking off the whole plow when welding up. Take the first heat at the top and work down.

C. W. SMITH.

An Interesting Letter—Please find enclosed $1.00 for another year's subscription to THE AMERICAN BLACKSMITH, your valuable paper as well as my own. I not only consider it as your valuable paper, but a valuable paper for myself or any other blacksmith, horseshoer or wagon maker. What interests me the most are the articles printed for the three above mentioned craftsmen, horseshoers especially. There is coming a time when we blacksmiths will be dropped and dropped awfully hard too, if we don't master the art of horseshoeing; and every one who practices the art ought to be compelled to pass a State examination or be dropped.

I wish to make a reply to the question of J. C. Troster in the November issue, "How to shoe a knee hitter?" The case he refers to may be a very stubborn one to effect a complete cure on by the first shoeing, but I will give my idea.

Pare down the outside of the foot as low as good judgment will allow. Make a heavy inside-weight shoe, according to the weight of horse and size of foot, fit the shoe full to the inside and close on the outside, leaving the outside even in length with the heel of the foot, with a very low calk, if any at all. Let the inside run back a little beyond the heel with a side calk welded on or turned on, either way will do. I would weld a low toe calk in the center of the shoe and bevel it towards the outside of the shoe as much as possible. If the horse does not stand square, or his ankles are inclined outward a little, take a piece of leather and lay it under the shoe on the inside from the center of the toe to the heel. Have the shoes reset every two weeks, as the inside is undoubtedly weak, and will give way before the shoes would need resetting on a sound hoof.

WM. BALDWIN.

Spoke Drawing and Timber Cutting—I saw in the November number of THE AMERICAN BLACKSMITH a query by M. W. Ralph for a simple device for drawing tight spokes from a hub. Saw into the back of the spoke and cut out a notch. Take a hand ax or foot adze and drive the spoke out. First place the spoke on something solid, and hold a sledge hammer underneath the notch in the spoke while driving it out, and you will find very little trouble in drawing the tight spokes.

Also brother J. E. Gaines wants to know the best time of the year to cut oak and hickory timber. Cut it in the spring of the year as soon as the bark will peel off nicely. Then put it away out of the weather, but place sticks between it to keep it from springing or warping. You will then have timber that the worms will not bother. I am now in my sixty-sixth year,and have been working in the wagon shop ever since I was eighteen years old, and have worked timber gotten out at all seasons of the year, and find that which is cut early in the spring by far the best. It is more solid, harder and heavier. If you want good hard spoke and fellow timber, get it out in the early spring, throw them in the water and let them stay there eighteen months. Then take them out and put them away out of the weather for eighteen months. Have the spokes turned and the felloes sawed out and dressed and put into wheels, and they will last a lifetime, for my father has tried it twice.

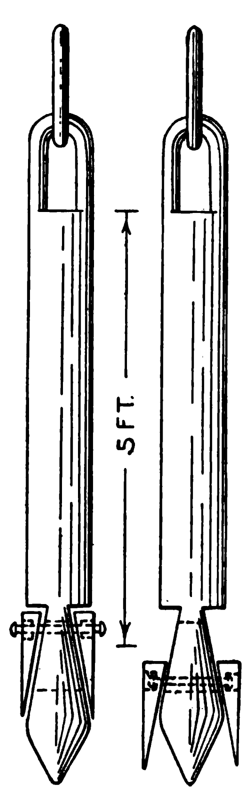
I think that brother R. A. Wood's way of drawing tight spokes from the hub is rather too much work, and then it will not do on buggy spokes. To cut a notch with square shoulder in the back of the spoke and drive them out is simpler, and will do for large and small spokes.

D. J. LESSEL.

Welding Plow Lays—In answer to W. A. Henry on welding up lays, I will give my method, which rarely fails, even in welding lays by the hundred. Make your landside slant with the frog of the plow, and bevel in the bottom one quarter of an inch deeper than landside of plow, as the weld takes up about that much. It is always well to have the landsides deep enough. Get the bevel on the landside point right with the point of the moldboard. If you use share, upset on the outer edge. Of course you must allow for that in the bevel. Now get your point set right on the landside. Next fit your lay, and remember that ten minutes extra spent in fitting your landside and lay may save you an hour after you commence welding. Fit your lay so it rests well on the heel of the landside and perfectly close down for about seven inches. I use a clamp made out of one by one-half inch stock with which no set screws are necessary. See that the back of your lay has the same curve as the moldboard and when resting the lay firmly on the landside, should it not fit the back brace on your plow, give the lay a twist till it does. Then lay share on landside and drive the clamp up to within about five inches of the heel. Make an ordinary wedge and drive it between your lay and landside point to throw the pressure on the heel. Now clean your fire, take the first heat on the heel and work towards the point. Finish as you go along, which saves running forth and back over the lay. Always turn under all you can nicely spare and never cut off the point, as that is the strength of the lay. Following these rules, you will have no trouble in welding. Use clean borax. Drill no holes before welding. I have welded hundreds of lays by this method and to my knowledge have had but one lay crack open in the weld, and that after it had run two seasons.

T. K. HANSON.

Tools for Removing Pipe from Drilled Wells—I have seen in your paper some tools for removing pipe from drilled wells, and as I have made one myself which I think will never let go once it has taken a hold, I will explain how I made it.



A DRILLED-WELL PIPE-REMOVING TOOL.

For a tool to remove a 1¼-inch pipe, I take a piece of 1-inch round steel about five feet long. Then I take a piece of ⅝-inch rod, two feet long, and after bending it into the shape of a V, weld it to one end of the first piece, making a loop some seven or eight inches long for a sliding link to play in. This will aid in starting the pipe if it should happen to be very firmly held. On the other end of the one-inch rod I hammer out an inverted wedge seven inches long, and beyond the wedge I taper the iron to a point. Starting about one-half an inch from the shoulder thus formed, I cut an oblong hole about three or four inches long through the wedge from flat side to flat side. I then made two wedges which will fit into the recess of the one-inch rod, formed where the inverted wedge was made. In each of these small wedges I made a hole $\frac{3}{16}$ of an inch in diameter, ½ of an inch from the larger end. Then using a ¼-inch countersink, I counterbore the holes on the rounding side of the piece nearly through the flat side. Placing the two wedges in the recesses of the one-inch rod, I put a piece of $\frac{3}{16}$-inch iron of the proper length through the holes in the two wedges and the slot in the inverted wedge on the inch rod. This $\frac{3}{16}$-inch piece I then upset on each end, making it just long enough so that the small wedges will have a play of about three inches in the direction of the length of the tool.

When I use the tool I wrap a piece of wire around the wedges on the lower end just tight enough to hold them in place while the tool is being lowered, but which will be pushed up when it is once in the pipe, thus releasing the wedges which slip down and are ready to take a grip on the pipe. I then give the tool a few sharp jerks to secure a good hold and then a steady pull generally moves the pipe. I guarantee that the pipe will split before the tool will slip.

ANTON OLESON.

Some Good-Natured Kicks—This is just plain shop talk and a few kicks. I heartily sympathize with Mr. Smith in his kick about farmer blacksmiths, as we have some of them here, but they are not the only ones that help make life miserable. The late comers are among them. I don't mind working hard all day, but I want to stop when night comes on. Some men will insist on you working after hours, and then get mad if you don't do it.

Then there is the "can't-wait" man. You know him by the cut of his jaw. He comes storming in and wants you to stop everything and do his work. He is in an awful hurry. You work like sin to do his job in time and the chances are he will stay around all day after all.

Then again comes the man with his plows. He has wired them in his wagon good and strong. He will call you out and take up a lot of your time, telling you all about them, and he will suggest to you how to fit them. While you are helping take off the wires, you could almost do the work. During the time he is telling you about it, the "hurry-up" man is poking you in the short ribs to get his work done.

And how about "Old Windy?" You know him, don't you? Well, he comes in and takes hold of your bellow's pole and proceeds to talk you to death. He tells you all about everything you should know. He tells you that you are the only man that can shoe his horse to keep him from interfering, and that he won't let any one else shoe him as long as he gets it done on "tick," as he calls it. About this time a team draws up and a farmer wants a bolt put in his buggy. He says it won't take you a minute, so you go out to put it in and while you are gone "Old Windy" takes a "fool" notion to blow your bellows just to keep your shoes hot for you When you go in he has them burnt up.

There is still another man. He is the "Cheap John." He comes in with a basket of horseshoes that he has collected goodness knows where. There are not two alike in the whole lot. He thinks you are getting rich and wants all he can get out of you. I am not referring to the poor "cuss" for I like to help them. I had one occasion to put in two axles for a man of the cheap class some time ago. When the work was done he wanted to take the old axles home with him for wood. He lived in the country with plenty of wood and we were paying $3.50 per cord for it. But it takes all kinds to make up the world. As the old man said to his friend, "Everybody's a little queer, but you and me, and sometimes I think you're a bit queer too."

W. L. G.

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THE AMERICAN BLACKSMITH

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The American Association of Blacksmiths and Horseshoers.

In the December issue appears a brief notice of the ambitious undertaking which is now on foot to secure a number of much needed reforms for the blacksmithing craft all over the country. The movement is one which affects the business welfare, in dollars and cents, of all blacksmiths, horseshoers, carriage builders and repair men, and is being prosecuted on lines which every one of the above craftsmen can sympathize with and support, no matter what his past experience or present views.

As stated on page 57 of the December issue, the primary object of this movement is to secure in every State in the Union a lien law for the craft, which shall, by its working, make it absolutely sure that the craftsman obtains his hard earned pay for every piece of work done. Other trades have similar lien laws for their protection; they secured such protection by direct appeal to their Legislatures. This is what it is proposed to do in the present instance. The newly organized American Association of Blacksmiths and Horseshoers intends to work directly towards the end of enrolling and organizing the efforts of all interested craftsmen in this movement, and of uniting all craftsmen to bring about the passage of such protective laws by various State legislatures. The force of combined effort is wonderful, and the aim of the Association is to combine and unite towards one end the efforts of the craft, individually and collectively.

As there can be little or no opposition to the passage of such laws, the principal thing to be done is to overcome the inertia of the legislative bodies and set the law-making wheels in motion. The American Blacksmith has gladly given its support to this movement in the interest of the craft, and will champion and lend its undivided support to obtaining the beneficial ends in view. It should be remembered, however, that little or nothing can be accomplished without the aid of the craft themselves, who are, of course, the directly interested ones, and if those who are thus widely affected are not willing to expend the small amount of energy which the Association proposes to ask of them, and which is so slight, compared with the advantages to be gained, the movement will hardly be a successful one. We feel, however, from our correspondence upon this subject, that there is not a single person but who would be willing to put forth considerable effort to secure legislation of this nature, and are absolutely certain that undivided support will be given to the American Association of Blacksmiths and Horseshoers. Reference is made to further details following.

A Few Words About Our Contributors.

The American Blacksmith is so justly proud of the staff of contributors which write for its columns, that a few words here regarding them may be pardonable.

Mr. E. W. Perrin, who is contributing regularly upon the "Scientific Principles of Horseshoeing," is an eminent farrier of Little Rock, Arkansas, whose thorough theoretical knowledge of the subject has been supplemented by a wide and very practical experience with the shoeing of horses, both in the English Army, in Canada and in this country. There are few, we are prone to think, who are capable of handling the subject of horseshoeing in all its phases as satisfactorily for our subscribers as is Mr. Perrin, and his series of articles form a valuable contribution to horseshoeing literature.

E. Mayhew Michener, V. M. D., is a veterinarian of wide reputation throughout this country, both as a man of practical ideas and methods, and as a contributor to various publications on the subject of veterinary surgery.

Mr. John L. Bacon, Instructor in Forge Shop Practice, at Lewis Institute, Chicago, Ill., has been writing a comprehensive series of articles upon "Elements of Blacksmithing," which has received wide and favorable comment from many sections of the country, and has in great part led to the adoption of The American Blacksmith in a number of colleges and schools where blacksmithing is taught as a text-book upon this subject.

Mr. M. C. Hillick hardly needs an introduction to the readers of The American Blacksmith, in view of his wide and almost national reputation as a practical writer upon painting and all allied topics.

Mr. William B. Reid, Foreman Blacksmith of the Repair Shops of the D. L. & W. Railroad, Buffalo, N. Y., is contributing a series of extremely interesting articles upon locomotive blacksmith work, in which we think every one of our readers will find much of great interest.

Another author, widely known in the carriage building field, writes under the modest signature of D. W. M., and gives American Blacksmith readers some very valuable articles upon subjects connected with the carriage shop and its practical, economical management.

The topic of power in the shop is now a very absorbing one for most shop

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owners. The gas engine, its availability and possibilities for the small power user, are treated of in an interesting manner in a series of articles from the pen of "Billy Buntz." We think these articles will be found of very timely interest to the majority of our readers, and especially to those who contemplate adding a gas engine to the equipment of their shop.

It has been the constant endeavor of the publishers of THE AMERICAN BLACKSMITH to secure the very best matter for the reading columns of the paper which it is possible for money to buy, and it is thought that the foregoing list of authorities will prove how far we have succeeded in carrying out this end. We may also add that it will always be our purpose to improve the reading columns of the paper as far as possible, and add to their value to subscribers in every practical way. Suggestions for improvement will always be gladly received.

Turning a New Leaf.

On New Year's Day, the new leaf many of us turn over looks as clean and promising as a new world. We make endless resolutions to keep it just so, but after a short time, it appears as bad as any that went before. The real difficulty, however, generally lies in the fact that the leaves are so much alike.

Considering the years as leaves, the centuries are volumes. These also look very much alike as far as human nature goes. But turn back to the early centuries, when all tools were made from stone by hand, and when the only force was man's unaided strength. Then look at the present century, with its wonderful machinery and marvelous control of nature's forces. We can at once realize the progress, the advancing standard of civilization.

A very grand thing it is to be alive and one of the world's workers in this glorious century still so young. Who can say what the new year will bring? All things seem possible. Living in touch with the great world of progress, and taking its lessons to heart, no man need be afraid of all his pages being alike. Resolutions have a tendency to crumble like the proverbial pie-crust, yet, even the best of us can but do his best. The result will take care of itself. If a man keeps up-to-date, carrying into practical, everyday life the advanced ideas of his times, the leaf, at the close of another year, may be just as full of blots and mistakes as the one before, but what is written thereon will be of a higher standard, and he will find himself a better developed man.

A Valuable Text-Book of Blacksmithing.

In this issue appears the fourteenth and last article of a series lately written by John L. Bacon, Instructor in Forge Practice at the Lewis Institute, Chicago, Ill. This series, under the heading, "The Elements of Blacksmithing," forms a complete and comprehensive treatment of the subject in all its various phases. Beginning with the fundamental principles of blacksmithing, Mr. Bacon takes up systematically and thoroughly every point worthy the attention of his craft. The result is a most valuable contribution to blacksmithing literature.

WROUGHT IRON ENTRANCE GRILLE FOR A NEW YORK RESIDENCE.

All the information contained therein is set forth in a plain and understandable manner, so that the series forms one of the best discussions on blacksmithing which we have ever seen. There are few smiths who could not read this series to profit, and the same applies even more to apprentices, helpers and beginners, who are looking to advance their knowledge of blacksmithing in all its fundamental details. For those who have not been subscribers to THE AMERICAN BLACKSMITH in the past, thus missing the benefits of these articles, we are able to make a special offer of the fourteen numbers, December, 1901, to January, 1903, inclusive, for $1.25, postage prepaid; bound copies, $2.25. We have a few copies of all these numbers left, and they are at the disposal of any who may wish to have this very complete series of blacksmithing articles. It may be added that a number of prominent schools and colleges, where blacksmithing is taught, have adopted Mr. Bacon's series as a text-book for the instruction of their students. This only serves to show in what high estimation Mr. Bacon's writings are held.

Ornamental Iron Work.

In modern architecture and manufacture, by reason of its superior strength, durability and neatness combined, iron has gradually crept into the domain of almost every other material. In fact, its uses and possibilities seem endless, and its popularity is yearly increasing.

So much is employed on exteriors that, in order to avoid marring the general effect, it is necessary to make the iron work conform to the style of the structure, or even to add to the effect. Hence, the field for artistic work in iron is very wide, and in no branch of the blacksmith's craft is there such scope for the exercise of skill and original taste.

The accompanying cuts represent two very fine pieces of ornamental iron-work. The first is the wrought-iron entrance grille in residence 353 Riverside Drive, New York City, from the design of the architect, Mr. Ernest Flagg. The other is a wrought-iron entrance gate to residence 11-13 E. Sixty-second street, New York City, by the architects, Messrs. Haydel & Shepard.

We are indebted for the photographs of these artistic pieces to Messrs. Richey, Brown & Donald, Architectural Iron Works, Long Island City.

Estimating Costs in Carriage Shops.—5.

BY D. W. M.

Aids to Calculations of Cost.

It will be found of great service to weigh the quantities of each size of iron or steel in a vehicle, also to measure the actual amount of plank lumber of each size and kind, as well as to have a list of all pieces used. For instance, if the stay irons on the reach are ⅝-inch heavy oval, measure the length of each piece and weigh it. Indicate on your list the number of pieces, and the size and weight of each. A list of all the pieces of timber, wrought and malleable iron, bolts, screws, etc., used on each vehicle, should be kept on the draft of said vehicle, and on each pattern should be written the thickness and number of pieces.

In the office, it will be found of the utmost service to have a cabinet with sufficient pigeon holes or boxes in which to keep all quotations of prices, and all estimates. These may be suitably indexed, alphabetically, or by number. One may contain all prices on wood work, another on iron, another on trimming goods, another on paints; or subdivisions of these may be made. Separate boxes should contain estimates on cost. With these for ready reference, one should be able to figure accurately and quickly. It takes some time to get all this together; but no better investment can be made.

The circular or catalogue received almost daily is frequently thrown away. If it relates to anything connected with the business, even remotely, the better plan is to keep it, and have a place where it may be referred to readily. The ordinary box file will be found useful for this purpose. Once a year they may be weeded out. The same system should prevail with copies of trade journals received, which often contain the very information you want, and for lack of which you must suffer some loss.

There are many business men who conduct their offices as though they were afraid of knowing too much about their business. Many keep no books, and have but little system, yet they are successful. They figure everything in their heads. They pay the best prices for the most skilled labor, and do not seem to care what the cost is, but by having the very best article to sell, they ask and get the highest price. There are others who have everything in the way of system; figure the cost of everything to a cent and sell at the bottom price, yet they make no money. The man with system, simply has his business well in hand; and if he will make the best goods and get the best price, he can drive his business and develop it on safe lines. At the end of the year it is of the utmost helpfulness to know where to push strongest the next year for profit, and where to avoid loss. This cannot be done without system, and correct estimates backed up and proved by the actual cost items, as shown by shop and office returns.

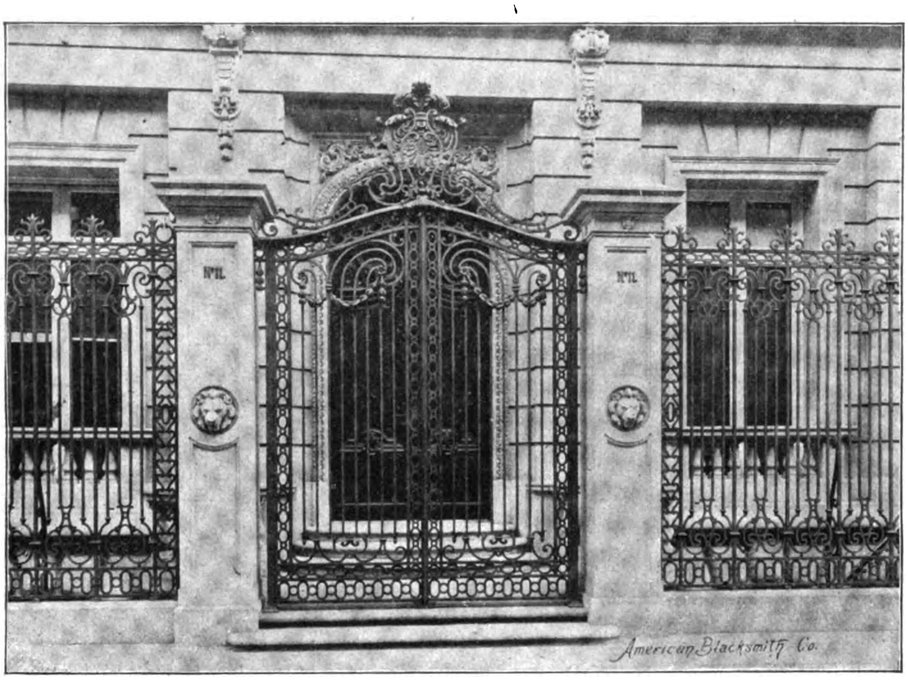
One other item,—a business man should pay himself a salary which should figure in the cost of running the business. He is worth just the same as any employe.

New Year Suggestions.

As Applied to the Carriage Paint Shop and the Painter.

M. C. HILLICK.

January, of all the months in the year, affords the jobbing shop painter the best opportunity for balancing the books, getting at the profit or loss of the year's business, and making preparation for the increased trade which he may hope to win during the approaching season.



SOME HANDSOME ORNAMENTAL IRON WORK.

No year, be it ever so successful, is quite free of disappointments and mistakes, and it is the man wise in his day and generation who is able and willing to profit by these mistakes. So, early in the youth of this present year, it is a step forward in the direction of a larger and more profitable business, to look close into the details of the business that has passed into history, to try to make amends for the shortcomings of previous years, and to build securely in anticipation of plenty of work in the near future.

Perhaps your book-keeping system is obsolete, or maybe—but we sincerely hope this does not apply to your case—you have failed to keep a set of books, trusting to luck and random entries in a pass-book carried in the pocket, to keep the business from becoming entirely lost in a wide waste of ill-remembered events. If this has been your experience in the past, why not reform, and once and for all time inaugurate a complete, comprehensive and accurate system of book-keeping?

Perhaps you have been a bit negligent in the matter of making estimates upon work submitted, and in your eagerness to keep it from your competitor, detailed items of cost have been ignored, and figures jumped at, only to be found, later on, misleading and disastrous in effect. If this has been your experience why not institute a second reform?

It has been said, and with much accuracy, that there is no royal road to estimating. In this age of remorseless competition, an estimate should be based upon hard, close figures, carried out to the exact length of every least detail.

The writer recently inspected an estimate made by a certain manufacturing concern upon the cost of putting certain repairs upon a railway coach, which was complete, even down to the expense attached to drawing a stripe across a transom glass! A carefully and fully computed estimate upon the cost of labor and material to be expended in painting and finishing a certain vehicle takes the contract, if secured, out of the game of chance, and converts it into "a dead certainty."

Possibly you have hitherto set too small a store upon the importance of shop conveniences, by which we mean labor-saving devices, roominess of apartments, light, ventilation, equipment for getting work into the shop, etc. Why not give all these things

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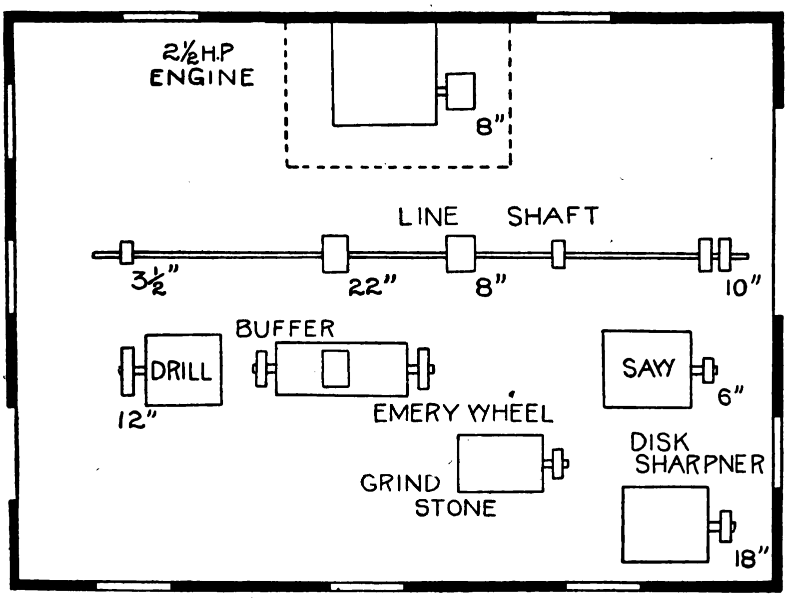
especial thought just now? If such conveniences are of value to the large shop they are proportionately of equal value to the small one. The same kind of conditions make profit in the shop of modest pretensions as give the city shop, with its millionaire clients, a sure money-making power. Plenty of room is a first essential in the paint shop. Lacking this, the painter is struggling under a severe handicap. The blacksmith or the woodworker can work more advantageously in restricted quarters than the painter. Freshly painted or varnished work cannot be stored closely without injury. The roomy paint shop, other things being equal, is the best paying shop. Plenty of light is no less essential than plenty of room. Light not only facilitates work, but it actively promotes the drying of paint and varnish. To illustrate: Note how much quicker a freshly laid coat of roughstuff, paint, or varnish, on the side of a carriage body next the light, dries, than the same material on the side away from the light. The ablest chemist that France has produced, making a specialty of varnish problems, declares that light, with but one exception, contributes more powerfully to the drying of varnish than other agencies. Hence the advice, make the paint shop, including varnish room, as light as possible. And after light, ventilation. Ventilation—in other words, pure, fresh air—prolongs the painter's life, contributes to his comfort in working, and quickens the process of drying of paint and varnish. The imperfectly ventilated paint or varnish room carries gases and impurities in the atmosphere, which greatly retard the drying of paints, colors and varnishes. They carry disease into the human system. They serve to cripple the painting business from all points of view. Equip the shop with a ventilator for every room. Failing to do this, arrange to lower all windows from the top. Arrange some device with which to furnish the shop with a full supply, daily, of fresh, wholesome air. You admire the mirror-like surfaces released from the high class factory shops, and wonder how such surfaces can be kept so clean. Clean rooms and clean surroundings help amazingly in this attainment. As a rule, ill health does not exist in clean quarters, nor are specky, dirty surfaces developed there. Keep the paint shop clean and increase its profit-earning capacity.

Some buyers of paint shop supplies mistake the importance of their business, and buy an inferior class of materials because the price is fashioned into an alluring bait. Price is only the means by which the goods are obtained. It does not necessarily indicate the quality of the goods nor define their cheapness to the consumer. The paint or varnish quoted at the lowest figure may, at the final reckoning, prove by far the most expensive. Quality, regardless of price, determines the value of what the painter has to buy.



PLAN OF SHOP OF PIRTLE & SMITH.

Forehandedness in buying, that is to say, ability to pay cash, or discount all bills at 30 days, is an exceedingly important factor in making the paint shop pay. The saving from this one line will alone go far toward paying rent of shop, fuel, and other necessary expenses.

At this time, and during the next few weeks, is an unusually favorable opportunity for making a general acquaintance with vehicle owners and users located within the outreach of your business. Sociability, good fellowship, or, if you please, a touch of human brotherhood, is a wonderful uplift in making the painter an appreciated and much valued man among men. This getting acquainted with the trade, and at the same time making a canvass of vehicle equipment needing repairs, is a strictly legitimate part of modern business, which must be taken into consideration at the present time. The paint shop hermit is, to-day, a trade outcast—to-morrow, a nonentity and forgotten. Publicity is indispensable—publicity by postal card distribution, by handsomely arranged signs for country roadways, by advertisements in the leading local papers, and by a high grade quality of work, which is, after all, a kind of publicity second to none, and of ever increasing value.

How a Gas Engine Runs.

BILLY BUNTZ.

The gas engine came into existence some 200 years ago through experiments made with gunpowder. Were the propulsive force occasioned by the discharge of a gun confined within the barrel and used to force a piston, the operation would be practically the same as the ignition of gas in the cylinder of a gas engine. The combustion chamber is provided with a valve, through which the gas is drawn by the piston. The piston also compresses the gas, after which it is ignited, and the concussion used as a direct force for pushing the piston forward. The burned vapor then escapes through the exhaust valve.

Kerosene, products of crude oil, natural gas, city gas, etc., may be used as fuel, although gasoline is generally preferred.

A few people fear that a gas engine might explode, whereas, when it is understood that only a few drops of gasoline are vaporized at a time, the uninitiated will comprehend that there is no more danger from a gas engine than from a gasoline stove. Only when gasoline is carelessly admitted to the open air in considerable quantity and formed into gas is there any danger. On the gas engine, the vaporizing of the gasoline is done either within the iron walls of the cylinder, or in a small chamber called a "vaporizer" or "mixer," so that no fumes reach the open air. In fact, it would be only through the most criminal carelessness that any damage could result, so closely is the gasoline confined. Even a Simple Simon could run a gas engine without danger of being "blowed up," and

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therefore it is frequently called "Fool-Proof."

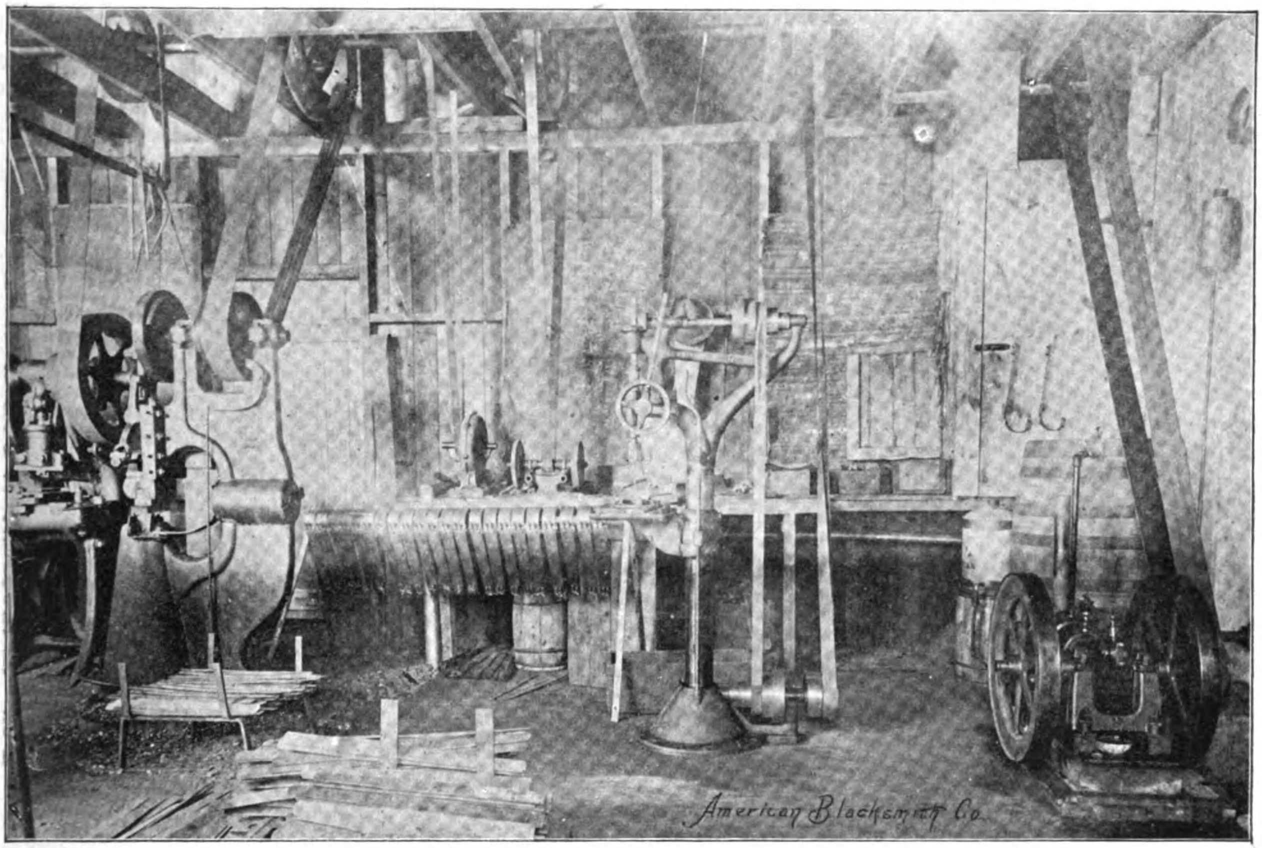
In construction, the gas engine is merely a cylinder mounted, or cast upon a base and provided with a piston, connecting rod, a crank, and a pair of balance wheels for steadying and retaining the motion. Power may be taken from the balance wheel shaft by a gear, pulley or clutch, or the shaft may be direct-connected to a machine.

The best gas engines have a perfect means for vaporizing the gasoline, which renders them economical in the use of fuel. A good engine also has a strong crank and connecting rod, balance wheels with heavy rims, a sensitive governor and a reliable igniter. Igniters which are operated by means of electricity are the best, the sparker being set so that the ignition of the gas in the cylinder occurs at the proper period of the stroke of the piston. If the ignition were to occur too early or too late, the piston would not receive the proper force. With the electric igniter the engine can be started at once, by simply turning on the switch which regulates the electric current. With the tube igniter, which is the oldest means of igniting the gas, it is necessary to wait a couple of minutes for the tube to heat before you can start up.

The cylinder of a gas engine is water-jacketed to prevent it from over-heating. A small tank or barrel holds the water, which flows through the jacketed-cylinder and flows back to the tank because of its heat, and is used over and over again, even though it does become heated from its repeated circulation through the jacket.

To give the reader an idea of how a shop looks when driven by a gas engine, the factory of John Donnelly, of Brandford, Conn., is here illustrated. Mr. Donnelly is making a specialty of manufacturing linemen's climbers. He says his line shaft is 24 feet long, and is driven by a Weber Junior 2½-horsepower gasoline engine, which furnishes sufficient power for driving all the machines at one time, although, as a rule, he has use for only two or three of them. He says the gasoline consumption is only 2⅓ gallons in ten hours. He has mounted the engine on a masonry foundation and uses a barrel for the water.

Mr. Donnelly says that his blower is a small one, just right for two fires, and was made by the Buffalo Forge Company, Buffalo, N. Y. The power press, shown in extreme left-hand corner, was made by The Ferracute Machine Co., of Bridgetown, N. J. Miner & Peck, of New Haven, Conn., made a hard coal forge to order for Mr. Donnelly, the same being next to the power press. He says his trip hammer is the well-known "Little Giant," manufactured by Mayer Bros., at Mankato, Minn. This is a much more convenient hammer for the smith shop than those operated by a steam cylinder or compressed air cylinder, and is especially adapted for being driven by a gas engine. It has a 50-pound hammer head, which runs in a steel ram channel, thus assuring accurate work. The ram, being of cast steel, prevents any possibility of breakage. The dies are of tool steel, hardened, and may be obtained in sizes suited to a special work. This hammer will forge stock 2 inches square, 2½ inches round, and flat iron up to 4 inches wide, without any adjusting. The blows are controlled by a tread, so that a light or a heavy blow may be struck simply by a slight movement of the foot, while the patented connection of the hammer head renders an easy, elastic movement. The drill press is a small one, especially adapted to his work. Altogether, Mr. Donnelly has a well equipped shop of which he may justly be proud.



THE WELL EQUIPPED FACTORY OF JOHN DONNELLY, BRANDFORD, CONN.

Pirtle & Smith, Wilsey, Kansas, state that they are using a 2½-horsepower

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gasoline engine, doing a general class of plow and wagon work. They use the emery and polisher shown in the accompanying figure, at the same time starting the engine as jobs come in, and shutting it down when power is not needed. Often it is started 25 times a day. They say they have ground and polished more than ever, since using the engine, and at one-half the expense and one-tenth the labor. One day they drilled and countersunk five sets of crucible steel cultivator rivets in 40 minutes with ease, while the same work by hand is hard labor and would take twice as long.

The engine sits in a dust-proof room, 8 by 8 feet, and is fastened by four $\frac{5}{8}$-inch bolts to a solid rock foundation, 28 inches wide, 5 feet long, 11 inches thick.

To Forge an Eye.—A Good Way to Make a Wood-Splitting Wedge.

BRICE E. PEASE.

The following is a good method of forging an eye for chain-hooks, braces, eyebolts, etc., when the whole strength of the rod is wanted in the eye:

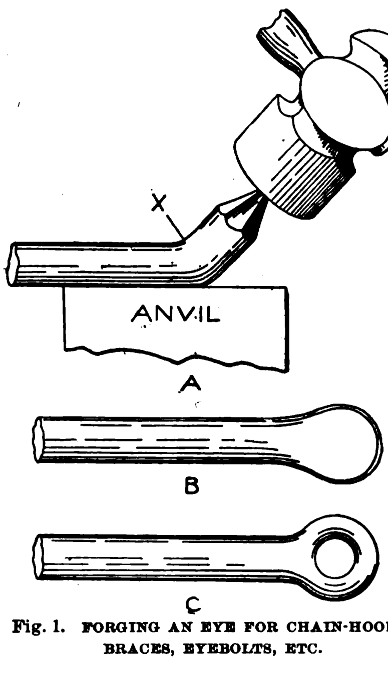

Fig. 1. FORGING AN EYE FOR CHAIN-HOOKS, BRACES, EYEBOLTS, ETC.

Take a soft heat on just the end of the rod (using a hammer of good weight), point it a little, and bend down over corner of anvil. Next turn the point up and strike as in Fig. 1, A, so as to upset the bent part down even with the rod, as in Fig. 1, B. Take care not to get a cold shut. Turn it over and punch as quickly as possible, rounding up on the horn of anvil.

With a little experience, you will make a good, strong job, and at one heat, too. (Fig. 1, C, shows the eye complete).

To make a wood-splitting wedge, take a piece of steel $1\frac{3}{4}$ inches square and $3\frac{3}{4}$ inches long, draw out the bit first with fullers, leaving it a little wider at

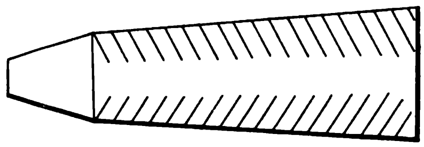

Fig. 2. A HOME MADE WOOD-SPLITTING WEDGE.

the thin end. Next, draw down for the head to about 1 inch square. An octagon makes a nicer looking job. It will stand much more, and wear longer than if left the full size of stock, for the corners will not split down and fall off as they do in a large-headed wedge. Last, but not least, cut a row of teeth the entire length of the wedge, either by holding in the vise or laying on a block of lead or hard wood.

Woodchoppers say that the teeth make no perceptible difference in driving, and that the wedge sticks very much better, seldom splitting even in frozen wood. The wedge complete weighs about three pounds, and appears as in Fig. 2.

A Special Subscription Offer.

In order to stimulate interest in THE AMERICAN BLACKSMITH, and to increase its subscription list at even a more rapid rate than it has been growing in the past, we have made a special arrangement to offer a remarkably fine prize in a new subscription contest, which is announced for the first time in this issue, and which is fully outlined on one of the advertising pages. Before describing this further, we wish to mention the prize of $10.00 cash, which was recently offered to the person securing the largest number of subscribers to THE AMERICAN BLACKSMITH before April 1, 1903. This prize will be awarded in addition to the premiums or commissions given for such new subscriptions. Reference is made to our premium offers among the advertising pages. Although the competition is very brisk, a relatively small club of from thirty to fifty new subscriptions will undoubtedly win this prize.

The new prize subscription offer which we now make is as follows: To the first person whose total number of new subscribers sent to this office amounts to one hundred, we will give free a fifty-dollar Scholarship in Blacksmithing and Forging in the International Correspondence Schools of Scranton, Pa. This scholarship is complete with all the books, literature and service which accompanies such a course. The International Correspondence Schools are well and widely known all over the country. The opportunity which we offer here to obtain a thorough course on these subjects in return for a little enterprise is a remarkably fine one, and we hope that many will take advantage of our offer to enter the contest. All those who intend to try for this prize must signify their intention of doing so, on or before April 1, 1903.

For those who expend their energy in competition for this prize, and do not succeed in winning it, we propose to offer a reward, as we do not desire any one to labor in our behalf without receiving some compensation. We will allow a liberal cash commission for all subscriptions obtained by those who do not secure the prize in question. The opportunity offered is an excellent one for obtaining a fine course of home instruction at no expense, and we feel sure that a large number will take advantage of it and enter the contest.

A Novel Piece of Mail Matter.

The world is usually ready to give credit for originality wherever it crops out. We cannot refrain from making mention of the novel piece of mail matter, which reached us the other morning, and which is illustrated in two of the accompanying engravings. The date, however, does not refer to the time of mailing. This parcel was sent to us in exactly the shape shown, with

A NOVEL PIECE OF MAIL MATTER.

no other coverings or tags, and was from L. S. Cleveland and Son, Onondaga, N. Y., in payment of their subscription to THE AMERICAN BLACKSMITH. Views of their shop are also shown here.

Considering the many hands through which mail matter passes, and hence the

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divided responsibility, we would not advise our subscribers to adopt this

SHOP OF L. S. CLEVELAND & SON, ONONDAGA, N. Y.

method of remitting, if they desire the money to reach this office with certainty.

The Elements of Blacksmithing.—14.

JOHN L. BACON.

Instructor in Forging, Lewis Institute, Chicago.

Materials Used in Forge Work.

For intelligent working in iron and steel, some understanding of their chemical nature and method of manufacture is necessary. For convenience sake the irons and steels ordinarily used in the forge shop may be divided into three general classes, viz.,—wrought iron, machine, or soft steel, and tool steel. Cast iron should also be considered as being the base product from which the above are commonly made.

We may consider the metals simply a compound of pure iron and carbon. The amount of carbon the compound contains determines the ease with which it can be hardened. Thus a compound having a very small amount of carbon can scarcely be hardened at all; one having 1% carbon hardens at a comparatively low heat, and one with a little less, say 0.8% carbon, will harden at a higher heat. These compounds are made up in about the following proportions:

Cast Iron, . .	about 3% carbon.
Machine Steel,	0.2% to 0.5% carbon.
Wrought Iron,	0.0% to 0.3% carbon.
Tool Steel, .	0.8% to 1.2% carbon.

The percentage of carbon given in each case above is about the average, though it may run higher or lower in particular cases. There is always present, in addition to the iron and carbon, a small percentage of manganese, silicon, phosphorous and sulphur, but for our present purpose we may neglect these and consider the metals as compounded of carbon and iron alone.

It will be noticed from the above that wrought iron and machine steel are almost the same, chemically, that is, we might have a machine steel containing 0.2% carbon and a wrought iron of the same amount of carbon. But as wrought iron and machine steel are two materials having very different qualities, there must be other distinctions. The main difference between wrought iron and machine steel lies in the fact that wrought iron contains a small amount of slag, found in the bars in the form of long drawn out, minute streaks, giving the iron a fibrous structure. Steel does not contain this slag and has a granular structure. This difference of structure and all the different properties arising from it are due entirely to the different methods of manufacture.

It will be seen from the table that cast iron contains about 3% carbon, while wrought iron and machine steel contain about one-tenth that amount. To make wrought iron or machine steel then, it would seem only necessary to remove some of the carbon from the cast iron, and in most cases this is exactly what is done. In making both wrought iron and machine steel (the "open hearth" steel used in forge practice) the processes are almost exactly alike, the difference being in the temperature at which the metals are worked. In both cases a furnace something like Fig. 116 is used. The sketch shows a lengthwise section through the center. At A is the fire place, at B, the puddle or hearth, and the stack or flue at C. The flames on their way to the stack are deflected by the roof of the furnace upon the melted iron lying on the hearth. The iron is thus brought under the influence of the flames without being in direct contact with the fire.

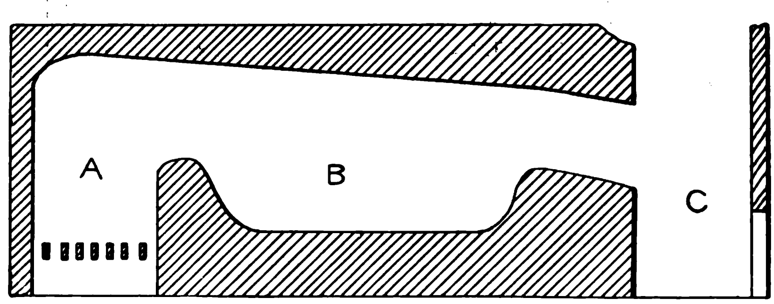
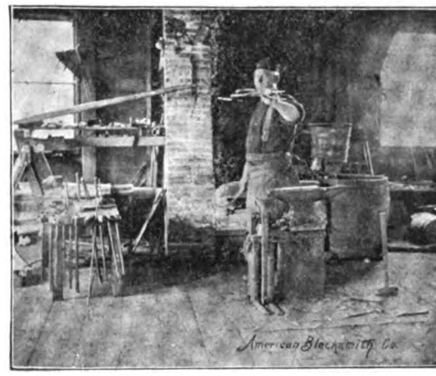


Fig. 116. LENGTHWISE SECTION OF A FURNACE USED IN MAKING WROUGHT IRON OR MACHINE STEEL.

Cast iron together with hammer scale, or some other oxide of iron, is placed upon the hearth and melted down. The fire is then so regulated as to give an oxidizing flame—that is, more air passes through the fire than can be properly burned, leaving a surplus of oxygen in the flames. This oxygen, as well as the oxygen from the hammer scale or iron ore, gradually burns out the carbon from the iron. The melted mass is constantly stirred in order to expose all parts to the influence of the flames.

Now the more carbon contained by iron, the lower the melting point. Hence, cast iron will melt at a much lower temperature than wrought iron.



INTERIOR VIEW OF AN ONONDAGA SHOP.

A temperature just high enough to melt cast iron will leave wrought iron merely in a pasty condition.

When making wrought iron, as the carbon is burned out of the metal, the temperature of the furnace is kept at about the melting point of cast iron. As the carbon is burned, the metal gradually stiffens and becomes pasty, and at the completion of the process is worked up into balls which are then taken from the furnace and rolled or hammered into bars. There is more or less slag with the iron in the puddle. A part of this slag is squeezed from the balls, but part of it remains in small drops all through the mass, and as the balls are drawn out into bars these small drops lengthen out and form the minute streaks mentioned before. It is these small slag seams that give wrought iron its peculiar fibrous structure.

When machine steel is made, the temperature of the furnace is high enough to keep the metal liquid during the entire process. In this way the slag floats to the top of the iron and

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does not remain mixed with it. After sufficient carbon has been burned out of the iron, and while the metal is still in a molten condition, it is drawn off underneath the slag, cast into ingots, and later rolled into bars. This gives the steel a granular structure.

The presence of slag in the wrought iron makes it more desirable than steel for certain kinds of work. On the other hand, every one of these minute slag seams is a source of weakness, and when the iron is hammered too much, it is liable to crack along one of these seams. Steel, not having these slag seams, is not so liable to crack when hammered. Thus when a great amount of forging is necessary, machine steel is a more suitable material than wrought iron. Wrought iron, however, welds much more easily on account of the presence of the slag which melts and acts as a flux, therefore when welding is to be done, wrought iron is the best material.

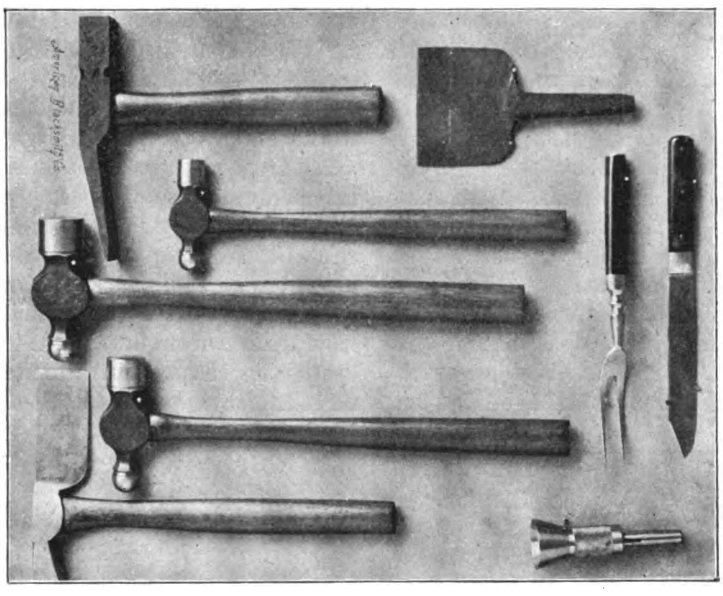
Soft steel is also much stronger than wrought iron, its tensile strength averaging about 10,000 lbs. per square inch higher. Machine steel can not be distinguished from wrought iron by the hardening test, for some irons will harden, while many soft steels can not be hardened at all. The Government specifications for boiler plate demand that the steel used in boilers shall be capable of being heated to a red heat, plunged into cold water, and when cold, bent double without showing any signs of cracking. This certainly indicates very little hardening.

Now, by the process outlined above, "open hearth" steel can be made with almost any desired percentage of carbon, and as the hardening properties depend upon this percentage, a steel may be had which will harden to almost any extent.

Machine steel has been condemned for many uses, simply because a steel of too high carbon has been found too brittle, and therefore unsatisfactory. If a softer steel, containing a very low percentage of carbon, had been used, the result would probably have been entirely satisfactory. Steel can thus be made to meet almost any requirement; and for all *forging* purposes, except *welding*, seems to be by far the best material.

Tool steel may be made by the open hearth process, but the best tool steel is made by the "crucible" process. Ordinary tool steel contains about one per cent. carbon and may be made either by taking part of the carbon from cast iron, or by adding carbon to wrought iron. This latter is the common method. In the "crucible" process, small pieces of wrought iron and cast iron are mixed in a crucible in proper proportions to give the desired percentage of carbon, together with some charcoal. The mouth of the crucible is covered with a lid to prevent the oxidation of the melted metal, the loaded crucible placed in a furnace and the iron melted down. When the iron has been melted and properly mixed, the crucible is taken from the furnace, and the steel cast into an ingot, which is afterwards rolled into bars.

What was known as "blister steel," was once made in almost the same way that "case hardening" is now done. "Harveyizing" armour plate is also done in somewhat the same way. The process was based on the fact, that when wrought iron is heated in contact with some substance very rich in carbon, it will gradually absorb the carbon and become converted into high carbon steel. "Blister steel" was made by packing bars of wrought iron in some kind of charcoal, sealing them up air tight, and holding at a high temperature for several days. The outside of the bars would of course be carbonized first, making a shell or coating of tool steel around a soft wrought iron center. In other words we have added carbon to the low carbon wrought iron, and converted it into high carbon tool steel. If the heating were continued, the carbon would work in deeper and deeper, until at last the entire bar would be converted into steel. After bars were carbonized in this way by the old blister process, they were cut into lengths, welded, and again worked into bars, thus making the steel more uniform in composition, but not nearly so uniform as modern "crucible" steel.



TOOLS MADE AT THE ILLINOIS STATE REFORMATORY.

Sometimes it is necessary to finish a piece of work so that the outside is hard and the inside soft; that is, the outside must be hard to resist wear, while the whole piece must be tough enough and soft enough to resist shocks and jars. If made of solid tool steel, and hardened enough to resist the wear it would be too brittle and liable to snap. To attain the combination of toughness and hardness the piece is made of wrought iron or machine steel, and the outside "case hardened."

To sum up: Wrought iron is made from cast iron by taking out some of the carbon—this being done at a heat below the melting point of the wrought iron. Machine steel is made from cast iron by taking out carbon, the process being the same as when making wrought iron, but the temperature of the furnace maintained high enough to keep the metal melted during the entire operation. Tool steel is made from wrought iron by adding carbon to it. Machine steel is superior to wrought iron for general forging purposes on account of its superior strength, uniformity of structure, and lesser liability to split. Wrought iron is weakened by slag seams, which are liable to cause splitting; it has, however, superior welding qualities.

A nice experiment, which shows the natures of wrought iron and machine steel, is to take a piece of each of these metals and put them in a bath of dilute acid for several hours or days. When

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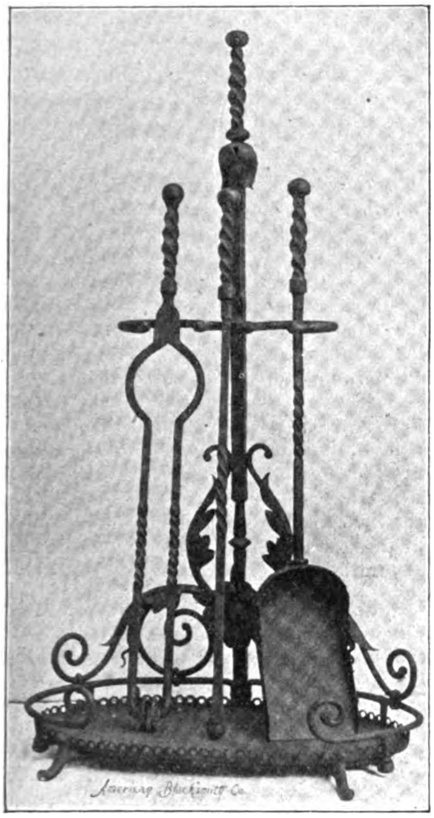
taken out, the machine steel will be eaten away evenly, while the wrought iron will have small ridges standing



FIRE STAND MADE AT THE STATE REFORMATORY OF ILLINOIS.

out on its surface. These ridges are the slag streaks which the aeid has left, having eaten away the iron between them.

The Blacksmith Boy in the Illinois State Reformatory.

J. GOOGERTY.

Instructor in Forging.

The Illinois State Reformatory, located at Pontiac, is the outgrowth of what was known as the Illinois Reform School for Juvenile Offenders. A law passed June 18, 1891, establishing the Illinois State Reformatory, has been the means of making this the largest of its kind west of the State of New York.

Prior to enactment of said law, only those convicted of minor offences were sent to the Reform School, but since all offenders between the ages of twelve and twenty-one have been received, the term of confinement being about two years. The aim of the reformatory is to provide for the thorough training of each inmate, in the common branches of English education, and in such trade or handicraft as will enable him, upon release, to earn a respectable living and redeem himself. As your journal is interested only in the craft of the blacksmith, I submit the following:

The ages of the boys in the blacksmith shop range from sixteen to twenty years. We aim to choose for this department, boys who are naturally adapted for this trade, but if we find out, after they have been in the shop for awhile, that they do not care to learn, or are better fitted for another line, we transfer them to another department. The mechanical talent thus developed in many of the boys is simply wonderful.

We work a boy about half a day—four and a half hours. The other half is spent in school, and his place in the shop is taken by another lad. Thus, we instruct about thirty boys during the day. When a new one comes in he is at once placed at a fire, and his work consists in welding pieces of scrap iron and drawing them out into bars from $\frac{3}{8}$ to $\frac{5}{8}$ inch by four feet. We keep him steadily at this, sometimes for months. At the end of that time he is thoroughly trained in the management of fires and is pretty handy with his hammer. The bars made are converted into heads for bolts, which are used in the institution. We offer nothing for sale that is made in the shop.

After this preliminary training, the boys are allowed to practice welding all kinds of iron and steel. They also receive instruction in carriage and wagon work, horseshoeing and structural ironwork, as the making of iron stairs, gratings, pieces for buildings, all kinds of tools, and even the ornamental iron doors, fences and grills for the institution. The accompanying cuts represent some of the work done by our boys. It is all handwork, including the tools, and excepting only the lathe-work on the hammers.

Hence at the end of his course, the boy is well fitted to choose whatever branch of the craft he may like best. He is a thoroughly competent blacksmith, and may earn a living in the world as a respectable citizen.

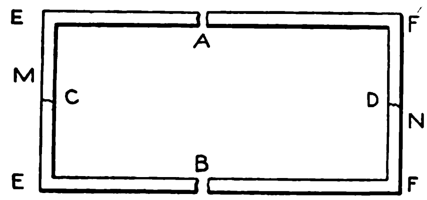
To Make a Chase for a Job-Press.

M. S. HEWITT.

I was given the job of making a chase for a job-press, and I nearly made a failure. I knew I was up against a hard problem, but I could not afford to fail.

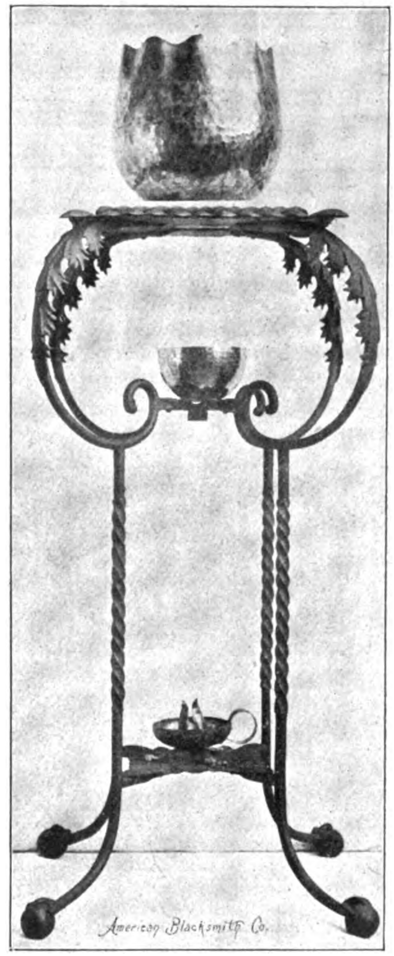
To make a chase is a nice job, for it is always a hard matter to make a rectangle, *i. e.*, a figure having four sides and four right angles. After trying to bend and weld, first one corner separately, then two corners, and still meeting with no success, I finally did succeed by the following method:

Bend or weld each corner separately. In the figure, M may be made in one piece, or the angles may be made



MAKING A CHASE FOR A JOB PRESS.

separately and welded at C and D. Of course the distance from E to E, and from F to F, must be the same, after



SOME ILLINOIS REFOMATORY BLACKSMITH WORK.

these angles are made to fit the try square. Weld in the center at A and B, and the work is finished.

The Blacksmith's Field.

A glance at the above cuts shows something of the wide range over which a blacksmith's work extends. Between the artistic pieces made by the Reformatory boys and the plain work-a-day chase with its four straight sides and four corners that appear so simple,—there is considerable difference. A smith never knows what he may be called upon to make or mend.

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The Circle of Human Weal.*

EDNA MANNERS.

Thundering, soaring, the flames burst forth,
Shaking the floors of the new-formed earth.
The master of smiths at his furnace stood,
Wielding his might in a playful mood—
Lustly with youth,
Girded with truth;
Molten rocks touched by his breath, congeal,
Planning the circle of human weal.

Over the plains as the man-race swarmed,
His open heart loved them, his furnace warmed.
Wond'ring they gathered the stones cast forth,
Learning to delve in the depths of earth,
Iron and gold,
Riches untold.
Sagely he taught them with clang of steel,
Forging the circle of human weal.

* * * *

Fires are all out, and the furnace cold.
The weary smith-master is bowed and old.
All he could teach them the race have learned—
Wise as the gods to their home returned.
Purpose is wrought:
Wisdom all taught:
Silent the thunders and clang of steel
Welded the circle of human weal.

* Written expressly for the January AMERICAN BLACKSMITH.

HEATS SPARKS WELDS

Happy New Year!

One way to learn is by asking questions.

When a new idea comes to you, do you remember your fellow-craftsmen?

In a progressive shop a smith lacking up-to-date ideas is like a clock without a main spring—won't go.

I have had your paper for a year and cannot do without it. Enclosed please find $1.00 for 1903. A. OSTLUND, FOSTER, IA.

Winter is here with its cold, crisp nights, and jangling sleigh-bells; and the horses must be sharp-shod.

A good workman cares for his tools. The most satisfactory way to do this is to get the best and keep them right up to date.

What do you think about the movement for securing a Lien Law for blacksmiths, horseshoers and wheelwrights in all the States of the Union? Let us have your views and suggestions upon the question.

A Situation as blacksmith is open at Glover, Michigan, where there is a vacant shop. Write to the postmaster for information.

I have been taking the paper and it is the best helper I have ever had in my shop. I would not be without it.
J. W. Bollnan, Pittsfield, Ill.

Are you a thinker as well as a worker? The former puts thought into even the smallest job, and is always on the lookout for better methods. Is that you?

Power is one of man's greatest boons. Have you considered the question of putting an engine into your shop? Smiths who have done so unanimously declare in its favor.

Tom Tardy's idea of economy is a common one; but an up-to-date man knows that the real meaning of the word is to have the right thing in the right place all round and thus save time, labor and money in the long run.

The storm king has Buffalo in his grip, and lashes his white missiles against the windows as we write. The city's shoeing shops are full of horses waiting to be sharpened, and to the busy farrier the snow-laden wind seems to howl, "O automobile, where art thou now?"

In spite of the wonderful advances that have been made in mechanical tools and appliances, no one need worry about their being no room for improvement. And the blacksmith shop is no exception to the rule. Great inventions are often stumbled upon by chance, but the inventors were wide awake all the time.

Fifty thousand strong—that's the size of the present January issue. And it practically means that all these people are brought together and enabled to exchange ideas through these columns on the endless number of interesting work-a-day topics relating to the craft. Have you a question to be answered? Send it in.

Our daily mail often exceeds 1,000 letters, and, if the number is under 500, the clerks feel that they are getting off easy. Comments from subscribers about the paper are carefully studied by the editors, ever alert to make the paper more valuable. Let us have an expression of opinion from you when sending your renewal subscription.

It has been said, humorously, that when a man couldn't do anything else he invented a new breakfast food or a rubber horseshoe pad. Leaving the benefits of the many new breakfast cereals out of the discussion, the very fact of the number of such rubber shoes on the market shows the demand for them, and the demand in turn is evidence of the benefits arising from their use.

The Pennsylvania Railroad at Renovo, Pa., is pushing the work of the erection of their new buildings. The southern end of the machine and blacksmith shops have been razed to the ground and the new steel framework is rapidly being placed in position. The brickwork of the new blacksmith shop and addition to the passenger car shop has been completed, and the work of roofing the buildings will soon be started.

Raphael Beck, when he painted "The Village Smithy" for our subscribers, was by no means the first artist to picture the blacksmith in glowing colors. Poets, too, have painted him in words, as representing all that is noble and honest. Our greatest poet, Longfellow, in his poem "Evangeline," says: "Since the birth of time, among all races and nations, has the craft of the smith been held in repute by the people."

There was a great stir and bustle about Tom Tardy's shop yesterday when we passed. It looked like business. But upon glancing at the faces of the men who stood or sat about the place, we felt there was something wrong. When asked what the trouble was, Tom said, Oh, he had some repairing to do. This sounded right enough until we came to find out that it was a pair of old tongs—which might have belonged to his grandfather—that Tom was working at, mending them for the twentieth time, at least. The customers, no matter how pressed for time, had to wait until the old tools were put into shape. Tom says he believes in economizing.

A subscriber, Eph. Shaw, Carbon Hill, Ohio, writes:—"Please find enclosed post office money order for the sum of one dollar for the renewal of my subscription for another year. I think your journal is worth twice the subscription price. You are giving us a good journal on our trade. I don't see how some smiths can run a shop without a paper devoted to their trade, yet we find them all over the country, and when you ask them to subscribe for such a paper they will say they don't need it. They are grumbling because they have no trade, but upon looking around their shop you will see tools that Tubal Cain worked with. They bind a tire on the wheel, they punch a hole in all material that is punchable, just like Tubal Cain, and if a job came in that had to be drilled, they could not do it nor would they know where they could get a good drill to do such work. I think the lessons which you are giving us on forging are very good."

Out in the west, where the conditions of living are very near to nature, a man owned an indian pony or cayuse; these ponies are sturdy little natives of the country and climb the mountains over trails that our horses would not face. After riding the cayuse for two or three years in the wilds, without shoes, the man took him to town, thinking him well "broken in." The horse was shod and put into use, but he could not understand the ways of civilization. With the second canter on the asphalt, the pony slipped fatally, and the man's shoulder, as well as the pony's two fore-legs, were broken. It takes two or three generations to civilize these ponies.

In the same portion of the hill country, the only blacksmith shop within miles is a rough forge built in the living rock and sheltered by a roof of cedar "shakes." In a rude cabin near by are kept a few tools. All is open, and the passerby is free to step in, but he must do his own repairing, for every man is his own smith.

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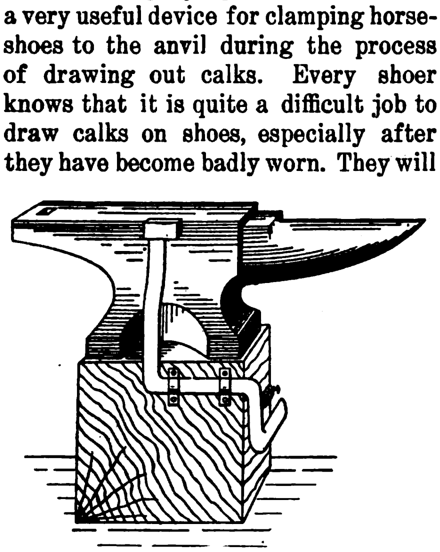
A Serviceable Horseshoe Holder.

A. H. WICKLER.

The accompanying illustration shows a very useful device for clamping horseshoes to the anvil during the process of drawing out calks. Every shoer knows that it is quite a difficult job to draw calks on shoes, especially after they have become badly worn. They will



AN ANVIL HORSESHOE VISE.

slip in spite of everything. The means which I employ for this purpose is exceedingly simple, and I would not do without my holder for a great deal.

In making the holder, I first took a rod of 1-inch round iron, heated the end and then upset to make it $\frac{7}{8}$ by $1\frac{1}{8}$ inches square, for four inches along the end. This I bent at right angles so as to fit along the top of the anvil, and when finished this piece should be about $\frac{5}{8}$ of an inch above the top of the latter. I next fastened the rod to run down the anvil, curving it out a little towards the base of the anvil. Then I bent the rod at right angles so that this part would run horizontally along the anvil block,

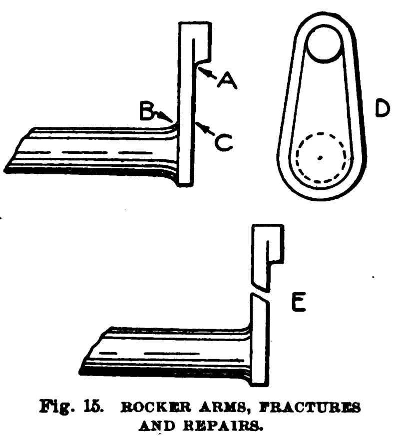


Fig. 15. ROCKER ARMS, FRACTURES AND REPAIRS.

then down again, with a right angle foot piece extending off parallel to the ground. A reference to the illustration will serve to better explain the construction of the device. The foot lever should be about twelve inches round and flattened out to give it better bearing for the foot. The horizontal crosspiece I fastened to a stout wooden clamp by means of curved pieces which are bolted to the block. I prefer to place a strip of iron underneath the rod to prevent its bearing upon the wood itself. The length of the various parts should be made, of course, to fit the anvil to which it is intended to attach the device, and the upper part can be bent so as to hold a shoe exactly as you want it.

In order to hold the holder back from the anvil, when not in use, I attach a spring to the lower arm and to the anvil block, and this may be of sufficient tightness to hold the upper part as far from the anvil as desired. I prefer to let it clear about five inches when not in use. I like this arrangement, on the whole, much better than any foot vise, because it is always where you want it and never in the way. In the summer time, I take it off the block entirely.

It takes very few trials for this arrangement to prove its merit to any smith trying it. The cost, too, is exceedingly small, the only requirements being a bit of iron and the little time employed in measuring, fitting to the anvil, and forging. The result is a holder second to none.

The Railroad Blacksmith Shop.—3.

W. B. REID.

Repair of Rockers.

In larger shops, where duplicate parts of locomotive forgings are kept in stock, many defective rockers are consigned to the scrap bin which the smaller shop finds it expedient to repair. The resulting economy of time and labor, especially in the machine department, justifies the practice. To repair a rocker neatly and substantially, it requires superior skill and workmanship than making the new article. The larger proportion of fractures occur invariably at one of three points. First, at base of hub, or boss of arm (Fig. 15, A); second at base of arm at point of conjunction with shaft (Fig. 15, B); third, at point where arm was originally welded to shaft (Fig. 15, C). The repair of fractures at A and B will be dealt with here. The break at C will be treated in the next chapter.

In the first two instances, the fracture is often partly the result of machining to sharp corners instead of safe fillets. In urgent cases, where the parts still adhere, the repair is often very simply done by shrinking a band of suitable proportions around entire arm (Fig. 15, D). Though neither artistic nor mechanical, rocker arms bound in this manner often endure many years of hard service.

The repair of fracture at point, Fig. 15, A, involves the substitution of a new end (Fig. 15, E), which should be carefully forged to secure a uniform texture of iron. Fracture is generally the result of carelessness in this respect, aggravated by sharp corners.

When not thoroughly welded in forging, the triangular fuller, used in forming boss of arm, cuts through the iron across the lines of direction, producing the weakening effect suggested by the

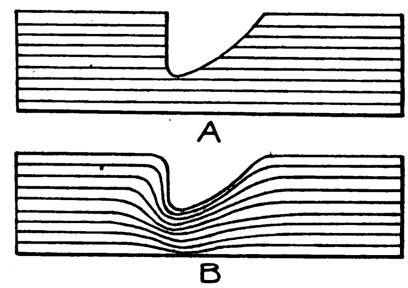


Fig. 16. EFFECT OF WELDING ON FIBRE STRENGTH.

broken lines in Fig 16, A. Contrast with the strength and elasticity indicated in Fig. 16, B. This result can be secured only by forging and finishing the piece throughout with welding heats, securing thereby a piece of iron of a comparatively perfect, homogeneous quality.

The new part should be forged with sufficient stock for finish and reduction in working. The old part should also be well upset for the same reason, as far down towards shaft as possible. This will allow more freedom in heating, and permit the perfect restoration of lines of arm at machine (Fig. 17, A), as contrasted with the unmechanical result (Fig. 17, B), where sufficient stock to true up the arm has not been secured. The parts may be scarfed in different ways. (See Figs. 18, A, B, C, and D). Fig. 18, A, is preferable to Fig. 18, B, as it carries the points of inside scarves safely away from shaft, ensuring a better weld. The seeming advantage of the lap scarf, Fig. 18, C, is largely neutralized by the awkwardness of the parts in handling. During many years of practical experience the writer finds the method shown in Fig. 18, D, by far the safest and most reliable. Welded with good, clean, separate heats, followed by two slow side heats, the job can be handled and finished with the utmost freedom. On the

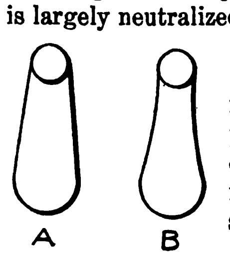


Fig. 17. COMPARISON OF ARMS WITH SUFFICIENT AND INSUFFICIENT STOCK.

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contrary, no matter how carefully handled, the parts welded, as in A and B, Fig. 18, will always have a tendency to draw apart in working, at inside point of scarfs.

The fracture at Fig. 15, B, involves repair of a more extensive and difficult nature, and may be done in two ways. First method: Cut arm entirely off at

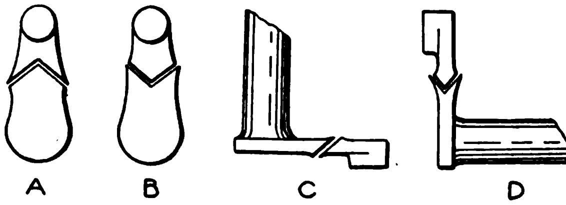


Fig. 18. METHODS OF REPAIRING THE ARMS.

extremity of shaft. Upset shaft well and scarf as in Fig. 19, but reverse the way so that in taking side heats the laps of scarf may lie downward in the fire. As in the previous case, the new part should be thoroughly welded in forging to insure best results. The process of forging is here shown. Fig. 20, A, is a piece of iron large enough for the purpose, checked down on opposite sides with triangular fuller; adjusted to shape B; C is part for shaft dressed, rounded and scarfed to weld, as in Fig. 19. The parts should be welded under steam hammer if possible, and finished with two good, slow side heats. This

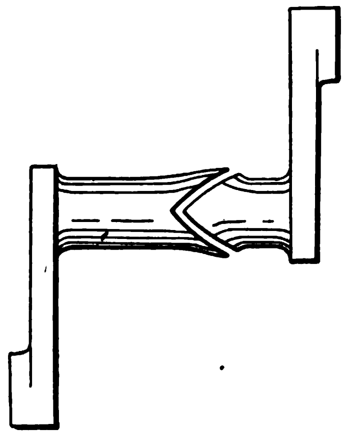


Fig. 19. WELDING A FRACTURED ROCKER SHAFT.

new piece could also be forged as at D, and bent around, but being so short the bending would prove rather a stiff process. Second method: Forge a new piece of shaft with a square collar on the end (the arm is forged separately and welded on collar). This method requires two welds, but it greatly simplifies the forging and makes it possible to secure a better weld in the shaft.

The objection urged, in former articles, to welding rockers in shaft, may be raised at this point. In the former case, however, the manufacture of new rockers was involved; in this, expediency and necessity justify the practice. With extra precautions, possible in the repair of an occasional rocker, the method may be considered reasonably safe and reliable.

(To be continued.)

A Good Punching Guide.

A. T. DICKINSON.

The sketch which accompanies this article shows a very useful implement for use in any smith shop. I have never seen anything exactly like it.

To make this punch guide, I take a bar of steel about five inches long, $\frac{5}{8}$ or $\frac{3}{4}$ of an inch thick, and one inch wide. Two or three holes of the desired size are then punched, as shown, after which a piece of $\frac{1}{2}$-inch steel is punched with the same number of holes in the same position, but somewhat larger, so as to hold the punch. The second piece is then fastened to the first by two rivets and the tool is completed. A, represents spring, B, the punch. The use to which I apply this tool is punching holes in $\frac{3}{8}$-inch boiler steel. If the end of the punch is carefully tempered, you can punch thousands of holes. You can have several different sizes of holes and punches. If the points of the punches are kept in order, punching will not damage or split the plate. This device will save considerable time in drilling holes.

Diseases of the Foot and Their Treatment.—12.

Notes upon the prevention of interfering, the treatment of wounds and the complications resulting therefrom.

E. MAYHEW MICHENER, V. M. D.

The prevention of interfering is a subject of the greatest importance to the shoer, and the general outlines of treatment of it and its complications may also be studied with advantage by both the shoer and the owner of the horse. The cause of interfering is not the same in each case, and not unfrequently two or more causes contribute to the formation of the trouble. The prevention consists in carefully studying the cause, or causes, operative in the individual case, and the application of the knowledge gained thereby.

The points to observe are: Conformation of the animal, including the form and condition of the hoof; the shoe, and the method of shoeing; the amount and character of the work done by the animal, as well as the nature of the road or surface over which it must travel in doing its work. The term interfering is applied to injuries of both front and hind legs when caused by contact with the foot of the opposite side. It occurs at any point on the inner side of the hind leg between the fetlock joint and the coronet. In the front legs it may occur at any point between the knee and the coronet. In both front and hind limbs the most frequent point of trouble is at the prominence of the fetlock.

The most common fault of conformation which acts as a cause is that condition in which the legs are placed too closely together. Another conformation which is a frequent cause, is that in which the toes point decidedly in an

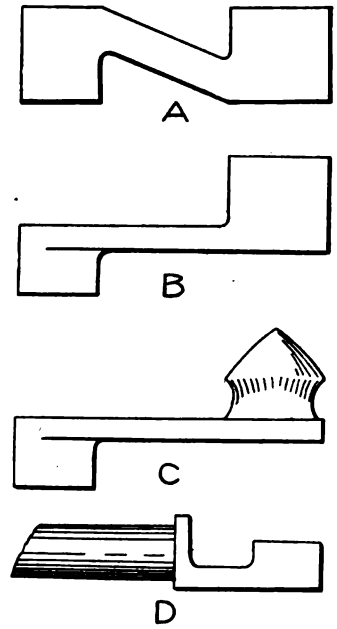
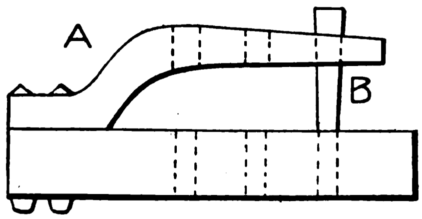


Fig 20. METHODS OF FORGING ROCKER ARMS.

outward direction. It is a fact that some animals of decidedly bad conformation do not interfere, while those of good conformation may, under certain other causes, interfere badly. Youth and insufficient training may be a cause in animals of good conformation. Not uncommonly, animals of fair form inter-



A HANDY GUIDE FOR PUNCHING.

fere only when overworked or while suffering from some constitutional disease.

A very common cause of interfering is that condition in which the foot has

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been subjected to faulty paring. The fault of paring the inner quarter too low is by no means rare, and strange as it may seem, the excessive paring of the inner half of the wall is resorted to by many shoers as a preventive treatment for interfering. When asked the reason for this, most shoers reply that by removing the inner wall the hoof is made smaller thereby, and can then pass its opposite leg without striking. It is a fact that lowering the inside wall throws the fetlock joint inward, and thus tends to defeat the purpose for which the paring is done. It is while the weight of the animal is upon the leg that the interfering is done, and it is also at this precise time that the prominence of the fetlock is thrown abnormally inward.

Neglected feet with sharp edges of horn may cause the unshod animal to interfere, and badly finished shoes or imperfectly clinched nails are a well known cause which requires no further mention.

While it is not possible to formulate any rule that will apply to the shoeing of all cases of horses which interfere, one general one that will apply to the majority of cases is: So dress the foot that the inner side will strike the ground slightly before that of the outer side. Lowering the outer wall accomplishes the purpose of relatively lengthening the inner wall. In no case should the paring be carried to the extent of weakening the quarter, or causing pain or tenderness. In cases in which the inner wall has been lowered excessively, much may sometimes be done by raising the inner side of the hoof by means of a thickness of leather placed between the shoe and the wall. In some cases, where the interfering has existed for considerable time, there is more or less enlargement at the point of striking, caused by thickening of the skin and deeper tissues at the injured point. This renders shoeing very difficult. If the injury is acute, the shoeing should be deferred until time has been given for the swelling to subside. Whenever it is possible, the use of predisposed animals upon rough roads should be avoided.

The symptoms of interfering vary according to the extent of the trouble. In very mild cases the hair may show a slight ruffling only at the point touched; other cases present wounds of variable extent, from that of the slightest scratch or abrasion to those in which the skin appears as though rubbed with a rasp. If blood be drawn by the injury, the striking point is commonly marked upon the opposite foot. Lameness in uncomplicated cases may only be noticed at the time of striking, and lasts only a few steps.

Complications of interfering wounds are several, and may be a simple inflammation of the surface of the skin, or it may extend to the deeper subcutaneous connective tissue, and in extreme cases to the tendons, their sheaths, or even to the fetlock joint proper.

A complication of rather frequent occurrence is that known as lymphangitis or farcy. This condition is caused by the entrance of germs into the lymphatic circulation, and is characterized by sudden inflammation of the lymphatic veins or ducts. It causes great swelling accompanied by great pain, commonly on the inner surface of the leg, and it may extend from the point of injury to the thigh, or even to the lower surface of the abdomen. The veins near the surface of the part are seen to stand out tense and full; the skin is hot and very painful to pressure, and the animal evinces great disinclination to walk, although it can generally do so if urged, and becomes noticeably better in movement the more it is made to move. . A slight cut or abrasion in the lower region of the legs seems more liable to be followed by lymphangitis than does a deeper cut which has bled freely. Deeper cuts are liable to be followed by this complication only if they have been neglected for a time. Other injuries than those caused by interfering may also be followed by lymphangitis.

The general body temperature is commonly considerably elevated, and may reach 106 degrees Fahr. or higher. The appetite is frequently impaired during the first day of the attack. The treatment of lymphangitis is local, and in cases where the temperature and general system is visibly disturbed, internal medicines are indicated. To treat the case locally, first clip the hair closely over and around the point of injury, cleanse the wound with warm water and soap, and apply some good disinfectant. For general use creolin, one tablespoonful to the pint of water, makes a good application. The whole extent of surface showing pain and swelling should have warm water sponging for periods of fifteen minutes, or longer, three times daily, and the surface must be dried well after each bathing with dry, soft cloths. Exercise is of the greatest benefit, and should be given if it is at all possible to make the animal move. The case should have a clean stall and be protected from currents of air. The food should be light and laxative. During the more acute period of the disease internal medicines may be required, but their use should be directed by a qualified person, according to the requirements of the case.

In rare cases of interfering, localized gangrene or death of a part of the skin and even the deeper parts may result. The first visible symptom of gangrene shows upon white legs as a reddened spot, which becomes more and more dark colored and sinks somewhat below the level of the surrounding skin. The gangrenous skin is devoid of sensation, but pressure may produce pain in the parts beneath. The complication of gangrene requires careful attention as the disease may extend to greater area and depth and become serious. The general treatment consists in disinfection and warm applications, which act as a poultice and hasten the separation of the dead skin. A warm water bath containing creolin serves the double purpose of disinfectant and poultice. The foot and fetlock should be scrubbed clean before immersing in the bath. As soon as the dead parts begin to separate from the living portion, the scissors should be used to cut away all loose portions of skin, and as soon as red living parts are detected they should be covered with a powder, consisting of powdered burnt alum, eight parts, and powdered iodoform, one part. This should be applied with pressure sufficient to make it adhere to the living parts of the wound, and frequently enough to keep the surface covered.

Another frequent complication of interfering wounds is that known as grease or greasy heel. This is a diseased condition of the deeper layer of the skin, and is characterized by pain on pressure, some swelling, and red coloration visible on white legs only, and more or less lameness may be present. Later a sticky, yellowish fluid is seen to exude from the surface of the skin. This discharge glues the hair of the region together, and is characterized by a peculiar, disagreeable odor. The skin may crack and form deep fissures, which run from side to side and bleed upon exercising the animal. In severe and neglected cases, the skin of the region may be the seat of mushroom-like growths, having the appearance of what is commonly called proud flesh. The treatment of grease should be careful and constant. Cleanliness of the

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part is of the highest importance, but the use of water for cleansing purposes is generally objectionable, as the average case recovers most rapidly if kept cleansed with clean, dry cotton or linen cloths. Exercise is beneficial in treatment of grease, excepting possibly certain cases where fissures or cracks are severe. If the parts become soiled with mud during work or exercise, allow the mud to become dry, and remove with clean brush and dry cloth. As an application for local use, the following solution will be found satisfactory if above directions as to care are followed, and no ointment of any kind applied to the part. Take of chloride of zinc, one dram, and clean water, one pint; mix in clean glass bottle or jar, and apply twice daily with a clean sponge.

Of course in this, as in every other malady, prevention is better than cure. Prompt attention and a little extra care of the animal in the early stages of the trouble, will prove of greater benefit than will all the doctoring in the world after lameness has become established.

There is no other subject which the shoer has to deal with that requires more careful thought and good judgment than does interfering. The foregoing is intended to serve as a general guide in the treatment of interfering and its consequences, but the topic is so broad in its nature and its phases so numerous that the farrier will need to study causes carefully and exercise his best judgment.

(To be continued.)

The First Subscriber to The American Blacksmith.

Several months before the date of issue of the initial number of THE AMERICAN BLACKSMITH, October, 1901, announcements and prospectuses of the paper were sent all over the country. The first paid subscription reached this office June 27, 1901, and was from Mr. William McEachran of Anaconda, Mont. We take pleasure in giving herewith a portrait and brief sketch of Mr. McEachran's life.

Born November 9, 1854, on a farm near Chatham, Ontario, he began his apprenticeship April 7, 1871, at Charing Cross, Ontario, in a general blacksmith shop, where they manufactured all kinds of wagons, buggies, sleighs, cutters, plows, harrows, cultivators, and did all kinds of horseshoeing. Leaving home in 1875, he worked in different towns of Michigan as a general blacksmith, ironing wagons, buggies, sleighs, cutters, as well as making all kinds of lumberman's supplies, known in those days as skidding-tongs, swamp-hooks, cant-hooks, pevies, chain-hooks, and other articles too numerous to mention. Last, but not least, he did some horseshoeing, and in some cases shod oxen that worked in the lumber camps.

In 1881, he started business for himself in Cheboygan, Mich. In 1884 he moved to South Dakota. Here his work was repairing farm machinery and implements. After five years of uncertain crops and prices, he went to Spokane Falls, Wash., and there ran a

MR. WILLIAM MCEACHRAN.

prosperous shoeing shop until the panic of 1893. Not satisfied with the prices for shoeing, he retraced his steps to Anaconda, Mont., where he has continued his horseshoeing up to the present time.

For the last twelve years he has made a specialty of horseshoeing in all its branches, shoeing the heavy draft horse, the gentleman's roadster, the light-harness or race horse, and the runner. Amongst the light-harness horses, he has shod horses of note, that have raced on the Northwestern race tracks, such as Anaconda, Searchlight, Lena N., Edith W., Raymond M., Kentucky Union, Klamath, Caryle Carne, Surphol and Altoka.

Mr. McEachran says that he is still an apprentice, learning something new every day. He is a close student of his profession, has a good library on the science of horseshoeing, subscribes for all the leading journals, and, at convenient times, contributes articles on horseshoeing to periodicals. Mr. McEachran is a loyal member of the National Master Horseshoers' Protective Association, takes a lively interest in all its affairs, and is a staunch supporter of its principles.

Announcement of the American Association of Blacksmiths and Horseshoers.

The Association named above has been conceived and created with the object of benefiting the blacksmithing, horseshoeing and wheelwrighting craft in several important ways. Its first and most important aim is to endeavor to secure for the craft the protection which is afforded by lien laws in various States, together with other favorable legislation. It intends likewise to furnish wholesome plans of organization and competent organizers to place such movements in various States on a firm working basis. Its aim is to leave no stone unturned to better the material and business welfare of the craft, individually and at large. As its ally, the Association has one of the best and most progressive trade journals in America.

No false or misleading statements will be sent out by its management, and good suggestions and advice will always be welcomed. Men of standing and character can secure valuable positions as organizers in various States. A campaign of education will be carried on. Sound statistics will be presented for candid consideration.

Many blacksmiths and horseshoers have never given a thought to some items of expense in their business, which are as much a part of it as the stock used. Take for example, the cost of shoeing a horse. Will any fair-minded mechanic say the following estimate is overdrawn? And yet, some men act as though the mere cost of the shoes was the sum total of the expense.

Net average cost of four shoes,	$0.28
Nails used, spoiled and lost,	.03
Coal and toe steel,	.03
Interest on capital invested,	.03
Depreciation of equipment,	.03
New tools bought yearly,	.03
Losses, loans, theft and neglect	.03
Losses, rust, wear and tear,	.03
Rent,	.06
Bad debts,	.10
Total,	$0.65

Suppose a farrier shoes two, three or four horses a day, how much does he make by the week, month or year? Figure it up carefully; there is food for thought in it. Everyone will say that the mechanic who shoes a thousand horses in a year, does a year of good

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hard work, takes many risks, and gives much valuable advice. In order for him to receive as much as the regular wages of good journeymen in the large cities, he cannot charge less than $1.50 per set. And if he charges $1.00 per set, he will not make $7.00 per week. Is it any wonder that many of the craft are living from "hand to mouth," and are dissatisfied with the business? It would seem needless to say that $1.00 per set is too low a price for shoeing. In these days of increasing living expenses and high prices for stock, it behooves the craftsman to turn his attention to a solution of the problem of how he may best obtain a proper profit from his labor. Towards such a reform the energies of this Association will be directed.

The American Association of Blacksmiths and Horseshoers asks that the readers of this article interest themselves in the movements under foot for bettering craft conditions, and would likewise be glad to have expressions of opinion from those who have given thought to this subject. The Association would also be glad to receive the support of the craft as a body, and urges that the readers of this article refer to page 23 and express their approval of the movement in the manner indicated on that page. What is your opinion regarding a lien law in your State to insure prompt payment for all work you do, and what also is your opinion regarding the benefits to be obtained from a local Association in your own county?

The Scientific Principles of Horseshoeing.—15.

E. W. PERRIN.

Shoeing for Laminitis.

Laminitis, commonly called founder, flat sole, pumiced foot, etc., is inflammation of the sensitive laminæ. Laminitis may be acute or chronic. In the acute form it may result from a chill, or as an after-effect of a severe drive on hard roads following a period of idleness. This causes the laminæ to become congested. It may, and does often, result as an after effect of inflammation of some other organ of the body, such, for instance, as enteritis, gastritis, or pneumonia. Laminitis following an attack of pneumonia—inflammation of the lungs—has given rise to the term chest-founder, by the process of metastasis—a shifting of the seat of inflammation—from the membrane of the lung or bowel to the membrane of the foot, causing inflammation of the foot. A draught of cold water when a horse is overheated, or over feeding, are among the causes of laminitis.

The symptoms of acute laminitis are so characteristic as to be unmistakable. The fore feet only are affected, and

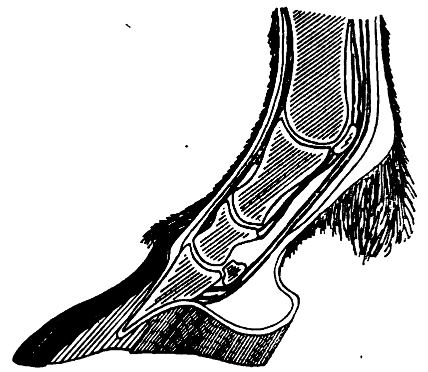

Fig. 77. SECTION OF LAMINITIC FOOT, SHOWING DISPLACEMENT OF THE OS PEDIS AND SUPERABUNDANCE OF HORN AT THE TOE.

invariably. The animal stands with both forelegs advanced, the heels of the feet resting on the ground, often with the toes slightly elevated. The hind legs are forward well under the center of gravity of the body, the horse leaning back on the haunches so as to get the weight as much as possible off the fore extremity. The face is expressive of great suffering, the body often bathed in profuse perspiration. There is high fever. The animal is so loath to put weight on the affected feet, that a whip will not force him to budge.

The treatment of acute laminitis belongs to the veterinary profession. I should advise the horse-owner to call in the veterinary surgeon with least possible delay; for it is the application of early treatment which does so much to modify the deformity of the foot which always follows an attack of laminitis. The services of the shoer are not required during the acute stages of the disease, unless, perhaps, to pull off the old shoes; but since an attack of laminitis always deforms the feet (see Figs. 77 and 78), according to the severity of the case, it is in the after treatment that the skill of the shoer is so indispensable.

During the acute stages of the disease, the congested laminæ exude a fluid which separates the sensitive from the insensitive laminæ. The pressure of this fluid forces the os pedis downward. In a few serious cases, the toe of the os pedis is forced through the sole of the hoof. The more the os pedis is depressed the flatter the sole will be; in some bad cases the foot bone is sunk so low that the sole is even convex instead of concave.

Laminitis leaves its indelible mark on the afflicted hoof. The symptoms are so characteristic that the student of digitalotomy can tell a laminitic horse when trotted toward him, even though he be a block away. The toe and front part of the sole being the seat of pain, the horse, in endeavoring to relieve the affected part of concussion, places the heels to the ground first, thus wearing away the heels of the shoe first, and when such feet are shod with an open shoe and heel calks, the continued concussion on the heel of the foot diminishes the secretion of horn at that part. As a result, the heels of laminitic feet are, without exception, very low, while the frog is abnormally high (Fig. 79). Hence when the shoe is off, the frog only touches the ground, and horseshoers who are not students of pathology of the foot—observing that the horse could scarcely stand without the shoe—concluded that the frog could not stand any pressure. It is therefore common to-day to see hundreds of laminitic feet shod with very high-heeled calks, in order—as such shoers will tell you—to prevent the frog's touching the ground. But this is a grave error, for the high heels not only add to the discomfort of the animal, but they seriously retard the growth of the hoof at the heels. Once a horse has had a bad attack of laminitis, the wall grows downward very slowly, hence

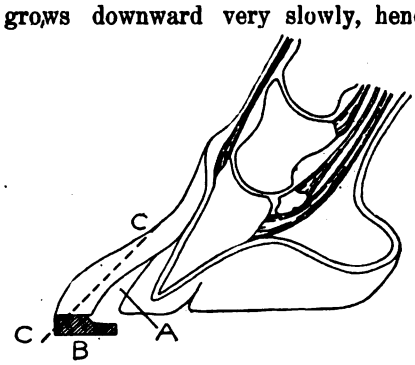

Fig. 78. A, SEPARATION BETWEEN WALL AND INNER LAYER OF HORN. B, SECTION OF SEATED SHOE. C C, HOOF TO BE RASPED OFF.

there is but little wall to cut away on the plantar surface. But instead of growing downward as in a healthy foot, it grows out long and shallow at the toe (see Figs. 77 and 78), with irregular rings running around the outer wall. You may rasp off these rings, also the surplus growth of toe, but the same condition will recur with the growth of new hoof.

In some bad cases where the abnormal growth of toe is considerable and the horse is shod with a seated shoe, the

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whole weight of the animal being thus imposed on this outer rim of wall, separates the outer from the inner layer of horn, causing a cavity in the wall (see Fig. 78). This cavity becomes a receptacle for dirt, stones, etc. These

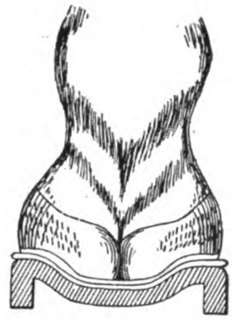

Fig. 79. SHOE APPLIED TO LAMINITIC FOOT WITH ABNORMALLY DEVELOPED FROG.

cavities have a tendency to extend up to the coronet causing other complications. Further description and treatment of such cavities will be fully dealt with in an article on "seedy toe." Some horses develop a chronic form of laminitis, which slowly changes the form of the foot without an acute attack. I have known several horses to develop a laminitic foot of a modified form without having been laid up a day. In bad cases, the horny sole being so thin and so near the ground exposes the sensitive sole to injuries from bruises, sometimes causing the sole to fester, in which case the pus must be given exit through an opening in the horny sole at the seat of injury. Do not thin the sole, however, unless you feel sure there is imprisoned pus.

Laminitis affects all sorts and conditions of horses and occasionally a mule; but horses of a heavy lymphatic habit of body are much more prone to the disease. It is common for some laminitic feet to be very tender at the heels, especially where high calks have been used for a long time. I have seen some where the heels of the hoof were so low that they were on the point of bleeding. If the feet are very sore I should advise poulticing for a few days before shoeing.

Preparation of the Hoof.

In preparing the laminitic hoof, rasp off some of the surplus growth of toe (see Fig. 78). The amount that may be taken off with safety and advantage will depend on the conditions of each case. In some feet, where the attack has not been very severe, you may rasp off all the abnormal growth of toe, making the profile of the hoof describe a straight line from coronet to plantar surface, as indicated by dotted lines C C, Fig. 80, but this is not admissible in feet more seriously affected, so the shoer must use discretion. The sole being flat and thin, needs its full thickness, therefore it should not be pared. Any surplus growth of wall at the plantar surface should be reduced, and the toe rolled up to the extent that the old shoes are worn.

As to the kind of shoe, all laminitic feet should be shod with bar shoes or rubber pads. For bad cases the shoes should be very wide in the web so as to afford protection to the sole. If there be an abnormally developed frog with low heels, the rubber pad is not admissible until the frog sinks back to its normal position. Use a bar shoe, with the frog piece large (see Fig. 81), so that it does not cut into the frog as a narrow bar will do. Bear in mind also, that the frog, having been deprived of its natural function—weight-bearing—for so long, normal conditions cannot be restored at once; for if you put too much weight on the frog to start with, you will be disappointed with a lame horse. The change from abnormal to natural conditions must be brought about gradually. Hence arch up the bar of your shoe corresponding to the height of the frog above the heels, weld a steel slug on each heel, then fit the shoe so that the bar rests lightly on the frog (Fig. 79). If the heels of the feet are sore, leave the bearing off the heels, and nail the shoe round the toe, using a leather, tar and oakum. When the shoe put on, as here described, has been on a month, you will find that the frog has sunk a little. Now you can put a little more weight on the frog; and after a few shoeings you will notice that the heels of the hoof—being relieved of the severe weight—are beginning to grow up. You can then put equal weight on heels and frog. It may take six months, or even a year,

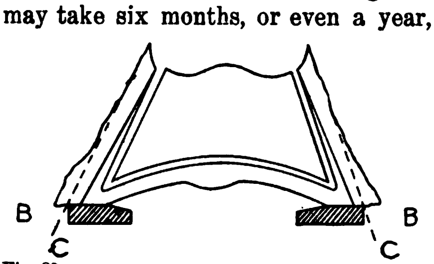

Fig. 80. VERTICAL CROSS SECTION OF LAMINITIC FOOT PROPERLY SHOD.

for the frog to sink back to its normal position, but it certainly will do so if my instructions are carefully followed. When the heels are level with the frog, there is no system of shoeing equal to rubber pads.

Regarding sole pressure in laminitic feet, of course I have come across many feet with soles so thin and sore that it was necessary to concave—seat out the shoe—right to the nail holes in the first few shoeings, but the idea that the sole of a laminitic foot will bear no weight is erroneous. The sole of such feet will carry some weight, and be greatly benefited by it, provided, of course, that the change is made gradually, and that you do not thin the sole by paring.

In many cases the outer wall is so weak and brittle from the constant use of seated shoes, that the horn will not hold a nail, simply because this thin outer shell is thus made to carry the whole weight of the animal (see Fig. 78). But if you gradually widen the bearing of the shoe until you divide the weight between the wall and outer margin of the sole (see Fig. 80), the wall, being thus relieved of some of this abnormal weight, will soon grow down stronger. The weak, brittle condition

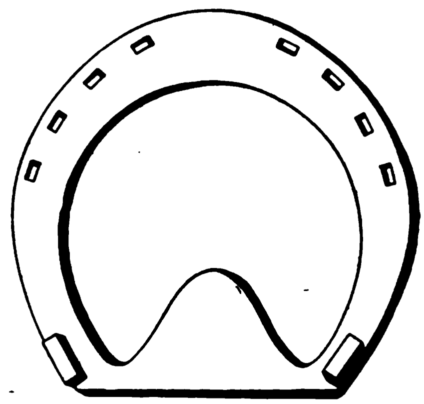

Fig. 81. THE PROPER SHOE FOR LAMINITIC FEET.

of the wall renders it liable to fracture; hence it is quite common to see a laminitic foot with quarter or toe crack. A strong stimulant applied to the coronet with friction will do much to improve the quality of the wall. In a few very serious cases that have not received the advantages of treatment by a competent veterinarian, the deformity may be so severe as to render the animal fit only for plowing.

In conclusion I would say, that while the deformity of the feet resulting from laminitis is incurable, it may be considerably modified by skilful shoeing, adding greatly to the animal's usefulness.

(To be concluded.)

A Hand-Made Furnace Front.

The accompanying engraving was taken from a photograph sent us by Todt & Peters, San Francisco, Cal. It shows a furnace front in antique style, made for an ordinary cast iron heating furnace. It is six feet four inches by five feet one inch, and is made of

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quarter inch steel, the entire work being made by hand, no tools being used but the punch, drill and hammer. The design is original with the above firm, the only instructions which were given them being as to size and intended purpose. After completion, the piece was placed in the music room of the country residence of Mrs. Phoebe Hearst at Pleasanton. This front was designed to be in keeping with the rest of the room, which is furnished throughout in antique style.

The Advantages of Gas Engines for the Smith Shop.

The prize competition, conducted by THE AMERICAN BLACKSMITH upon the above topic, resulted in a host of articles from smiths who have installed engines, and it is a significant fact that not one of the writers had a word of regret for having put in an engine,—in fact, the verdict was unanimously in favor of power in the shop.

Briefly enumerated, the chief advantages brought out for the blacksmith's gas engine were as follows: A saving of time and labor; more and better work; the greater revenue; the low cost of running; superiority over other forms of power; constant readiness for service; suitable capacity or size for the smith's requirements; the excellent advertisement, and consequent attraction of new trade; and finally, the opportunity for profitable side lines, as grinding feed, shelling corn, cutting ensilage, disc grinding, plow sharpening, wood sawing, churning, and many other things.

After careful consideration of the question under discussion, and the many contributed articles, the prize of five dollars has been awarded to Mr. J. K. Riblet, of Florence, Ohio. A year's free subscription to THE AMERICAN BLACKSMITH is also given to Mr. E. H. Brewer, of Seaton, Ill., and Mr. John S. Schafer, of North Creek, Ohio. These three prize-winning articles are printed below.

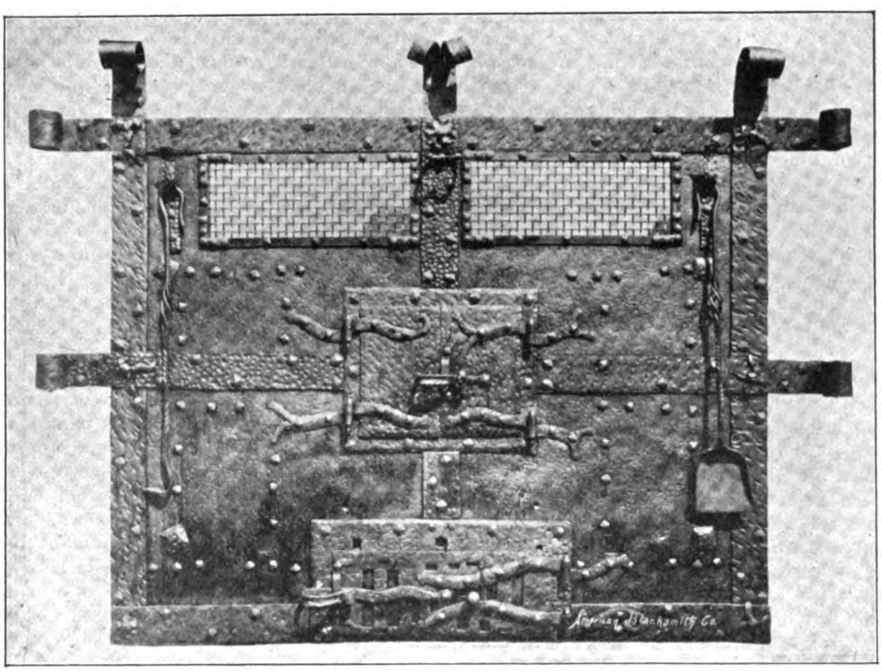
Of the large number of very meritorious articles, we regret that lack of space prevents publishing here all except a very few. Almost without exception, all the articles submitted were of a very high standard.

Prize Article No. 1.

J. K. RIBLET.

I was working alone, doing all kinds of jobs, wood and iron, except shoeing. But I found that I was wasting some good timber, together with an immense amount of time and muscle, getting stuff into shape. A job would come in, such as a plow beam, bolster, axles, reaches, eveners, heavy and light, and it would be impossible to have a stick just the right size and shape for every such thing. There was no mill where I could get ripping done, so I had to pick out something and go to work with handsaw, axe, adze or draw shave, doing more work to get a stick in the shape it ought to have been in when I commenced than I do now to finish it. Do any of our readers find themselves in the same row of stumps? If so, buy a gas engine and sweat no more. I put in a gasoline engine of 3-horsepower three and a half years ago. The principal reason was to run a saw by power. I not only consider it a good investment but I would not run a shop without one again.

As to the kind of power, I don't know enough about electricity to judge whether it would be best where obtainable or not, but I think gas or gasoline far better than steam for small shops. In a general way the benefits derived from the use of power are a saving of time, labor and material, better finished jobs, increase of business and profit, besides the ability to do much of our regular work more satisfactorily. We can do many things profitably by the use of power which we could not without. Almost every community affords a chance for some special work. In one place there may be considerable lathe work and no machine shop near. In another place



A WROUGHT IRON FURNACE FRONT.

there may be considerable ripping to do for other mechanics. I get a run of work grinding chilled cast-iron plow points for farmers. Also we have a Swiss cheese factory here using tubs of different diameters for shipping cheese. They sawed out their round heads by hand until I built a jig saw. Now I mark them out, saw and nail them. I also gum saws as well as make and turn up wood pulleys for myself and others. I derive less benefit from my blacksmith work than from the wood work, although I run my drill and emery wheels with power as needed. I do not run either the engine or my blacksmith fire steadily enough to make it profitable to attach a blower.

Prize Article No. 2.

J. S. SHAFER.

In reply to the question "Are gas engines a good investment?" I will say that I think so, for the following reasons: First, they are cheap in operation; secondly, they are ready at a moment's notice; thirdly, a 2-horsepower gasoline engine will turn everything in an ordinary shop. I have a lathe that swings sixteen inches, also an emery wheel, a power drill, a rip saw, a feed grinder and a buzz saw (26 inches), and I get along very nicely with it. The size of my engine is 2-horsepower, hot tube, Cinz make.

My engine increases my income at least one-third. Furthermore, it is a great labor-saving device. When it comes to turning a large drill by hand, life is too short for a man to wear himself out doing work by hand that could just as well be done by power. I had a steam engine before, but sold it and put up a power windmill. That was all right when the wind was blowing, but I sold that and put in the real thing—a gasoline engine. I must say that it is the only thing. A motor of course is very handy, but as a general thing you are not in a position to put in an electric motor. As for steam engines, they require a man to attend to them; another thing is this, you will have to wait an hour to get up steam, and after you have used it for twenty minutes you must shut down, and then you have a heavy head of steam and don't know what to do with it. You will find you can run a 2-horsepower gasoline engine all day for what it will cost to get a steam engine ready. As for the make, I would recommend the Fairbanks, Morse & Co.,

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or the New Erie or the Foos. They are good engines, but there are other good makes. I mention these three as they are the first to come to my mind, and I know they are good engines.

Prize Article No. 3.

E. H. BREWER.

I notice you ask for opinions as to power in the blacksmith shop, and also if the gas engine gives perfect satisfaction. In regard to the gas engine I have, I consider it a complete success. I have had the same in my shop for four years, and to date it has not cost me one cent except for fuel, and has never failed to run. I consider the gas engine far superior for the blacksmith to the steam engine, as it requires no care. Also one can polish a plowshare or set of shovels and make a little money on them, where with steam it would be impossible for the smith to do the work and make any money. The gas engine which I use is the Davis, made by the Davis Gasoline Engine Works Company, Waterloo, Iowa, three or four horse-power. I have a power hammer for plow work, an emery wheel stand, a disc sharpener, power drill, blower for two fires, and a 16-inch circular saw for sawing material about the wood shop. I can run any or all of these machines with the engine at any time. The beauty of the gas engine is its low cost of running. I have run mine twelve hours on five gallons of gasoline. I consider the gas engine a paying investment for the shop as power. Of course it may make some difference with regard to the gas engine, but I prefer gas to steam, if for no other reason than the cost. As we smiths all know that this is an age of progress, why not keep step with the procession ; if in other lines it pays, why not in the blacksmith line ? It enables the smith to do more work in a day and better pleases his customers, besides taking a lot of hard work from him. I am in favor of the gas engine for the shop as power.

Competitive Article by A. A. Schaeffer.

Noting your request for an article on the gas engine, I would say that I am using a 2½-horsepower Weber Junior gasoline engine, and I tell you I am pleased with it, as is everybody else who sees it. It is of horizontal type and does not consume much oil, so that the expense of operating it is small. I run a drill press, an emery wheel and a disc sharpener with it. When two of us are grinding it does not seem to affect the power any more than with only one of us working. In these days it is hard work to pound out a living with only hand tools. Try as he may, the smith without power will find himself handicapped when in competition with a neighbor who has an engine. The man with the engine can do his work more quickly and cheaply, as well as more easily. It is going to be with the smith a good deal as it was with the old-time tinners who tried to eke out a living by making coffee pots, pans and dippers by hand. They awoke to find machinery for cutting out the various parts so that they themselves could buy a machine-made coffee pot cheaper than they could make one. To put in small machines and a gas engine will prove the mose profitable investment a smith can make. Hammering, drilling and grinding should be done by power. A gas engine invites trade, and will prove profitable if only for running a blower, an emery and a few home made machines. Machinery and power lift a heavy burden, and none of the craft appreciate it more than the smiths who have spent years swinging a sledge, or the smiths who are aging. Many a smith has sold his shop because he could not stand the heavy hand work, whereas he would probably have been able to have continued at smithing had he had a gas engine to help him. It is certainly the most profitable helper he could have. It saves lots of hard work and brings trade, as a man can do his work quickly. It would pay any smith to get an engine if only for pulling the emery and the blower, as he will surely find it profitable later on to add a hammer, drill press, etc.

Competitive Article by Wm. Exline.

Two years ago this winter I did not have any power, and my shop was only 24 feet long by 16 feet wide. Now I have a shop 80 by 35 feet. A gasoline engine will pay for itself the first season. Before I put one into my shop I could not do one-third of the work, so that another shop started up in the neighborhood. Inside a year after I put in power they sold out to me.

I can sharpen nine plowshares an hour and not hurry, where four is good work by hand. If I wish I can sharpen twelve in an hour. I have a Little Giant hammer, the best I ever saw, two forges, a Roat's blower, an emery wheel, a drill, a disc sharpener, a grind stone, a band saw, a circular saw, a 12-inch planer, using a 3½-horsepower Dempster engine for the whole. Every bit of this machinery has paid for itself since I got it. I have everything handy and everything in sight. I made many of my own tools, including a band saw, a planer and a lathe. I should never have made them without my engine. I have a "Motsinger Auto-sparker" on my engine, and it cannot be beat. Nobody should run a gas engine without one. It is always ready to go and does not freeze up as a battery does. I sharpened close upon 800 shares this season, from July 15th to September 1st, receiving from 25 to 30 cents for each. I guess one man could not have done that by hand, but a gasoline engine can, easily. It costs me 70 cents to run ten hours. I have water run just where I want it from a tank windmill.

I am twenty-five years old ; I have been at the good old trade all my life and expect to stay at it for the rest of my days, for I love it.

Competitive Article by C. L. Carton.

Regarding the advantages of a gas engine, I would state that I put in a gasoline engine of 2½ horse-power some eight months ago, to run an emery wheel and drill press. I soon found, however, that I had been doing a great deal of hard work and consuming a great deal of time that could be saved by putting in more machinery. So I have added a rip and crosscut saw, and recently a trip-hammer. I don't see how I did business before, and surely think it a good investment for any smith that is doing anything like a profitable business (or wants to).

As to special benefits, I consider that the saving of time and labor, the better work and the fitting up of my shop has been the best advertising I have ever done. Trade will go where work is done quickly and in an up-to-date manner. In my shop, 20 feet wide by 80 feet long, I have my engine, saws, drill press, Henderson tire-setter, trip-hammer and two forges, and still have room to shoe horses (which, I regret very much, I cannot make the engine do). I should advise any brother smith to get an engine of not less than 4 horse-power, for he will soon find that he can use it in so many ways that the smaller one will be too light for his work.

This is my experience, and what I think of a gas engine in an ordinary blacksmith shop.

Competitive Article by C. W. Lewis.

With regard to gas engines, I would say, for the benefit of my brother smiths, that I have an engine in my shop and could not do without it. It takes off more than half the hard labor ; the work is done faster and better ; it saves fuel.

It does not take a large shop. If you have a small shop, build your engine room to one side so as to put your line shaft overhead. Put idlers on the line shaft so that when running one piece of machinery the others may be stopped. By so doing you save fuel. Place all machinery in line on one side of your shop. I run a general repair shop with a 2½-horsepower engine, and the fuel costs only 25 cents a day.

Competitive Article by C. W. D.

In regard to the advantages of the gasoline engine over steam, I can say this: With the gasoline engine you have power any minute in the day. If you want to grind a drill or drill a hole; if you are pointing a plowshare or set of cultivator shovels and want to finish them on the emery wheel, all you have to do is to open your oil cups, give your pump a few jerks, roll your wheel and you are running ; when you get your job done one twist of the hand stops all expense. I have a 6-horsepower Lewis engine to run an emery wheel, trip-hammer, blower, drill press and saw, and have two or three horse-power to spare. It costs me about thirty cents for a whole day, as my engine does not use any more oil than is necessary to do the work.

I have had my engine seven years, and it runs better than a steam engine that has been in constant use for that length of time. One dollar will cover all repairs since I have had it. On the other hand, if you have a steam engine in a blacksmith shop, unless you have a tall, expensive smokestack that takes your smoke above the other buildings, which are sometimes 45 and 50 feet high. many days you will find you can hardly get up steam, if the wind is not just right. Then you cannot fire up any time with less than one dollar's worth of coal. With a steam

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engine, if a man has his mind on his wook, he is liable to forget to tend to his engine at the proper time, thus causing serious results from low water or many other things. With the gasoline engine, when your gasoline pump fails to raise the supply the engine stops, and that is all there is to it. Or it may be a leaky joint in the pipe. Sometimes maybe a little chip or grain of oats works its way into the check valves so that they cannot seat themselves to hold the gasoline. These are the main causes of trouble. Of course you should get good gasoline cylinder oil. If you get a good standard make of gasoline engine for your shop you will have good power and just as you want it.

Competitive Article by M. Schrodt.

I have had a gas engine about ten months and find it a great labor saver. A man can do double the work that he can with a blower or bellows, because he can get his iron hot sooner, and while one piece is heating he can work another on the anvil, in such work as calking shoes. When he gets at the drill press he can drill more holes in one hour than he can in three by hand, and won't be all tired out. He can also do his grinding and sawing.

I have the Bates and Edmonds engine, $2\frac{1}{2}$-horsepower, which is advertised now in THE AMERICAN BLACKSMITH. It is a very simple engine, and I find it a valuable machine. No blacksmith ought to work without one. He can easily do enough extra work in two months to pay for the machine. As to the cost after he gets the machine, this is light—ten cents a day for the $2\frac{1}{2}$-horsepower, which I have, which is large and powerful enough for any ordinary shop. I run a blower, drill press, grinder and rip saw, and could run more if I had them. I was the first blacksmith who put in an engine in Watertown. Since I have put in one there have been large numbers of smiths in my shop to see it work, and they all say it is fine and they must have one. When I tell them how much I do with it and how little expense it is they are more than surprised.

Competitive Article by R. T. D.

A certain smith labored for two years adding what small hand tools he could to his stock. One of the first was a blower to take the place of a bellows. Finally he bought an engine, a $1\frac{1}{2}$-horsepower Fairbanks-Morse, and put in an emery wheel and rip saw. His work increased. He was now able to undertake jobs that he could not have thought of before. Naturally, too, he could do everything much more quickly—a fact which brought custom. Finding he could not keep up with his work he hired an apprentice for one year and enlarged his shop. Then he put in a planer, a wood lathe, sand belt, screw cutting lathe and band saw, all within a little over a year. He now keeps a hand and they have all the work they can do. I will say right here that the engine can pull any one of the machines at a time, and any two or three of the light ones, such as the drill, blower or lathe, but if I were buying an engine, I would buy a 3-horsepower Fairbanks-Morse engine, which I think is plenty large enough for a small shop.

Competitive Article by M. L. Beal.

With regard to gasoline engines, I think that it matters but little as to the size of a shop. If one man alone in a shop with a reasonable trade can afford a gasoline engine, it is a labor and time saver as well as a helper to any up-to-date blacksmith.

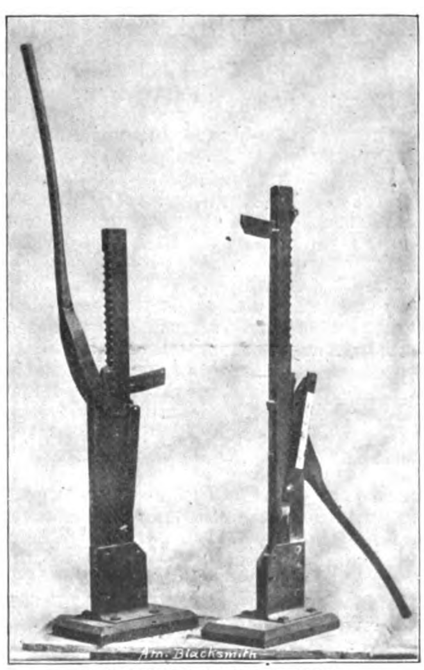
But let me say a word before going further. Do not put in a gasoline engine without the electric spark attachment. If a man has a gasoline engine in his shop without the spark, he loses valuable time waiting for heat. A gasoline or gas engine with the spark attachment is ready to start on a minute's warning, and furnishes sufficient power for the average smith cheaper than any power on the market today. An engine without the spark is little better than steam, for it takes so long to heat the carbon.

As to the size an engine should be, if a man has only an emery-stand, a pulverizer, a sharpener and a drill-press to run, a two or three horsepower gasoline engine is sufficient, but if he expects to keep up with the times and add to his machinery, he should not invest in less than a six horsepower engine. My experience has taught me that running the hammer, the emery-stand, the pulverizer machine and the drill-press by power is a great labor saver. I can do more work with less exertion by having an engine than I could without. And more, I will say that no shop is complete without an engine and the above mentioned machinery. For my part I would not be without one under any consideration.

How to Make a Wagon Jack.

L. VAN DORIN.

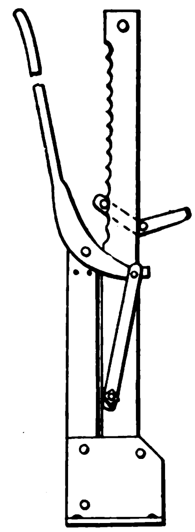
The wagon jack shown in detail in the illustrations herewith is the best thing of its kind I ever saw. It weighs six-



A HOME MADE WAGON JACK.

teen pounds, and will lift a wagon with 4,000 pounds on it. I sell them for \$2.50 with a fair profit, so that it is an excellent thing for a smith to know how to build to fill in spare time with. I make them of steel, with the exception of the lever.

The jack is shown in two positions in the engraving, lowered and raised. The base is formed of two $\frac{1}{8}$-inch plates, 4" x 6", bent, punched and riveted as shown. This base supports two uprights, one movable and 25 inches long, the other rigidly attached to the base and 14 inches long. Each of these two parts is made double, out of $\frac{3}{16}$" x $1\frac{1}{2}$" soft steel. The lever is made with a forked end, and is pivoted on a steel pin running through the upright. The lever crotch is of tire steel $\frac{1}{4}$" x $1\frac{1}{4}$", having a $\frac{5}{8}$-inch round handle 24 inches over all. The end of the lever connects by two links, $\frac{3}{16}$"x$\frac{3}{4}$", with the movable upright. Both bars of this upright are notched as shown, to prevent the slipping of what I term the shifting dog when the jack is loaded. This dog is made out of tire steel, $1\frac{1}{4}$" x $\frac{1}{4}$", with two short pins made fast by upsetting. To hold the movable upright in place I rivet a piece of iron $\frac{1}{4}$" x $\frac{3}{4}$", between the two parts of the stationary upright, and this has a T-shaped end for holding the movable piece in its proper vertical position.



SIDE VIEW OF WAGON JACK.

It is scarcely necessary to describe the operation of this jack. It may be mentioned, however, that when the handle is thrown down the connecting links should pass by the fulcrum or turning point of the handle lever and thus lock itself.

An Electrical Phenomenon.

Will the time come when blacksmiths generally will adopt electrical power in their shops, just as they are doing with the gas engine today? A contemporary informs us that a certain manufacturer has now completed his electric welding plant, and is welding cylinders with it at the rate of 300 to 800 welds per hour. The only requisite is a smart boy to operate the machine.

One question! Does the smartness of our boys increase in proportion to the development of electricity? It would take a very smart boy, we think, to conduct the work mentioned.

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If you find a bill in this copy for next year's subscription, it means that your subscription has expired.

If it has expired, we hope you have found the paper so valuable to you in your work that you will remain with us another year, and for many years to come. Thousands of subscribers have written that a year's subscription to The American Blacksmith is worth a great deal more than a dollar to them, or to any one interested in blacksmithing, carriage-building or horseshoeing. Many say one issue alone is worth that much. This, however, is a matter for you to decide.

It is our purpose and endeavor to put out a paper worthy of the craft, and we would appreciate the aid and encouragement of a prompt renewal subscription from you. At the same time, also, tell us how we can make the paper more valuable to you.

We have constantly in mind the effort to make The American Blacksmith better this year than last, by far, to make each issue better than the preceding one. The preceding article shows how deeply we have the interests of the craft at heart. We do not wish to take your name from our lists at the present time, and hence hope you will send us the money at once. No renewal subscriptions will be taken for less than one dollar per year.

Remit by money order, express order, registered letter or stamps. Do not send checks, as we cannot collect face value on them. Let us hear from you.

Address The American Blacksmith Company, P. O. D. 974, Buffalo, N. Y., U. S. A.

QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

Welding Flues—Will some one please inform me through these columns how to weld flues, and what fire and anvil I need? A. G. Ottoson.

Tempering Buggy Springs—I wish to hear through the columns of The American Blacksmith as to the best and quickest method of tempering buggy springs in a general job shop. M. S. K.

A Cutting Question—Now I want to know if any brother smith can tell me of any way to make a machine or tool to cut off nuts from bolts that can't be unscrewed with a wrench, without cutting off with a cold chisel. Is there such a tool on the market? A. Bruton.

How Make a Band Saw?—I would like to ask some brother blacksmith or wagonmaker to give me a drawing or tell me how to make a band saw which will give good satisfaction, as I would like to make one for myself. Herman Schaffer.

A Good Levelling Table—A useful and economical article in my shop is an old sorgum mill bottom which I have turned upside down and use for a levelling table. It serves the same purpose as a plough table and costs a great deal less. I can hit a lay with a 4-lb. hammer, as hard as necessary, and it never breaks. A. Bruton.

What's the Best Drill?—I have been taking The American Blacksmith and find it the best paper on general blacksmithing published. I wouldn't miss a copy for $5.00. I have found many useful suggestions in it.

Now I have a question to ask some brother mechanic. Which drill on the market gives the best results in a general repair shop? O. B. Fox, Tenaha, Texas.

Tempering Superior Steel—As Mr. Thomas McKummie wishes to know how to temper Superior steel, I would say I have always had success in heating it to a cherry red, and heating it to an even heat the entire length of the piece then quenching in hot water, which must be soft. By this method you will have no trouble with such tools as axes, knives and all edge tools in fact. To draw the temper on edge tools have your fire burning clear without smoke, grease the edge of the tool on both sides with tallow, and hold it over the fire until it comes to a blaze, when it is to be dipped into water. Do not try to temper where the air is too cold. J. D. Pettis.

Spoke Removing—When a spoke is broken off, a good way of removing is to bore a hole with a ¾-inch augur, or one the size of the tenon, at the bottom edge. Next, chisel out corner-ways with a flat chisel. This method is satisfactory when the spoke is broken off; but I have never been able to find a really good way of pulling when the spoke is not broken off. I have screwed the spoke in a vise and hit the hub with the sledge, which certainly gets it out quickly, but is very hard on the hub. I should like somebody to tell me of a better way. A. Bruton.

Soldering Gun Ribs, Thimbles, etc.—In answer to the question in the November issue as to how to solder gun ribs, thimbles, etc., I would give the following: Clean the barrel, rub bright and tin. Then place the rib in its proper position, confining it by clamping. I usually use a small wire, twisting it around to hold the parts together. Then heat rod of iron something like the size of a barrel. Place it in the barrel or barrels, commencing at one end, and have the rod hot enough to melt solder. Then apply muriatic acid reduced with zinc. As usual, have soldering copper hot so as to melt on what solder is needed. Use a feather for applying the acid. I can solder from six to eight inches with one heat. This is my way of joining barrels and ribs or thimbles, and it works satisfactorily. C. F. Ritter.

Brazing—I saw in the November number a question asked in regard to brazing. As I have done quite a bit of it, I will tell how I do it. In the first place, have the pieces to be brazed fit as closely as possible; then take a piece of soft brass (for this I use sheet brass, brass wire, brass cartridges, brass boxes, globe valves, etc., according to the weight of the pieces I am brazing); sprinkle a little fine, pulverized borax over the places where I want the brass to run, lay on the brass and heat slowly until the brass melts. For material that does not hurt to harden, dip into water, as cooling quick softens and toughens the brass. I have taken knotter pinions on binders that had worn off the side and dovetailed in a piece of steel from an old file, brazed and hardened, and had a job that would last longer than new. Trip pawls can be fixed the same way. Drive the end of packers in gas pipe, braze and drill out to fit. I have done brazing on all kinds of malleables, iron, steel, pipes, saw blades and all kinds except cast iron. Care should be taken to have the parts free from grease. R. R. Tichenor.

A Good Chimney—I built a flue or chimney like the one Mr. Legoe described in The American Blacksmith of December, 1901, and like it better than any I have ever used. It draws finely. Though not a bricklayer myself, I built it completely and it did not cost me much. I would advise any brother smith contemplating building one to follow the same design. I did not have as wide iron as Mr. Legoe used, but placed two pieces close together and they worked all right. I have always used galvanized iron, and the tinner never made one to suit me. Then, again, they don't seem to draw well, and usually burn out in one or two seasons. A. Bruton.

An Interesting Letter—It may be of interest to some of my fellow craftsmen to know how I made a box for a vise screw, as I had broken mine off at the collar. I took a Concord axle-box that fitted the eyes of my vise and cut it off with a hack saw the right length. I then inserted the point of the 1¼ screw in the box and let it extend half an inch through the large end, just enough to get a hold on it in my woodworking vise. After securing the screw I centered the screw in the box and put a small piece of clay on the end to keep the babbitt from running through. I then poured in my hot babbitt and filled the box. After it cooled I backed the screw out, which of course was very tight, but I have a good box and a perfect thread, and by oiling frequently it works well. The screw should be cleaned before pouring the babbitt, and there should be several grooves filed lengthwise in the box before pouring babbitt to insure the babbitt against turning with the screw.

I noticed an article by a brother smith in one of the past issues of The American Blacksmith on how to upset axles. The next morning I went to my scrap pile and picked up a pair of discarded axles and followed his directions. As a result I practically made a new set of spindles, and so easily that I was surprised with my own work. The spindles were 1¼ inches double collar steel ones, and as the boxes were not much worn I was saved the expense of buying new ones.

I consider The American Blacksmith a great boon to our craft, for it draws us closer together and through its columns we can all be students and educators.

I will give a brief list of the prices of shoeing and some repair work in my locality:

Setting shoes, per set	$1.00
Bar shoe, each	.50
No. 0 to 3, plain, per set	1.50
No. 4 to 5, " "	1.75
No. 0 to 4, Perkins, calked	1.50
No. 5 to 6, " "	1.75
No. 0 to 3, hand-toed and calked	1.75
No. 4, " "	2.00
No 5, " "	2.25
No. 6. " "	2.50

Tire setting from 75c. per wheel to $1.50 for largest; welding on axle st [illegible] s from $1.00 to $1.50 per stub and fr [illegible] $1.00 per box for setting. [illegible] $16.25 per ton in San Francisco [illegible] $13.00 per ton to freight in addition to cost price. J. C. Shay.

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The Village Smithy.

The handsome new painting by Mr. Raphael Beck, which was bought by THE AMERICAN BLACKSMITH for complimentary presentation to its new subscribers, has been considerably, though unavoidably, delayed in reproduction. We are aiming to secure faithful and artistic copies, and will have to ask the patience of our friends for a short while longer. We do not wish to sacrifice any of the merits of the picture by unduly hurrying the engravers.

A Special Prize Offer.

For those who may see a copy of THE AMERICAN BLACKSMITH this month for the first time, we wish to briefly state our special subscription offer. As a special inducement we will send to all who subscribe during February, THE AMERICAN BLACKSMITH for twelve months, with a handsome copy of our picture "The Village Smithy," and also, as a premium, either a neat little pocket bench level, or else a farrier's hoof knife.

See your friends of the craft, tell them about the paper and induce them to [illegible]cribe. If you can get us any [illegible] scribers in this way you will [illegible] a more expensive premium. Write for particulars if interested.

As a special prize offer, we are going to give ten dollars in cash to the person sending the greatest number of new subscribers before April 1. A small number of new names, twenty or thirty, will probably win the prize. Isn't it worth your effort?

A New Electric Process of Steel Production.

A dozen or more of the leading independent steel manufacturers of the United States were in Lockport, N. Y., recently, to witness an important test of an electric furnace process for making steel directly from the raw material. It is said the test was successful and satisfactory.

The men who witnessed the demonstration were John Fritz, of the Thomas Iron Works, Bethlehem, Pa., and builder of the Cambria Iron Works and of the Bethlehem Steel Works; S. T. Wellman, of Cleveland, inventor of the Wellman steel furnace, of the firm of Wellman, Seaver & Morgan; W. J. Taylor, of High Bridge, N. J.; E. Thomas, president of the Catasauqua Iron Works, Catasauqua, Pa.; Walter Phillips, European representative of the Westinghouse Company, Pittsburg; Dr. Frank Slocum, of the Jones & Laughlin Steel Company, Pittsburg; E. Kirchoff, editor of Iron Age, New York. Superintendent Fred J. Davis, of the Cowles Aluminum Works at Lockport, extended the visitors every courtesy.

Inventor Marcus Rutheburg said, regarding the electric furnace process: "We apply electricity to the smelting of iron ore at about one-half the cost of reduction of ore through the blast furnace and steel hearth. The furnace has the advantage of all others in that it consumes only one-tenth the amount of electric power heretofore required in reducing iron electrically. This vast saving places our process on an extremely favorable basis of comparison with the old methods employed in the blast furnace and steel hearth.

"We take the raw material and cleanse it to the highest state of purity. Reducing material in the form of charcoal or coke dust is incorporated with the ore and the mass is then fed direct to the electric furnace. A fritted mass is produced which goes to the open hearth furnace as steel melting stock, eliminating the expensive blast furnace process. This saves 33 per cent. of the fuel used in old processes and all the limestone, which is not employed at all. Using only 67 per cent. of the fuel, we manufacture a purer and better quality of steel."

The American Association of Blacksmiths and Horseshoers.

The great number of communications and letters of endorsement, which have been received at this office since the publication of the first announcement of the principles and objects of the above Association, would be all-convincing evidence, if any were needed, of how vitally the reforms aimed at affect the welfare of the blacksmith body. There has not been one dissenting note in all the many letters written us upon the subject. For the benefit of those readers who may not have seen the articles in question, the aims of the new Association will be briefly given.

It is proposed in the first place to arouse the sentiment of the craft regarding the passage of State laws, which will enable the smith to place a lien on a horse, wagon or implement, and thus be absolutely sure of prompt and rightful payment for his work. Another reform in view is to secure a general advance in prices on all smithing, shoeing and repair work. Since conditions vary with the locality, it would obviously be impracticable to apply the same prices to any large section of country. The idea is to organize each County of each State, and to have each county association adopt prices for itself. In these days of advanced prices of material and increased living expenses, it is absolutely necessary for the craft to "get together" and agree on prices which

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will allow the smith and his family to enjoy a proper return from his labor. It is a well-known fact that prices of commodities rise much more rapidly than do wages and the returns from labor. Such days as these of prosperity and higher prices, mean in reality, "hard times" for those whose wages do not advance in the proper ratio. It means a greater amount of work must be done to secure an equal measure of living necessities and comforts. This, in our opinion, explains the straitened circumstances and "hard up" conditions of many of the craft. The laborer is worthy of his hire, whether he work for a master or for the public. Better prices are an urgent need.

Other questions, such as measures to improve the standard of horseshoeing, and the prices of material as charged by the various heavy hardware dealers, will be taken up by the Association. The undivided support of every member of the craft is needed to secure all these reforms, and you are earnestly requested to aid us by keeping in touch with the progress of the movement, as will be reported in these columns. An account of what has already been accomplished will be found on a following page.

Estimating Costs in Carriage Shops.—6.

BY D. W. M.

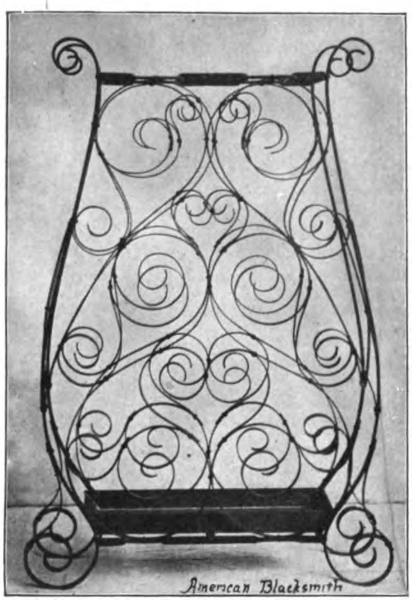
Aids in Making Calculations.

Very few shops have a blackboard large enough to accommodate a full size drawing of a coach, a large truck, or an ice-wagon, yet any one who has ever used such a board will wonder how it is possible to get along without one. The convenience which it affords is incalculable as an economizer.

Such a board should be made to be used on both sides. The original design of the contemplated vehicle may be drawn in small size to scale first, but the large or full size drawing will be found invaluable in determining the general effect of lines and proportions, and in getting the proper position in hanging off the gear. Also in calculating sizes of springs, wheels, blocks and various irons—in fact, anything belonging to the details of construction.

Chalk marks are easily corrected. After the blackboard sketch, permanent drawings and patterns can be made for preservation for future use. Some prefer not to roll the paper drawings, but to keep them flat, and hang them against the wall back of the blackboard, on hooks or clasps, but this grows too bulky in time. Each draft should be numbered, and the same number stamped on all the patterns which belong to it. Bore a hole through each pattern and tie together all the patterns belonging to one draft, so that they may be hung up in a convenient place. On each pattern mark the number of pieces required for one vehicle, also the size of the material.

On the paper draft make a scheduled list of all the pieces required, if by pattern; for instance, a top rail, two pieces 1¼ by pattern; or rocker, two sets 1⅝ by pattern, unless the pieces are straight, in which case the full dimensions are given with the quantity.



AN ARTISTIC UMBRELLA RACK OF WROUGHT IRON.

If any irons are to be forged, it is well to have not only the drawing and listed size but a sample. If it is such as can be used on other vehicles, it should be so indexed that it may be referred to by number. All forgings and malleables which are in use as regular stock should be so indexed, and samples kept, not in a heap, but hung up and properly labelled, as to be easily referred to or designated in any itemized list of materials, and found in an instant. This list of materials should include every piece of timber, the screws to the exact number, bolts, malleables, forged irons, springs, axles, wheels, etc. Nothing should be omitted.

It will be found a very great assistance to carry a book small enough for the pocket, in which each vehicle is entered by number. The pages should be ruled in columns, to show the number of vehicle, for whom built, date of order, date when body is made, wheels, springs, axles; or received in shop, ironed, pinned; shafts or pole made and ironed; date of each coat of paint; when trimmed, finished, hung off, put in wareroom, shipped; and a column for remarks. To keep such a book means that its possessor is always fully informed about what goes on in his shop. It will also be found of great value for reference at future times. A book of this kind has settled for the writer a great many disputes and won several law suits, besides being of the utmost assistance in the daily prosecution of business. It enables one to know on the instant where anything lagged and the cause, and to produce work always when promised. With a fountain pen, one can make the entries in this book in passing through the shop, and if anything has been overlooked the book will reveal it at once.

Ornamental Iron Work at the Illinois State Reformatory.

In every branch of art, there are two elements—the artistic and the mechanical. The first element calls for natural taste and originality; the second for mechanical skill. A man may have the taste and originality to plan a design without the mechanical skill to execute it, or vice versa. Also a special understanding of the style of design suitable for development in different materials and for different purposes is necessary. Thus, a design that would be effective in wood or tapestry, might not work out well in iron or copper.

As the demand for decorative metal work grows, the supply of skilled workmen must be increased proportionately. Hence, various of our institutions are making special effort to develop and cultivate the artistic instinct in connection with blacksmithing, as well as to provide a thorough training in the execution of designs.

In the January issue was given an account of the work done by the blacksmith boys in the Illinois State Reformatory, but lack of space made it necessary to omit some very interesting photographs of achievements of these boys in ornamental iron work. The accompanying engravings represent three of the pieces. The first is an umbrella rack. It is 5¼ inches by 16 inches at the base and 26 inches high. The pan is of brass and the upper part of iron. The second is a group of very artistic rosettes and other decorative pieces. The third cut represents a collection of hinges and handles of pleasing design.

The boys range in age from sixteen to twenty years, and are put through a

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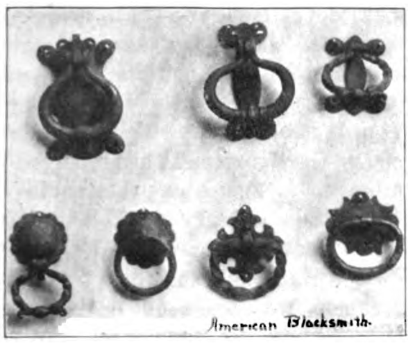
thorough course of preliminary work to train them in handling their fires and their hammers. They are then advanced to welding iron and steel, horseshoeing, carriage and structural iron work. The ornamental iron work of the boys marks still another step in their training.

Gear Painting Novelties.

M. C. HILLICK.

Not a few trade writers have surrounded the subject of painting the carriage gear in aluminum bronze with an air of mystery, which in no respect belongs to the operation. To paint the gear in aluminum bronze, simply bring the surface up in the usual way and to the approved degree of smoothness.

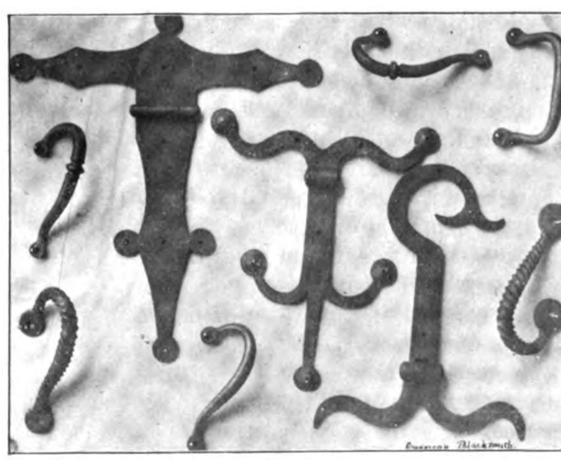


SOME UNIQUE ROSETTES AND DECORATIVE PIECES.

The last coat of lead, which should serve as the ground for the aluminum, should be made of white lead shaded out slightly with lampblack to bring it very close to the color of the aluminum, of which there are two distinct shades. To get a ground desirably near to the aluminum, it may be necessary to shade the white with ivory drop black instead of lampblack.

The writer has seen in the large carriage factories aluminum mixed as paint and applied to the surface with a camel's hair brush, but for the most luminous and permanent results, it is advisable to first apply a sizing and dust the bronze on dry. Apply a size of elastic rubbing varnish "let down" a little with turpentine. Locate the gear over a large square of wrapping paper, and when the right stage in the drying of the size is reached, dust on the aluminum powder, using for the purpose a 1½-inch camel's hair brush. Aim to coat up the surface solidly, so as to necessitate no touching up. Next apply, in due time, a coat of very pale or what some workmen would call "white varnish," laying on plenty of varnish. When this coat is adequately dry, rub over lightly with a wet sponge dipped in No. 00 pulverized pumice stone. Never use hair or moss on a surface of this kind. The sponge rubbing not only serves to deaden the gloss, but aids to bring out the best sort of surface. The striping should be done upon this coat. Stripe in dainty shades of blue, and use double and treble lines, the double being more popular. Fine, nicely drawn lines of white furnish beautiful effects. A line of gold split in the center with a fine line of flake or Florence white looks very striking. Double fine lines of gold give a rich effect. Primrose and sulphur yellow in fine lines show handsomely upon aluminum gears. Occasionally the aluminum gear is blacked off with changeable or Prussian blue, and while this style of painting adds a certain effectiveness in the matter of color contrasts, it at the same time increases, apparently, the size and weight of the job. This is an optical illusion, and in the case of some colors the blacking off makes the surface look lighter in build, but in the case of aluminum, the effect is the reverse. In many cities, society has accorded the aluminum running parts its stamp of approval, hence the color may be expected to retain at least a brief season of popularity.

For heavy pleasure vehicles, the bottle green, formerly so popular, will be in favor as a gear color the coming season. For a particularly fine bottle green—one having depth and brilliancy, into which one may fairly look as into a mirror—only the bottle green as brought up fifteen or more years ago will suffice. Bring the surface up becomingly level and smooth, then apply a green made of chrome, lemon yellow and ivory black. This constitutes the ground work. Next procure Dutch pink and Prussian blue, Japan ground, and mix the two to a fine rich bottle green. Exact proportions of these ingredients cannot be advised owing to the varying strength of pigments, but the practical man used to handling colors will be able to hit the shade handily enough by working a bit carefully. The Dutch pink and Prussian blue mixture, having been applied with a camel's hair brush and given a few hours to dry, may next be glazed with yellow lake. To a pint of the yellow lake, as mixed in elastic rubbing varnish, add a tablespoonful of Dutch pink. Flow this lake coat on as freely as a clear rubbing varnish coat is flowed. For an exclusively brilliant and aristocratic green, the bottle green as thus produced has no rival. It has an elegance and a beauty unsurpassed. Striped with black and carmine lines, or with black and gold, it appears at its best. If the green is expected to have an olive hue, add a drop or two of English vermilion and ultramarine blue to the yellow lake. Newport red, titled after the city made famous by Henry Watterson and America's Four Hundred, is to be one of the popular gear colors for boulevard and park wagons the coming season. Bring the gear up in a light peachblow color, and then mix English vermilion in varnish, thinning out with turpentine to the proper consistency, then add, say, No. 40 carmine in the proportion, practically, of one part carmine to two parts vermilion. Apply with a 1½-inch badger hair brush. The color mixed in varnish will go on more in the nature of color-and-varnish than as a flat color coat, but this need not disturb the workman. If the peachblow ground is properly builded, one coat of vermilion will suffice. Next, to enrich the vermilion, glaze with No. 40 carmine. Buy the carmine in collapsible tubes, and ¾ of an ounce, floated in sufficient elastic rubbing varnish to coat the gear entirely, will suffice. This color is best striped with lines of black, although double fine lines of gold show handsomely, and are often used effectively in conjunction with the black.



COLLECTION OF HINGES AND HANDLES OF PLEASING DESIGN.

For surrey, phaeton and cabriolet gears, olive green promises to be popular the coming season in eastern sections of the country. Olive green—all greens, in fact, which possess an excess of yellow in their composition—is a warm, rich green easy to handle, and

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quite as permanent as any of the other greens. You simply bring the surface up dark, lay on a coat of the flat color, and then apply a coat of green color-and-varnish. Give this coat a gentle rub over with a soft sponge dipped in pumice-stone-flour and water. Olive green offers handsome contrasts in color if striped with double lines of carmine, or a ⅜-inch line of black, edged with a fine line of carmine.

Maroon, while not exactly a novelty, is not so common as to be called commonplace, and, as for a couple of seasons past, it will hold in favor with many exacting vehicle users as a gear color. If shop made, maroon is compounded of three parts No. 40 carmine and two parts lemon yellow. Use the final coat of maroon as a glaze color, and for the most exclusive effects stripe with lines of black.

Shrinking a Wagon Band.

M. S. HEWITT.

To shrink a wagon band, take an old rasp, either straight or bent in a half circle. Heat the band and make a kink in it, and placing it on the rasp at the kink, catch on either side with tongs and drive the kink down straight with the hammer. By this means, wagon bands may be quickly upset and shrunken when they become loose.

Pointers on Box Setting.

CHARLES D. BRIDDELL.

I find very often that I wish to put in thimble skein boxes, or large axle boxes, and desire to get the wheels perfectly true without much wedging of the boxes. The following is the way I should suggest that this be done: Lay the wheel down on its side with the big end of the hub against the floor. Place the box and the hub small end down and put it at the center as near as possible. Then take a small rod and place one end of it against the box, and get the measure from the box to the edge of the tire. Measure on the opposite side of the wheel from where you first measured, and if both measurements are not the same adjust the box until it is exactly in the center. By repeating this process of measuring, and adjusting half-way between the points where you first measure, you will be able to get the same accurately in the center. Having done this, mark around the box carefully. Then turn the wheel over and proceed exactly as before, placing the big end of the box down. Chisel out for the box where you have marked, drive it in and you will find that the wheel is nearly true. Place the wheel on the axle so that it will have room to turn, and by means of wedges, you can use the wheel perfectly.

The great advantage of measuring in the above way is that a great many wheels are dished on one side more than on the other, so that if the box is put exactly in the center of the hub the wheel will not be true.

A Youthful Member of the Craft.

In the issue of May, 1902, we published an account of the oldest blacksmith which we were able to locate, Mr. Samuel Brock of Falmouth, Ky., who was still working at the age of ninety-four. In this issue we reproduce the photograph of a youthful blacksmith, Mr. John Schaffer of Elkton,

A YOUTHFUL DAKOTA SMITH.

S. D., who, although but seventeen years old, has been working steadily with his father for the past four years. He states that he has learned all he knows in his father's shop and by picking up knowledge wherever he could. On another page in this issue will be found an article from this young blacksmith on the advantages of the gas engine.

Factory Cost Systems.

In the carriage trade, and in any trade, an accurate knowledge of shop and office costs is absolutely essential to an intelligent conduct of the business.

The question of determining the cost of production bears such a vital relation to the profits in every factory, that the following system for conveniently figuring shop and office cost will doubtless be of interest. We are indebted to the Shaw-Walker Company, Muskegon, Mich., makers of card index systems, for the following outline of a simple method of determining the cost of production, and one which can be enlarged to meet the requirements of almost any business.

Card systems lend themselves splendidly to methods of this kind. In the first place, all stock should be received in the stock room, and there recorded on cards. One person only should have charge of keeping these records. No stock should be issued to any department in the factory, except on written requisitions, signed by the foreman of the department in which it is to be used.

Factory orders should be issued to each department through which an order is to pass. These orders contain the order number and the shop order number, together with instructions as regards its execution. When the foreman of the department has received his order, and has made out the requisition for all the necessary stock, he is ready to proceed with the work.

He will assign the work to certain workmen, who make out a time card, bearing the order number and the kind of work to be performed, and sign his name and number and make a cross on the card at the time work was commenced. When the job is finished he makes another cross and turns the card in to the foreman, who OK's it. The time cards are then turned in to the cost clerk, from which the cost of productive labor can be figured on any order, as each card bears the order number.

From the requisition slips can be figured the cost of material entering into the construction. These two systems will give the exact cost of what may be termed "known quantities."

Unknown quantities, such as non-productive labor, general expense, etc., can be figured in a number of ways. We consider the dollar basis the most satisfactory method of determining the cost of non-productive labor. Determine the cost of productive labor in a given department for a given period of time, say the pay roll period of two weeks. This we will suppose amounts to $1,000.

Then also determine the cost of non-productive labor for the same period of time and in the same department, which we will suppose to be $100. Dividing the latter by the former will give you 10%. Then in determining the cost of productive labor for any

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department, add 10% to cover the cost of the non-productive labor.

The percentage will vary in different departments and will vary in the same departments for different periods of the year, as the proportion of productive labor changes.

General non-productive labor, such as engineers, superintendents, teamsters, etc., labor that does not enter directly into the cost of production, but that is necessary to the work of manufacturing, can be figured and pro-rated over the entire cost of productive labor in a similar manner to the method of figuring it by departments.

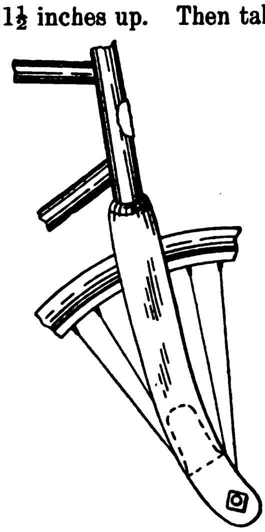
General expense, including rents, taxes, insurance, selling cost, etc., can be determined for a period of time and pro-rated over all the orders completed during that time.

The above system is one that has been installed in a great many concerns. It has been given practical test and found successful. Of course the forms have to be changed to meet the varying conditions governing each different concern.

Repairing a Broken Bicycle Fork.

J. H. JENSEN.

The following method of repairing the fork of a bicycle which has been broken off will be found very handy at times. Saw off the tube of the fork a little above the break, say from 1 to $1\frac{1}{2}$ inches up. Then take a small rattail file and file out the inside until you get a feather-edge on the fork tube all the way around. The next step is to forge a piece of soft steel, which will drive up inside the end of the fork for about an inch or more. In the illustration, the part which is driven up in the fork is indicated by the dotted lines. The part which is outside is to be forged like the old end of the fork, and either drilled or slotted for the spindle. The forged piece outside should be the same size and shape as the fork at the point where they join. If a slot is desired in the end of the fork, bore a hole at the proper point and cut the slot down with a hack saw. The new part can be dressed down smoothly with a file. If the bicycle has black enamel on the forks, I warm the new ends a little and brush them over with coal tar, after which no one can notice that the fork has ever been broken. I do all the broken fork repairing for the two wheel repair shops in town, and have never had any complaint as to strength or looks. My charge for this work is seventy-five cents an end, and I can easily put on about two ends in two and a half hours.



A UNIQUE METHOD OF REPAIRING A BROKEN BICYCLE FORK.

To secure the repair parts in place, I usually resort to brazing. First, clean the parts which are to be brazed and prepare a well coked fire. Then place the pieces on the fire and blow gently, so as to heat the parts uniformly and without danger of overheating. Keep the joint well covered with powdered borax. When this begins to melt down, put your pieces of spring brass or soft brass on the joint, so that when the same melts it will run into the joint. As soon as the brass has been melted and run into the joint, remove from the fire and allow to cool off. Close attention should be paid to the heating and to the brass, so as not to burn the latter.

Recipe for Cleaning Brass Articles.

W. J. HILL.

The following is a good recipe for cleaning brass articles: Six large spoonfuls of cider vinegar and two spoonfuls of salt. Put in a bottle and keep ready for use. Apply with a small cloth, rubbing well. All stains will disappear and the brass will be as bright as when new. Wash the vinegar off and dry the brass, as it will become discolored if left on.

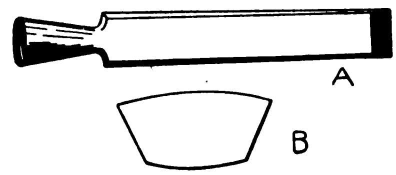
Firmer Socket Chisels Made From Old Files.

C. F. HEINE.

The accompanying sketch illustrates the manner in which I make firmer socket chisels from old worn out files. I make a number of these from $\frac{3}{16}$ to $2\frac{1}{2}$ inches for my customers, both farmers and carpenters.

I first take a file, a mill cut for the small size and a bastard for the large size, and grind them as nearly smooth as possible, and then draw them down for the socket, as shown at A. Having drawn it down to the size which I wish, I make a pattern by wrapping a piece of cardboard or stiff paper around the upper or handle end, and using this, cut out a piece from $\frac{1}{16}$-inch iron, which I shape, fit and weld for the socket, welding to the chisel first.

Care must be taken to have a nice, clean fire, and keep the piece turning, so as to get a good even heat and not burn the iron or the socket. Then turn and finish the chisel and temper to a pale blue. This produces a chisel which is hard to beat, and which will stand more prying and jerking than most factory chisels. I would like to hear from others as to their experience in making chisels from old files.



MAKING A FIRMER SOCKET CHISEL FROM AN OLD FILE.

The Handling of Vicious Horses.

C. E. GOULD.

The following way of handling vicious horses has never yet failed me, and I have used the same to great advantage time and time again. My method is to attach a good, strong eye-bolt to an outer wall for the purpose of tying the horse up. I then take a $\frac{1}{2}$-inch rope thirty-five feet long, tie it to the top of the collar of the horse, pass it back to the tail, around the roots of which I take a half hitch. The rope is then placed through a pulley which has been strapped to the hind foot to be shod, and from there leads up to a pulley at the ceiling, fifteen feet from the front wall. By my arrangement I run the same rope through still another pulley, which is attached to the anvil block below and still a little further back, say sixteen or eighteen feet from the front wall. In addition to this, I take another rope about fifteen feet long, tie it to the strap around the foot which has the pulley on it, run it outside the front leg, take one turn around the collar and then one turn around the ring in the wall. One man should hold the rope so as to give the horse a little slack, or take it up in order to get the foot in the right position for shoeing. One man also has the rope which ends at the anvil block.

When the horse jerks, the slack on the rope can be taken up and the foot pulled high. The horse will soon give up, and can then be shod.

If the horse is bad with his front feet, put the strap on while the hind foot is up. Leave the rope tied on the

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tail and then make the pulley fast to the strap on the front foot, after which you can proceed as with the hind feet. This may seem a very cumbersome method, but the cost is small, and once in operation it saves many a lame back.

The Railroad Blacksmith Shop.—4.

W. B. REID.

Repair of Rockers.

A fracture in a rocker above C, Fig. 15, may be repaired by either of the methods described in the last issue, or when the shape of the broken part is favorable, more expeditiously as follows: A piece of iron of sufficient thickness for the purpose is welded on the old collar, from which the arm is broken

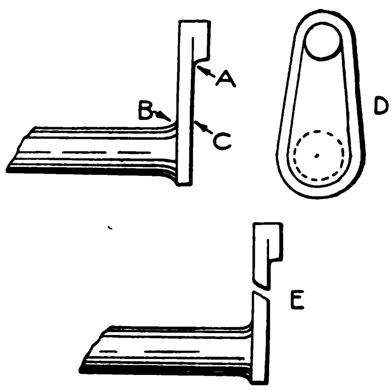

Fig. 15. ROCKER ARMS, FRACTURES AND REPAIRS.

off. This should be done under a hammer, the bottom die being removed if necessary. A few vigorous blows effectually weld the parts, and at the same time upset and reinforce the stock on the shaft sufficiently for further operations. The new arm can then be welded upon the enlarged collar thus secured, by methods described in a former article. If the fracture at this point is of a slight or partial character, it can be repaired as in Fig. 21, A. A small cavity in one or both sides is formed with a fuller in such a way as to augment the stock of surrounding surface. Into this, a small plug is welded with separate heats. Light manipulation with hand hammers welds this neatly and securely, with but slight disturbance of the proportion of the arm.

Straightening the arms and adjusting the centers of rockers is a frequent necessity of locomotive repair, requiring considerable neatness and accuracy on the part of the blacksmith. Rocker arms are sometimes distorted into unseemly shapes (Fig. 21, B), in attempting to restore centers to line by bending the arms. This can be done in a simple and more workmanlike way by heating and twisting in the center of the shaft. Although regarded with disfavor by some, we have followed this practice successfully for many years. By heating slowly in a small open fire, covering the part to be heated with egg-sized pieces of clean coke, instead of wet sulphurous coal, a uniform dull red heat, sufficient for the purpose, can be secured without scaling the rocker shaft in the least. Placing the rocker flatly upon the surface plate, and holding the heavy sledge or weight upon one arm, a smart blow of the sledge upon a flatter held near the end of the other arm succeeds in twisting the shaft without disturbing the true line of center. To do this work accurately, a true surface plate, a surface gauge, two short parallels or straight edges and two pairs of adjustable cone centering tools are necessary. The tool described below is not found in general use, although it is a remarkably useful and accurate device for gauging centers in various kinds of motion work. Fig. 22, A and B, are two hollow cones of soft steel, hardened. A pin, C, centered accurately on both ends, of sufficient length and thread for adjustment to different sizes of holes, passes through both cones, holding them in position by nuts on the ends of the pin. When applied to both arms of the rocker at once, the conditon of the centers can be determined quickly and with perfect accuracy. The application of this tool will readily appear from the illustration Fig. 23.

(To be continued.)

Setting Up a Gas Engine and Some of the Benefits From Its Use.

J. K. RIBLET.

It will probably be of benefit to those intending to put in power to tell them my experience. First, however, I will say that if I wanted to buy an engine, I should write to The Ajax Engine Works, Corry, Pa., and the Superior Gas Engine Works, Springfield, Ohio. When I set up my engine, I blocked up solidly under the floor joists and set the engine near the wall, bolting it to some heavy planks on the floor. Whenever the engine was running you would think there was an earthquake, so I cut a hole in the floor a little larger than the base of my engine, and built a cement foundation, wider at the bottom than the top, which comes just even with the top of the floor. The engine runs perfectly steady now, and the building behaves in a proper manner.

I have a wood lathe, two emery wheel stands, one jig saw, one blacksmith's drill, and a saw table with four circular saws, three rip and one cross-cut, all of which I run with power. I did not buy one of the above machines expressly

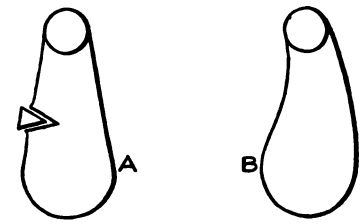

Fig. 21. A, METHOD OF REPAIRING A FRACTURED ARM. B, ARM DISTORTED IN ADJUSTING THE CENTERS.

for the purpose. The drill I had, so I put a wood pulley on the back feed, and now run it by hand or belt. The wood lathe I made myself, also the emery wheel stands and saw table. I got an old Champion binder worth $2.00 for old iron, dissected it, and found, among other useful things, several nicely turned shafts, suitable for counter-shafts, saw and emery wheel arbors, etc. I am sorry to say I have no iron lathe yet. Hence I took three of them to a machine shop and had suitable collars, threads and nuts put on at a small cost. I have a very efficient jig saw of my own device and manufacture. I made nearly all my own pulleys. My line shaft is eighteen feet long and $1\frac{7}{16}$ inches in diameter, turned up full length, which enables me to put a bearing or pulley at any place. I run my line shaft at about 350 revolutions per minute, in three hard wood boxes or bearings, which are perfectly satisfactory. My circular saws I bought very cheap of an old mill man. Two of them had cracks and broken teeth, but were larger than I could use, so I cut off the outside until they were sound, and with the aid of my emery wheel made new teeth on them. When I get an accumulation of old poles, shafts, axles, edgings, etc., I take off the rip saw, put on the cut-off, and buzz up a nice lot of wood. I intend to fix up a hub-boring machine next. There are no cider mills

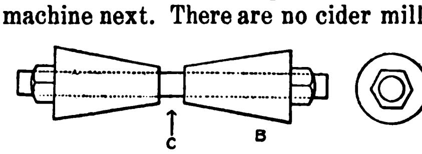

Fig. 22. TOOL FOR GAUGING CENTERS IN VARIOUS KINDS OF MOTION WORK.

or feed mills near here, and if I could sell my engine, I would get a larger one to grind feed and make cider. A 14-inch saw is as large as I can run profitably. Saws from ten to fourteen inches should run from 1,800 to 2,200 revolutions per minute. Emery wheels should run at a surface speed of nearly a mile

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a minute. If run too fast, they will glaze, and if too slow they will waste or cut the work they do. I have a countershaft to run my emery wheels from, and another for my saw. After I bought my engine, I built a house, and sized all my studding and upper joist with my rip saw, also ripped out all cornice corner boards and frame stuff.

A Convenient Arrangement for the Post Drill.

A. BRUTON.

Here is a little device which may be useful to some, as it certainly is to me. It consists simply of an arrangement to lower or raise a post drill. I first take a hardwood plank 6 inches wide by 5½ feet long, or longer if needed. I cut a slot in each end large enough to let a ½-inch bolt move up and down. Chisel out a place for the head of the bolt, so that it, with a large washer, can work up and down even with the surface of the board. Bolt this arrangement to the wall, where the drill is to be placed. Then proceed to make a crank or lever-nut for the bolts that hold the drill board to the slotted plank, so that these nuts can be tightened up without a wrench. This arrangement which I have described will allow the drill to be moved up and down, adjusted, and easily fastened at any convenient height.

In order to have a means for easily raising or lowering the drill, I fasten a lever to a post at the left of the drill, by means of a lag screw, placing the short end of the lever under the drill board. By means of this, you can raise the drill up as desired, and fasten it by tightening up the crank-nuts. Most drills are up a little too high for any thing except wheel work, but with this arrangement they can be adjusted to any height in a minute with great ease. The lever can be raised up out of the way when not in use.

The great saving of time, the added convenience, the simplicity of construction and the small cost of this device are only a few of its points of advantage. To fully appreciate it the smith must try one for himself.

Blacksmithing—A Year of Work in Canada.

The following yearly routine of blacksmithing work, as it comes to the smith shop in Canada, will probably be of interest. We are indebted to Mr. George Nablo of Fisherville, Ontario, for the information contained herewith.

Repairing of sleighs usually begins about the first of November and continues until the latter part of March. Next comes the repairing of soil tilling implements, such as plows, harrows, cultivators, disc harrows, and all such implements which are required for putting in the spring seed. The shoes on horses that had been made sharp during December, or during the winter's icy roads, are then taken off and replaced with dull or mud calks.

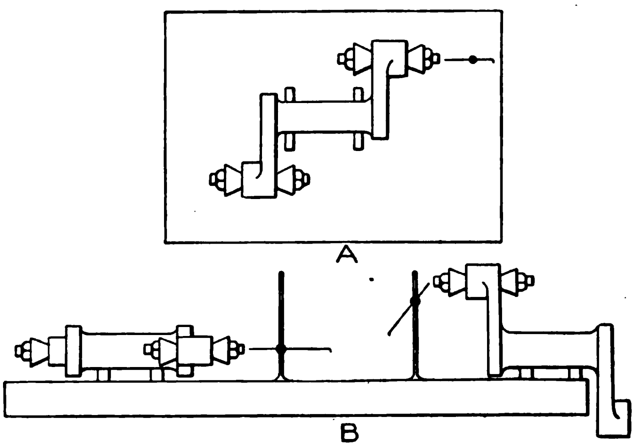

Fig. 23. DETERMINING THE CENTERS OF ROCKER ARMS.

After the spring seeding is finished, preparations are made for the hay cutting, and mowers, horse-rakes and hay-racks are put in condition. Also the farm wagons are repaired. Mowers are then almost constantly before the smithy for repairing break downs of some sort.

The season for that class of work having passed, harvesting of wheat commences about the middle of July, and during that time and all through August the repairing of binders takes up the time of the smith almost exclusively. Also during July and August, the weather being favorable and dry for harvesting, the roads become dusty and hot, which has the effect of drying up the spokes and felloes of wheels as well as expanding the tires of the wheels. The latter become loose and that is the time for tire setting, which often, when the drought continues, extends through September and part of October.

After the grain is cut and housed in the barns, plowing for fall wheat commences, and then the repairing of plows is much in demand; and this is with me, the main season for plow work. Threshing of grain is on, and repairing engines and grain separators takes up considerable time, so that the months of August and September are often very busy periods of the year.

In October, repair work somewhat slackens, except the sharpening and repairing of plows and cultivators for the fall seeding and fall plowing.

The above is about the routine work of a year in a repair shop in this locality. Horseshoeing with sharp calking commences as soon as the frost sets in in earnest, and is usually at its height about the holidays. During the preparations for putting in the spring as well as the fall sowing, grain drills often have to be repaired, and the wheels respoked, which often takes considerable time. During the haying season, horse-rakes have to be repaired, teeth which break have to be welded, the tines of broken forks welded, new handles put on forks—which is a part of the miscellaneous work which comes to the shop for the repair smith to do. Such is a synopsis of repair work here on heavy clay soil.

Oil Furnaces and Their Construction.

H. A. FOLK.

Any one who wishes to employ oil for fuel should, in the first place, know exactly what he is going to heat with the oil, and then proceed with the building of the furnace to suit the class of work he intends to use it for, making the furnace as small inside as possible to admit the work, and avoiding sharp corners and square edges as much as possible. This is so that there will be no obstructions in the way of the flame. One should also be careful not to allow the oil to come in contact with the material. The burner should either be put above the material or below it, and, by having all corners rounding, the flame will form a circle or combustion chamber, as it were, and there is where the stock is heated. If the oil and blast are too close to the iron, it will form a heavy scale and will not heat. This of course can be detected very quickly by the scaling of the iron.

We have in successful operation at the Altoona Shops of the Pennsylvania Railroad, two furnaces 18 inches by 12 feet, and one furnace 18 inches by 4 feet, which do the heating for six power hammers. We also have a furnace for a 6-inch forging machine, on which we make all our transom irons for four and six-wheel trucks, and for all upsetting of axles. There is also one furnace for a 5-inch forging machine for heavy work, and one for a 3-inch forging machine;

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one for a drop hammer and six for bolt heating. With the latter, we turn out from 4,000 to 4,500 $\frac{3}{4}$-inch bolts in ten hours. The consumption of oil for ten hours per day, when all these furnaces are in operation, is about twelve gallons.

A Few Useful Original Devices.

C. S. SIMMONS.

The following are a few tools that I have devised and which I think will be of great practical use to any blacksmith who tries them.

The first is what I call a "no-helper" swage. Take two old buggy-stubs. Turn down a stem and weld on a hinge as shown in Fig. 1. Make the outer end of the top piece on an angle as shown, to catch the hammer under, when opening to insert work. Put in the hinge pin, clamp together and drill holes on the joint. Round off the corners a little as shown in Fig. 1, and the tool is complete. It does good work and has the advantage of combining a number of tools in one.

Another useful device is a heading or upsetting tool for a vise made as follows: Take old buggy-stubs, cut to

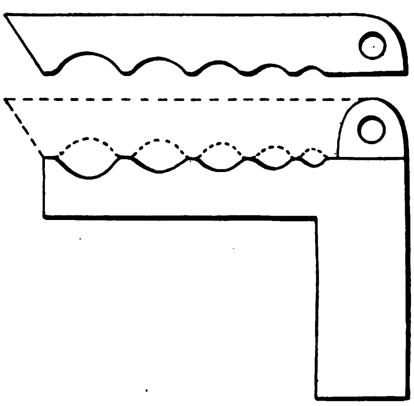

Fig. 1. A HOME-MADE SWAGE FASHIONED FROM OLD BUGGY STUBS.

the length of the vise jaws. Square-fuller a lip $\frac{1}{4}$ inch from top edge to rest on vise. Make a flat spring, as shown in Fig. 2. Fasten to one end securely, so as to hold the jaws, and open them about $\frac{1}{4}$ inch when inserting work. Put a piece of hoop iron $\frac{1}{16}$ inch thick between the jaws, clamp together, drill hole on the line as shown in Fig. 2, and the tool is done.

I have also devised a tire bolt holder which I call "La Grippe." To make one, form a thumb screw $\frac{3}{8}$ inch round, punch a hole in the end and weld in a bit of steel. Sharpen, thread, and harden the point, and you have a first-class tire bolt holder. Fig. 3 clearly illustrates this tool.

It so often happens that portions of old implements or vehicles may be turned to account in the construction

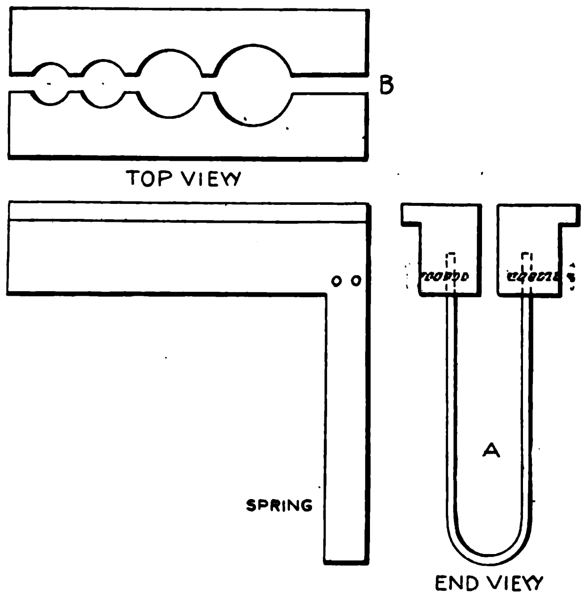

Fig. 2. A HOME-MADE TOOL FOR UPSETTING AND HEADING USES.

of home-made devices that it will pay any smith to have a few such odds and ends always on hand. Old buggy stubs, especially, will work up in almost innumerable ways.

The Grinding Wheel.

BILLY BUNTZ.

So useful is the grinding wheel that certainly it should be of the best. A carborundum or corundum wheel is excellent, although there are plenty of excellent emery wheels.

The grade or hardness of a wheel is determined by the way the wheel is made, or the kind of binding material used to hold it together, while the fineness or grit is determined by the size of the grains or particles. For efficiency, wheels of different hardness and grit should be used on different metals, as one wheel might prove too hard for some kinds of work and only glaze the metal, while another wheel might be too soft and wear away in a short time. The smith needs wheels of different hardness and grit, just as a carpenter requires sandpaper of different grade and number. It is a waste of time to use a very fine grit on heavy grinding and injurious to use a very coarse grit on fine tools. The size and nature of the work determines the size of the wheel. Small wheels from one to twelve inches answer for tools, while plow-shares require a large wheel, one forty inches in diameter sometimes being used, although wheels from twelve to twenty inches are sufficiently large. The grinding surface may be of any width up to about four inches.

Should the smith rely on the manufacturer to furnish a wheel adapted to his work, he should state the kind of metal he wishes to grind, the size of the work, and how fast he wants to do it, giving his previous experience, and stating what trouble he has had with wheels, if any.

The revolutions per minute a grinding wheel should make depends upon its diameter and the compactness of the grain of the wheel. Generally speaking, manufacturers are agreed that a surface speed of between 5,000 and 5,500 feet per minute should not be greatly exceeded, else the wheel might burst, while if it runs considerably slower the wear on the wheel will be heavy. Taking 5,000 surface feet per minute as a basis for the peripheral velocity for all wheels, a wheel six inches in diameter may run 3,183 revolutions a minute, a 10-inch wheel 1,910 and an 18-inch wheel 1,061, while a very small wheel may run at a terrific rate. In order to equal a surface speed of 5,000 feet a minute a 1-inch wheel must make over 19,000 revolutions.

To insure safety, a wheel should be carefully inspected before being mounted, and it is also well to look it

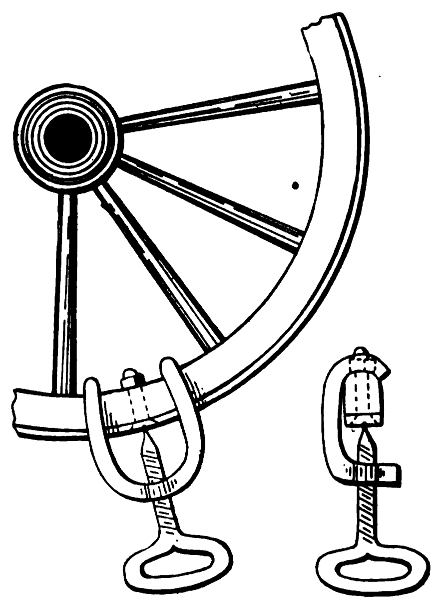

Fig. 3. A USEFUL ARRANGEMENT FOR HOLDING TIRE BOLTS.

over occasionally, as a car inspector looks at car wheels under railroad coaches and by hammer taps learns if they have a clear sound. The wheel

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should not fit too tightly on the mandrel, else its bushing might become heated from the shaft or journal, and expand, causing the wheel to crack or burst. However, it should not be so loose as to wabble.

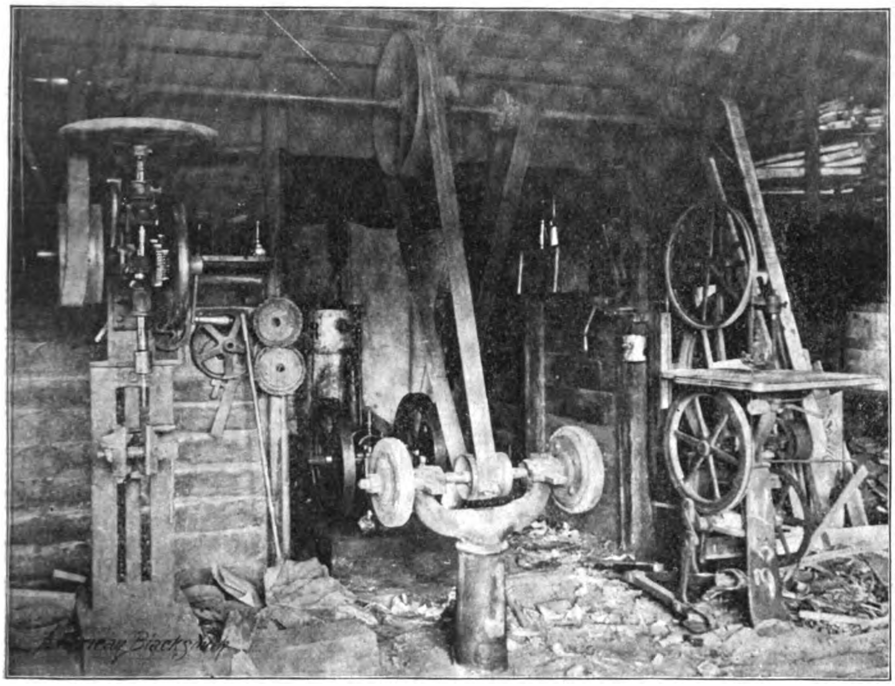
Spindles should be protected from grit by dust-proof collars or shields to increase the life of the bearings, otherwise the journals will probably overheat and possibly become fractured in time, and break. There should be no end-motion. Spindles and stands should be sufficiently strong and heavy for the size of wheel used, and it is better to have them plenty heavy enough than a little too light. A medium-sized wheel and floor base may weigh 400 or 500 pounds, while a large one may scale at 2,000 or 2,500 pounds. Bench stands weigh from 25 pounds to 500 pounds and require a strong fastening to hold them steady, as the wheels run at lightning speed.

On account of the high speed of grinding wheels they necessarily take a large shaft-pulley to drive them, one thirty inches frequently being necessary. As a pulley of this size is rather large for a small line shaft, it is best to drive the grinding wheel from a countershaft. By using a tight and a loose pulley on the line shaft, the countershaft may be switched in or out. A friction clutch is excellent, but its cost is too often beyond the means of the smith.

Grinding wheels may be had of various designs, as cup wheels, cylinder wheels, gummers, etc. For flat surfacing and squaring edges, a ring-wheel fitted in a chuck may be used, which insures better work and more of it than when grinding upon the periphery.

When needing wheels for special work, it is best to write the manufacturer direct, as the jobber usually is familiar with standard goods only.

The engraving shows the smith and wagon shop of I. W. Pirtle & Company, Wilsey, Kan. The floor plan of this shop appeared in the January issue of THE AMERICAN BLACKSMITH. The double emery wheel is speeded direct from the line shaft, which is short and runs as a countershaft. The emery and buffer are used almost constantly on a general line of plow work. These gentlemen state that with their 2½-horsepower gasoline engine, they produce a better class of work and about twice as much in a day as they were able to do with a 3-horsepower steam rig, and at a great deal less expense. They also say that the engine did eight months of shop work on twenty-five gallons of twenty-cent gasoline, or at a cost of five dollars.



SHOP OF PIRTLE AND CO., WILSEY, KAN. CORNER SHOWING BELTING ARRANGEMENT, ENGINE, GRINDER, DRILL AND BAND SAW.

Sharpening and Tempering Mill Picks.

L. A. STANNERT.

The following item will be found very useful to any man who has coal picks to sharpen or temper. The method explained will make them as hard as a diamond on the point. A coal pick sharpened like a needle is not effective. The point should be of a small square section, being flattened out at the extreme end, so that it will not stick in the coal when driven. The harder the point, of course, the better it will cut.

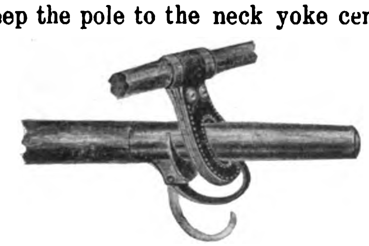
Pour turpentine into a tin pan until it is about an eighth of an inch deep. After hardening the point, place it straight up and down in the turpentine and hold it until it is chilled. Then dip the pick in water to cool it off, and do not allow the temper to run. This will give a small, hard shell on the very point, and the pick will do good service. I have seen picks tempered in this way last four times as long as others. I think the process would be well worth trying, to any one who has this kind of work to do.

Practical Time-Saving Results of Machine Work.

Even where the profit on articles is very small, it is today found more advantageous to do by machinery as much of the work on them as is possible. It is even cheaper in the long run to perform certain "unnecessary" operations by machine in order to make the subsequent processes easier. The reason of this is found in the great efficiency of modern machine tools. In certain lines, these tools have revolutionized manufacturing methods, and new tools are being devised every day for saving labor and cheapening production.

A Novel Safety Pole Tip.

The half tone engraving shown on this page illustrates a neat safety pole tip, which has features that almost every horseman will appreciate. This safety tip has been recently placed upon the market by the Covert's Saddlery Works, Farmer, New York, the manufacturers, and is guaranteed by them to keep the pole to the neck yoke center



A NOVEL SAFETY POLE TIP.

until the safety hook is thrown back. A concealed spring holds the hook in position when either open or closed. It is finished by the manufacturers in japan, silver, nickel, oroide and gold plate, and is not only convenient and ornamental, but costs little more than the common tip which is usually supplied.

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The Ancient Anvil.*

EDNA MANNERS.

To the sound of pick and blasting and the plash of mountain streams,
Where the old black rocks show rusty in out-cropping iron seams,
It has come at man's compelling with fulfilling of his dreams.

To the soulless giant crushing with the whirr of giant wings,
To the hell-like furnace fury that destroys all meaner things,
It has yielded. To man's genius its native wealth it brings.

To the ringing clang of hammers and the discipline of blows,
Its destiny was shaped by man, as at its side arose
Smith after smith, each welding home his life's deep hopes and woes.

They passed, and still its iron heart and ancient iron face
Keep record of those hopes and woes that time cannot efface—
A monument primæval of man's transitory race.

*Written expressly for the February issue of THE AMERICAN BLACKSMITH

HEATS SPARKS WELDS

Success to the smith.

A leaky bellows means lost work.

Let your work speak for you. And the louder it shouts, the better.

Forty blacksmith fires are to be put in by the Great Northern Railway Line, St. Paul, Minnesota.

Has the winter been prosperous with you? Good times, ready cash, shop full of custom? Keep it up!

The brightest fire, the best work and the widest reputation,—these things and the smartest smith go together. Is he you?

Do you encourage the apprentice to read the literature relating to his craft? Now is the time for him to begin and he will thank you in years to come.

Know as much as you can, but don't "know it all." A man may keep on learning about a given subject, even if he knows more than anyone else about it.

Have you thought anything at all about Spring, and the line of work it will bring you? Will you be prepared for it—old tools put into shape, new tools and supplies ordered in ample time?

A neat little folder just issued by THE AMERICAN BLACKSMITH Company tells of the inducements offered to secure new subscribers to the paper. Cheerfully sent on application to those interested.

He is strong who is foresighted. How many times during the year is your shop over-crowded with work? Often enough for you to add an apprentice? Won't odd jobs between rush days keep him going?

Enthusiasm—there's nothing like it and nothing more catching. Be enthusiastic in your work and about your work—you will surprise yourself. Like faith, it will move mountains, and do it more quickly, too.

It is said that attention, application, accuracy, method, punctuality and despatch are the principal qualities for an efficient conduct of business of any sort. Is the blacksmith left out of this? We think not.

Going to try for the prize we are offering—a $50.00 scholarship in the International Correspondence Schools of Scranton, Pa.? Send your name and address at once to THE AMERICAN BLACKSMITH, and get further particulars.

The best craftsman is not necessarily he who works hardest, but he who works most intelligently. Much drudgery can be done away with by modern tools. A man is to be blamed if he toils like a slave over work which he can do quicker and better by improved methods.

To spread knowledge is an excellent thing. Through these columns the wide-awake smith may teach his fellow-craftsmen the lessons which experience has taught him. He can thus be of considerable service to his craft No two persons approach or solve difficulties in exactly the same way.

Advertise yourself. To succeed in these days of great competition, one must push himself and his business forward. Think over some of the many ways of keeping your name before the people whose trade you desire,—as printer's ink, good fellowship, wayside signboards, good workmanship. Adopt such as will aid you.

A smith who finds that he has a considerable amount of any one kind of work to do, can very often by a little thought and ingenuity get up some tool or jig or die to do the work with far greater ease, rapidity and accuracy. This is an age of thought and improvement, and in the smith's trade, as in every other, the man who advances fastest is the one who uses his head.

If the price of shop materials rises and the cost of living also increases, the blacksmith or other craftsman, whose income does not go up proportionately, is in reality receiving a lesser return from an equal amount of labor. There are few localities where blacksmithing and horseshoeing command an adequate return in these days of prosperity and high prices. What is your solution of this problem? Let us have your opinion.

The successful business man takes pride in knowing where to buy to best advantage. Perhaps some of "our folks" have been buying supplies too long in one place, and do not keep in touch with the market. Before adding a tool to the shop, get the leading manufacturers' catalogues and study them. Your judgment will determine what means the most money for you. Too often the dealer's sole viewpoint is the largest margin of profit for himself.

Duty to subscribers is the first law in this office. Hundreds of dollars worth of advertising have been declined because we honestly believed "our folks" would suffer if it were inserted. But it is a good rule, and always means more subscribers and more confidence from them. When a journal follows this rule, reputable advertisers are glad to go into its columns at any cost. This journal never has the thought of making a dollar at the risk of its reputation.

It would seem from recent statistics that a number of women are actually working at the blacksmithing trade all over the Union. They must know more about it than did a certain young woman who lived in an out-of-the-way place in the West. She had a horse to be shod and had to ride ten miles to the nearest town to have it done. She departed in the morning in high spirits, never stopping to ask questions. But alas! in the evening she returned, tired out, and ready to cry with disappointment, announcing that she had hunted the town through for a "shoemaker's" sign, but had found none.

A bull in a china-shop is an old story, but "A horse in a parlor" is surely something new. Nevertheless, that is what it amounts to. A contemporary describes a very up-to-date horseshoeing establishment in one of our large cities, which is called, not a "Smithy," but a "Horse-Shoeing Parlor." The equipment is very gorgeous,—offices carpeted and hung with pictures, white-washed forges placed upon polished, hardwood floors and all the rest in keeping, while the smith, or "proprietor" dresses like a banker and draws an annual income of $15,000. This seems to indicate that the horseshoer's calling is "looking up."

No, indeed, quoth Tom Tardy, when asked if he was in favor of lien laws, and also qualifications for horseshoers. In this whole county, he declared, he did not believe there was one qualified blacksmith. Moreover, he reasoned, that as far as examinations go, a girl may easily learn by heart all there is to know about the trade and answer certain fixed questions, but she could not begin to shoe a horse. On the other hand, he said, he himself knew nothing of the science of horseshoeing, but he considered himself a first-class horseshoer. This is all very true, as far as it goes. He did not weigh the fact that, supposing he could do good work knowing nothing of the real principles of it, he would do much better knowing all about what he was at. The truth in a nutshell is, that theory and practice must go together. A doctor must take a practical course of training after he has finished his study of medicine. Nobody with any common reason would trust his life to the quack who pretended that years of experience without study had fitted him to practice the medical profession.

Tom Tardy will never know just how many horses he has injured and sent to early bone-heaps because of his ignorance. He may make a neat appearing job, but why have so many horses shod by him become lame without cause, so far as he or their owners were able to find out?

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The American Association of Blacksmiths and Horseshoers.

The aims of the above named Association have been described in these columns before, so that it is thought necessary only to mention them here. They are in brief, the adoption of uniform county price schedules to give the smith adequate payment for his work, and passage of Lien Laws by the State Legislatures which will make it possible for the smith to secure prompt and sure payment for his labor.

Two meetings were held during January by the blacksmiths, horseshoers and wheelwrights of Erie County, New York, exclusive of the City of Buffalo, the offices of the THE AMERICAN BLACKSMITH Company being placed at their disposal. Both meetings were well attended in spite of unfavorable weather conditions, and both were equally enthusiastic. At the second meeting, the Erie County Association of Blacksmiths and Horseshoers was organized, a constitution and by-laws adopted, and officers elected.

The Association was unanimously in favor of an advance in prices, and a spirited discussion followed upon the amount of the advance. A vote was taken to determine the sentiment of the meeting, but it was decided advisable to hold over the final adoption of prices until the next meeting. Organization in this County has been secured and perfected by the representatives of the American Association of Blacksmiths and Horseshoers, having its headquarters at 453 Washington Street, Buffalo, N. Y. From the work which has already been done, it is more than safe to predict that Erie County will be enrolled almost to a man and complete prices adopted in a very short time.

The movement under foot, as carried out by the Association and championed by THE AMERICAN BLACKSMITH, is meeting with an enthusiastic reception on every hand. Success seems certain, if we can judge by the reception of our representatives and by the communications upon the subject pouring in from all over the country. And no wonder! It is high time the blacksmith fraternity was improving its material welfare, and if it does not take the necessary steps, surely no one else will. The American Association of Blacksmiths and Horseshoers has been formed for the sole purpose of aiding the craft to take these much needed steps in advance.

In this connection, the following letter, under date of December 22nd, from Mr. E. A. Cornell, of Canton, N.Y., will be of interest. St. Lawrence is the largest county in the State.

"I was much interested in your article in the December number regarding a blacksmith's association, as it refers to the work we have been doing for the past month.

"We have already organized a St. Lawrence County Horseshoers' Association and have enrolled as members about one fourth of the master shoers of the County, which I consider a very good start, as the Association has only been organized about three weeks. At our last meeting, we appointed a committee of six of our best men to canvass the entire County and interest the shoers in the work of the Association. I think by April first, our membership will include at least three fourths of the shoers in the County.

"The object of the Association is to promote concert of action among the members relative to reforming the present methods of competing for work, and in adopting a uniform scale of prices. It is also the object of the Association to eliminate from our ranks all incompetent workmen, who bring discredit upon our trade and do much injury to our patrons. To assist and encourage each other in business necessitates ever being actuated by the peculiarities of brotherhood, which bind us together in a common cause to enjoy the advantages of mutual improvement, and aim to elevate the craft generally.

"The following officers were elected:

"Mr. F. A. Cassada, of Potsdam, president; Mr. I. Cornell, of Canton, vice-president; Mr. E. A. Cornell, of Canton, secretary and treasurer; N. S. Seaver, of Norwood, Wm. Keenan, of Madrid, Anson Butler, of Morley, A. B. VanDyke, of Rensselaer Falls, and David Gilmore, of DeKalb Junction, directors.

"The following price list was adopted:

"New Shoes, No. 5 and smaller, $1.25 per set; New Shoes, No. 6 and larger, $1.50 per set; Flat Bar Shoes, same as Open Shoes up to No. 6, No. 6 and over, $1.00 per pair; Calked Bar Shoes, No. 5 and under, $1.00 per pair; Calked Bar Shoes, No. 6 and over, $1.50 per pair; Cold Setting, 50 cents per set; Setting and drawing up calks, 60 cents per set; Setting and Toeing, 80 cents per set; Plain hand-made Shoes, $2.00 per set; Hand-made Bar Shoes, 75 cents each; Resetting on Track Horses, 75 cents per set; Single Shoe, No. 5 and under, 35 cents; Single Shoe, No. 6 and over, 40 cents; Putting on Pads, 25 cents in addition to price of shoeing; Machine-made Toe Weight and Side Weight Shoes, 75 cents a pair.

"This is a slight advance over the former prices. There have within the last three years been advances in iron and steel goods, including horseshoes from 40 to 45%. And this alone, to say nothing of the advanced price of living, would be sufficient cause for the slight advance in the price of shoeing."

A New Tool Steel and Details as to its Treatment.

One of the latest things in tool steels is the product of the Ternitzer Stahl and Eisenwerke von Schoeller & Co., of Ternitz and Vienna, Austria, as we are informed by the International Steel & Machinery Co., of 245 Centre Street, New York, N. Y., which company is placing this steel on the market.

There are ten grades of these tool steels, each adapted to a different variety of work, the chief of which bears the name of "Express." This is made of styrian ore, and is adapted to rapid work, having the qualities of tenacity, cutting, durability and efficiency. It is claimed, in fact, to be an almost ideal tool steel. Numerous tests at the works have shown that tools made of Express steel can take a cut of 1¼ inches, with a feed of over ¼ inch and a velocity of over 175 feet per minute. These figures demonstrate that with machines of but ordinary capacity, the depth of cut, the feed and the velocity are limited by the construction of the machine only. On special machines, however, constructed to withstand a heavy strain, full advantage can be taken of the enormous durability of the cutting quality of Schoeller-Express tools, and results have been achieved which surpass normal attainments from three to five times. These results of course are obtained on machines with an admissible strain far above the work accomplished, thus avoiding vibration, which would damage any kind of steel.

The most valuable quality in a tool steel is its cutting durability, as thereby, other conditions being equal, the efficiency of the tool and the machine are not only increased in direct ratio, but the cost of production is reduced. The following figures are submitted as showing the capabilities of the cutting steel in working homogeneous iron and steel. In each case, a cut ½ inch deep was taken, and the tool neither ground nor cooled. The actual working time on an iron shaft was 36 hours and 27 minutes, with a cutting velocity of 21 to 33½

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feet per minute, the total weight of shavings being 3,461 pounds. The steel shaft had a cutting velocity of 24 to 33 feet per minute during the working time of 34 hours and 26 minutes. In this period, 91 to 117 pounds of shavings were removed per hour, amounting in the aggregate to 3,448 pounds.

Schoeller & Co. claim that in their department for the production of turned shafting, the capacity has been much increased by the introduction of "Express" steel, and that tools when cutting steel would last from 18 to 20 hours before regrinding.

The treatment of this steel is claimed to be extremely simple. To cut off a piece, the bar should be gradually heated to a cherry-red and cut off with a chisel. If the steel is annealed, pieces can be cut off cold, with a chisel or cold saw, or turned off in a lathe. Further heating of the piece should always be done gradually and uniformly, either on a forge or a charcoal fire. The steel is readily worked at a heat varying from a light red to a cherry-red, and after forging, the tool should be cooled off slowly. Before hardening, the cutting edge should be ground off, to remove the scale. The hardening heat depends upon the work to be done and should be from a cherry-red to a white heat, according to the hardness of the material to be cut. The hardening is done by cooling the cutting edge more or less rapidly, that is to say, the harder the edge is required, the quicker the tool has to be cooled. In ordinary cases it is sufficient to let the tool be cooled off in the atmosphere, but where the utmost degree of hardness is essential, the tool should be brought to white heat and cooled off in a blast.

Midwinter Reflections.

After the first six weeks or so of novelty, as it were, during which the accumulated repairs from last spring have poured in and been disposed of, the winter is bound to fall flat. It is not yet time to begin to prepare for

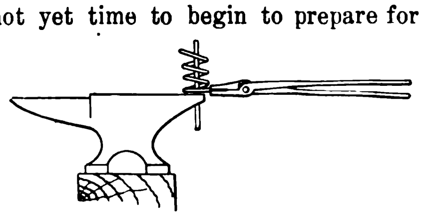

Fig. 1. STRAIGHTENING A COIL SPRING.

spring, so the spring implements and vehicles lie away to be rushed in for repairs just as the winter ones were. This dulness of midwinter is felt in almost every branch of trade or business.

The days are still short, and the smith must get up by candle light, and work until after sundown if he means to make anything. However, the winter has its advantages, even dull February. What about those bright crisp days when the ring of the horses' hoofs and

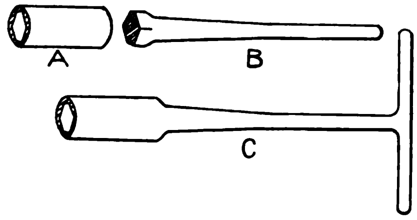

Fig. 2. A HOME-MADE SOCKET WRENCH.

the sleighbells seem frozen into the very air; when loads of red-nosed, red-cheeked neighbors, bundled warm to the eyes, pull up to have their horses sharpened or a whiffle-tree mended? Busy times! The long evenings, too, afford an opportunity for extending friendly and neighborly relations, in the shape of social gatherings, spreading the smith's reputation and popularity.

Last, but not least, for those who wish to push ahead and make a science of their craft, the winter presents unlimited opportunity. In the larger towns and cities, the night schools place a training within easy reach; while for any smith, in country or city, the Correspondence Schools offer good, solid courses. Then, between whiles, in the minutes that might be spent in idleness or grumbling, the smith may read his trade journals and literature, and think about them a bit. Thus he will have laid up ideas that will come handy in the days when it is almost too hot to think.

After all, February is a short month, and the days are gradually lengthening out. The philosopher, looking beyond old Lion March, can already see the spring.

A Few Useful Shop Notes.

BY C. C. H.

To straighten out a coil spring, heat it to a red heat, place it on a rod or bolt in the hardy of the anvil, and pull it out straight by one end.

A piece of ½-inch round steel drawn down to $\frac{3}{32}$ inches thick and $\frac{11}{32}$ wide, will save lots of time in making wedges for buggy spokes. This may be made larger for large sizes of tenons. Drive it into the end of the spoke, and push the wood of the tennon in. This forms a wedge which cannot be beaten.

Do any smiths have trouble getting guards off a mowing machine? If so, they can save time by making a $\frac{7}{16}$ or ½-inch socket wrench, such as indicated at A, Fig. 2. I also show two forms of very handy wrenches which can be made of any size and length, as desired.

Any one can make an end wrench, but there are many different ways of doing it. I recently had a hexagonal wrench to make for a four-inch nut, six inches deep. The way I went about it was to form a hexagonal ring, A, Fig. 3, and then a shank, B, welding these two pieces together. By jumping on a handle the wrench was completed.

A Youthful Craftsman's Experience with a Gas Engine.

JOHN SCHAFFER.

I have a 6-horsepower White gasoline engine (which is a little too large for a common repair shop), and I run it at about 220 revolutions per minute. I run my grindstone and disc sharpener from the same pulley and I have a 3½-inch pulley on the shaft, a 4½-inch pulley on the grindstone and an 8-inch pulley on my disc sharpener, with a 3-inch belt. I run my circular saw with a 24-inch pulley on the shaft and the same on the drill. I use wooden split pulleys which do very well. With regard to a gasoline engine, I must say that it is one of the best investments a man can make in a blacksmith and repair shop. An engine is always ready

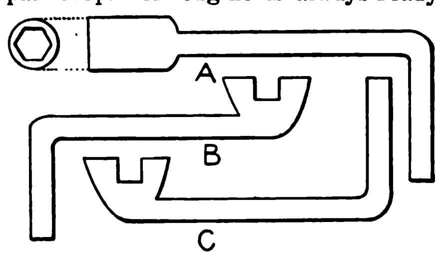

Fig. 3. A NOVEL AND SIMPLE WAY OF MAKING AN END WRENCH.

to work, and it takes only a minute to start them. They do not cost very much; and, as I am only seventeen years old and have run one for three years, I may say that they are very easy to operate, after you understand them. At first, I did not know anything about them, and I had some trouble, but now I have no trouble at all. Some blacksmiths think they are dear. So they are; but they will pay for themselves in two or three years. They do not cost much to run, and, when they are not working, they do not cost anything. There are no grates to burn out, no flues to leak, and no smoke-stack to rust to pieces; no clinkers and ashes to carry out and no wet and dirty floor, as with steam engines. I have used a tread-power, but I would not trade my engine

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for ten tread-powers. They are horse killers; besides, you have the trouble of looking after a horse and the expense of his keep.

I run my engine with a battery altogether. I have used the same battery for three years, and it is good yet. I keep it a little warm in the winter. The water tank is something that has to be taken care of in cold weather, as well as the water jacket. In winter, I close the valves in my tank, and let the water out of the pipes and cylinder jacket, below the cylinder. I take away my big tank, which holds five barrels, and put a barrel in its place. When it is very cold, I can warm the water in about an hour. If I cover it, it keeps warm for one or two days and will not freeze. The cost of oil is not very much. I use about five gallons a year.

Diseases of the Foot and Their Treatment.—13.

B. MAYHEW MICHENER, V. M. D.

Ringbone.

By the above common name is known that diseased condition of the first and second digital bones, situated between the fetlock joint above and the third digital bone which is contained within the hoof. The disease is characterized at some period of its duration by appreciable enlargement of the surface of the bone, or bones, involved. The enlargement commonly encircles the digit more or less completely, hence the common name given the condition.

Like other diseases of the bone and its covering, ringbone is the result of an inflamed condition of the parts involved. The location of the primary inflammation differs in various cases; for example, the periosteum, or covering of the bone, may be inflamed as the result of blows or by violent traction upon the various tendons and ligaments of the part. In other cases the first injury is to the articular surfaces of the joints between the first and second or the second and third bones of the digit. In certain cases, the two varieties of cause are operative in the same case. The symptoms of ringbone are, as a rule, positive enough to enable the experienced examiner to determine whether the disease is one of the periosteum alone, whether the insertion of the ligaments is involved, or whether the articular or bearing surfaces of the joint be diseased. The location of ringbone caused by direct blows depends entirely upon the location of the injury, and may thus be located at any part of the first and second digit, frequently from some injury as, for example, such as caused by a tread inflicted by the opposite foot of the animal, or from its mate in the team. Persistent lameness is rarely caused by injury of this kind, and the enlargement may gradually disappear. When, however, the cause is due to injury of the attachments of the ligaments, the enlargement rarely encircles the bone, but appears as prominences upon one or both sides of the digit. The enlargement may be seen by standing directly in front of the animal, and may be detected by the touch by stroking the digit from above to below between the thumb and forefinger.

When the trouble is divided between the second and third digital bones, the enlargement is partly contained within the hoof, and shows itself as a rounded prominence of the coronet. Lameness is generally present to greater or less degree during some period of the existence of this form of ringbone. The lameness is noticed at the exact moment the foot touches the ground in traveling, and generally becomes more severe with exercise or work. Prolonged rest commonly results in a diminution of the lameness during that period, to return again with work. Lameness is commonly rendered more noticeable by turning the animal in a small circle, when, if one leg only is diseased, the lameness is more noticeable when the animal is turned toward the diseased side.

In the form of ringbone originating from inflammation of the articular surface of the joint, the enlargement takes the form of a ring, or prominence encircling the bone, and may be detected by touch on sides and front of the bone, but not commonly behind the digit, where it is covered by the passage of the large flexor tendons. The most common location is on the second bone of the digit, and hence the prominence is noticeable at the coronet. The best position to view this form of ringbone is directly to the side of the limb.

Certain cases show the ring of enlargement upon the lower third of the first digital bone. These are sometimes called high ringbone, in contradistinction to that form in which the enlargement is around the second digital bone, when it is known as low ringbone. The lameness of low articular ringbone is generally severe, and is by far the most persistent and difficult to remedy. Exercise or work generally causes an increase in the severity of the lameness. The enlargement in ringbone is caused by a deposit of lime salts in the periosteum, or covering of the bone, as well as in the ligaments of the joints involved. The deposit may progress to such extent as to limit the movement of the joint to greater or less degree, or even to entirely obliterate it, by causing the two bones to unite in one solid mass. Defective movement of the joint may be detected by raising the foot and attempting to move it at its diseased joint. As a result of such extensive changes to the parts, the stride of the animal is shortened, the digits acquire a perpendicular position, and the muscles of the shoulder may waste away on account of the limited amount of use they are called upon to perform in extending the limb.

Causes of Ringbone.

Direct blows, as before mentioned, may be a cause, but commonly only the most unimportant cases are produced by such cause. Faulty conformation is certainly an important predisposing cause. Fetlocks that are too slanting are predisposed, caused by over amount of tension upon the ligaments of the joints involved, as in such cases the line of weight is placed too far back of its base of support. The front limbs are more liable to ringbone than the hind ones, on account of the greater load of body weight sustained by the front extremities. In that conformation in which the toes are turned either inwardly or outwardly, a disproportionate amount is thrown on either the inner or outer half of the joint, and also unequal weight falls upon the inner or outer side of the articulation. Abnormally straight fetlocks are predisposed to articular ringbone, on account of the weight blow falling directly upon the bony surfaces of the joint, for in such conformation the impact of the weight is not properly divided among the bones and the more elastic structures of the tendons and ligaments, which in a perfect limb all receive due proportion. Neglected feet in which the weight is improperly distributed is certainly a prominent cause. Many colts are damaged to greater or less extent by simple neglect of proper care for the growing hoof. Unequal paring of the hoof is also a cause. If one side of the hoof is allowed to be higher than the other, clearly the distribution of weight must be unequal. Allowing the shoe to remain on too long, and the consequent deformity of the hoof, is a common cause among farm horses during the winter months. Severe strain, as from

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work on irregular footing, is sometimes a cause. The wedging of the foot or shoe in car tracks is not a rare cause of ringbone in city horses.

Treatment.

The results of treatment of ringbone are frequently difficult to foretell. In cases where the enlargement is confined to the first digital bone, the chances are better than when the second digit is involved. In the articular form the animal never becomes sound, but may become serviceable for certain kinds of

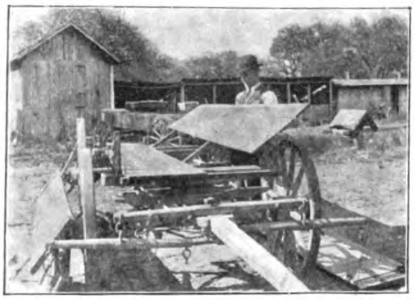

Fig. 1. FOLDING WAGON BOX. CONSTRUCTION OF THE FLOOR.

work. The size of the enlargement may not be in direct proportion to the gravity of the case, but, as a rule, enlargements of the front of the joint are far more serious than of the sides of the articulation. Where the angle of the fetlock is altered, recovery from lameness is extremely doubtful. Bad conformation renders recovery less certain. The treatment consists in removing the cause, if such be possible. Careful balancing of the foot is of the greatest importance in all cases. If the fetlock be slanting, the toes should be shortened, or the heel raised, or both. Generally the hoof is best left unshod during treatment, but some cases may require a thick-heeled shoe. The application of blisters composed of cantharides ointment, eight parts, to the red iodide of mercury, one part, is useful. The blistering should be repeated once every two weeks for a period of from one to two months, or longer. Deep firing with thin platinum or iron points is one of the most useful forms of treatment, but the operation requires a knowledge of the minute anatomy of the parts, as penetration of the joint in firing may be fatal. The firing should be deep, and the points of the instrument should penetrate the surface of the diseased bone. When firing and prolonged rest fail to render the animal serviceable, the one remaining form of treatment consists in dividing the digital nerves. This operation is frequently successful, provided the movement of the joint is not limited by the amount of ringbone deposit. Not unfrequently, complications following section of the nerves cause degeneration of the foot, which necessitates the destruction of the animal. Animals showing ringbone should not be used for breeding purposes, especially if the conformation be defective.

(To be continued.)

A Novel Folding Wagon Box.

A new contrivance has lately been placed on the market, in the shape of a folding farm wagon box. Every farmer, more or less frequently wishes to remove his wagon box from the running-gear. With the old style box, this is a heavy lift for at least two men, depending on the size of the bed, on account of its weight, cumbersome shape and liability to bind between the standards of the bolsters in wet weather. The folding box as manufactured by the Folding Wagon-Box Company, of Haverhill, Ohio, is built in separable sections so that a boy old enough to drive a

Fig. 2. THE SIDE BOARDS—METHOD OF FASTENING.

team can easily and quickly put it on or off the running-gear anywhere, without tools. The claims of the makers are as follows:

It cannot bind between the bolster standards when being removed from the running-gear in wet weather. It occupies less than one-tenth the storage space of the old style box when not in use. It is more durable than the old-style box, because it can not be wrecked or broken in handling as is the old style box.

The floor is built in two separate pieces that meet in the center with a tight ship-lap joint. The lugs that extend along the floor are firmly secured to the ends of each cross-bar and prevent either floor or side boards spreading, thus insuring a perfectly tight box. A neatly braced side step serves the usual purpose of step and brace to side boards. The end gates complete the box, making a rigid, durable farm wagon box. In removing the box from the running-gear, the ends are first taken out. The side boards next infold and the bottom is taken out last.

Fig. 1 shows the construction of the floor of the box. It is made in two sections, length-wise. The cross-bars extend the full width of the floor as in the old style box. Fig. 2 shows the construction of the side boards and the manner in which they are secured to the floor. Hooks on the side boards pass under the end of the cross-bars and bind the floor and side boards firmly together when the side board is raised vertically. Fig. 3 represents the box complete.

The patterns and dimensions of all woodwork are the same as commonly used in wagon boxes. A set of special irons is all that is necessary to enable any wagonmaker with the usual tools and dimension work to turn out the folding box easily and cheaply in his own shop.

All these points of excellence claimed by the manufacturers must go to recommend the new box to the farmer who is in search of improved methods. Actual test is the only proof of the merits of a new article.

The box is made in both the standard widths, narrow tread, three feet, two inches and wide tread, three feet, six inches. All boxes are ten feet six inches long outside—with the boot, they are eleven feet, six inches.

Report on Flue Welding.*

T. J. RIGGS.

Among the many features connected with economical shop management, there

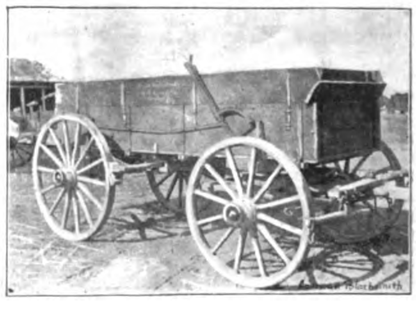

Fig. 3. THE FOLDING WAGON BOX COMPLETE.

is no more deserving of close study than the best method of welding flues.

The first to be considered in this line is the formation of the joints. This may be done by the lap weld, the butt weld, or the scarf weld. The butt weld, we will not discuss, as I believe it has passed into disuse. The lap weld in which the tube is enlarged sufficiently

* Read before the Chicago N. R. M. B. A. Convention.

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to admit the other end, which has not been previously scarfed down, is in my opinion not a proper form of weld. And the two objections, which I will mention, seem to me to overbalance any good points connected with it.

First: The tube being enlarged sufficiently to be shoved over the safe end, the belt of the metal is thereby merely doubled. The result is that when it is subject to the pressure of the rollers, the excess metal will form a ridge on

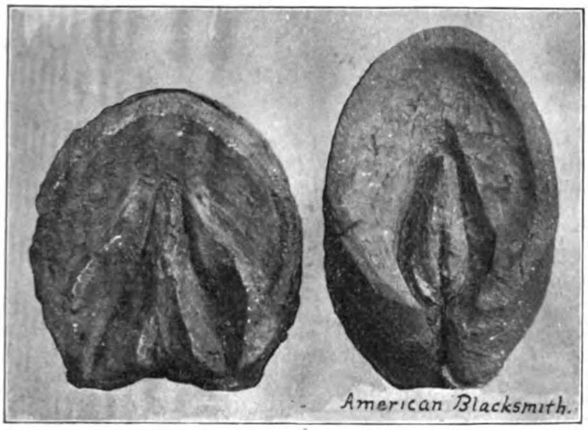

Fig. 82. GROUND SURFACE OF NORMAL HOOF. Fig. 83. VIEW OF CONTRACTED HOOF.

the inside of the tube, thereby reducing the size smaller than its natural calibre. Although this reduction may be from $\frac{1}{8}$ to $\frac{3}{16}$ inch, yet in a whole set of flues, the reduction in size will to an extent affect the draught and render the flue more liable to be plugged or closed.

Secondly: If the flue is expanded by a mandrel, there will yet remain a certain amount of dirt at the joint. This, upon being heated to a welding heat, becomes dross. This dross during the process of welding, if done by the roller, forms into two masses and is deposited just back of the point at which the rollers come into contact with the flue, and as this will not fuse with the metal of the flue, you will have two spots on each which have been welded. This may or may not leak, but they both go to weaken the weld, which in this class of work should be perfect.

I wish now, for a moment, to draw your attention to the scarf weld. By this process we ream out the flue to a distance of $\frac{1}{2}$ an inch. The safe end is accordingly pared down and when placed within the scarfed end of the flue, forms a close and clean joint. Both the outside and the inside of the flue are thereby kept in the same line, and, as the pressure of the weld is brought upon the flue the metal will not upset and form itself into ridges and masses, but will be brought into direct contact with the other. Another point in this weld is the clean joint which is formed, there being no chance for dirt or grease, as this is entirely cleaned off by the reamers.

The machine used by us at the Buffalo shop, enables us to both weld and swedge down the end for the flue sheet on the same heat.

The method fully described above seems, all things considered, to have more advantages than any other. The results obtained by following it are both practical and satisfactory in all cases.

The Scientific Principles of Horseshoeing.—16.

E. W. PERRIN.

Contraction of the Hoof and Foot.

Contraction of the hoof, and in serious cases of the foot also, is, as its name implies, a shrunken condition of the parts, which usually affects the front feet. It is also formed in the hind feet to a limited extent, but it rarely causes lameness in them.

Contraction may be very slight, or it may be so serious as to cause structural changes in the foot as well as the hoof. Figs. 83 and 84 are typical cases, the result of long years of neglect. Fig. 84 shows the foot out of the hoof—observe the narrow dimensions of the heels, and the cramped condition of the sensitive frog. Of street horses 75 per cent. are affected with contraction in some of its various stages of development. We have contraction of the heels and frog—the most common—contraction of the quarters, contraction of the sole, and sometimes contraction of one heel and quarter, producing a condition commonly known as "wry hoof."

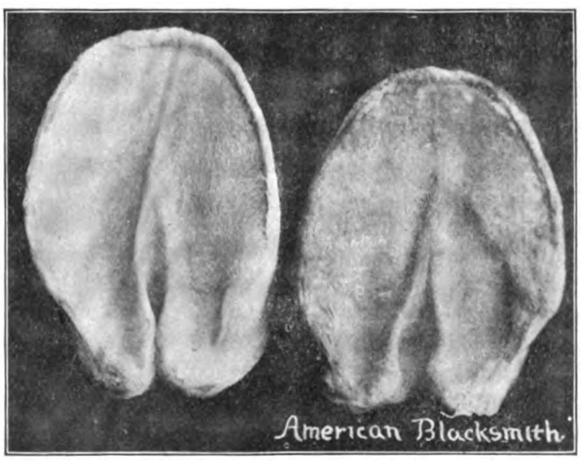

Fig. 84. CONTRACTED FOOT DENUDED OF HORN. Fig. 85. NORMAL FOOT DENUDED OF HORN.

An early symptom of contraction, before any marked change in the dimensions of the hoof is perceptible, is a dry, hard condition of sole and frog, with some rise of temperature and soreness, as evinced by concussion with a shoeing hammer. If this condition, which is the incipient stage of the disease, be not promptly relieved, the hoof begins to shrink, the median and lateral lacunae—which in a healthy hoof are wide—get narrow and deep, and the points of the heels turn in on the frog, slowly crowding it out of existence; atrophy sets in; it wastes away, and as the frog diminishes in size, the heels close in upon it, slowly producing the condition seen in Fig. 83. If there is much contraction, corns will be present also; thrush in the frog usually accompanies contraction; in fact, contraction is the forerunner of many other diseases of the foot.

In a healthy foot, the heels are somewhat wider at the ground surface than at the coronet, while in a badly contracted foot the very opposite is the case. The horse with contracted feet, if not actually lame, will have lost the elasticity of step and freedom of movement. He steps short and is very prone to stumble. He hobbles along.

The most prolific causes of contraction are: Want of moisture; concussion resulting from fast work on hard roads; want of frog pressure; thinning the sole and rasping the outer wall; leaving the shoes on too long, thereby allowing the hoofs to grow abnormally long; the use of seated shoes; unlevel hoofs; improperly fitted shoes, and neglect of the hoofs in colthood.

As to treatment, in the early stages of contraction before perceptible change in the dimensions of the hoofs has taken place, poulticing the feet with warm wet bran, or soaking in hot water three or four times a day, or turning the horse out in a wet pasture for a week or so, is usually all that is necessary to restore freedom of movement and comfort in travelling. This of course must be followed by proper shoeing. But wherever change of shape has taken place,

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where the hoof is contracted, a course of treatment is necessary to effect a cure. First remove the shoes and reduce the hoofs to normal dimensions, then the hoofs must be softened by poulticing or soaking for three or four days, so as to get the horn soft enough to admit of expansion. When the hoof is thoroughly soft, use a pair of expansion springs (see Fig. 86). To apply the expanders, take a small saw and saw a deep slot at the point of each heel, the same as you would "open up" the heels. You may do this with a shoeing knife, but you can make a much better job with the little saw supplied for that purpose. This slot must be cut down close to the vascular structure, so as to facilitate expansion. Make a small hole on the inside of each

Fig. 86. GROUND VIEW OF HOOF WITH EXPANDER SPRINGS APPLIED.

heel to receive the points of the spring, and take a spring that when released is from $\frac{1}{2}$ to $\frac{5}{8}$ of an inch wider than the hoof. Compress the spring with the tongs supplied for that purpose, insert it in the holes made for its reception, then release the spring and the pressure will retain it in its place. However, a strap is usually attached to the spring and buckled round the coronet to guard against its being lost even if pulled out of the foot. Let it be understood that this expansion process must be done gradually. Therefore much care is necessary in selecting a spring that fits, as too much forcible expansion will be followed by acute pain. All these changes in the hoof must be brought about gradually. You will find it good practice to use the spring first in the morning, and watch the effect. If the animal evinces much discomfort, use a smaller spring. Take them out at night for the first day or two, after which they may be worn night and day. As soon as the lameness is over, the animal can go back to work wearing the springs, but the feet should be poulticed or soaked every night.

In shoeing, if the frog is sound enough to bear its share of weight, shoe with a bar shoe or rubber pad, so as to obtain frog pressure. If thrush be present, as is often the case, shoe with an open shoe until the frog is healed and grown up strong; the normal pressure should then be restored. Now as the hoof slowly expands, you'll find the springs getting loose, which indicates that a spring one size larger may be used. A hoof badly contracted may need three or four sizes of springs during a course of six months' treatment. After the first month, the hoofs may be kept soft enough by stopping with wet clay regularly every night, but the hoofs must be kept soft, as the expansive treatment is inoperative on a hard, dry hoof; therefore, if in your judgment the hoof is dry, poultice again for a few nights.

There is no question of the effectiveness of this treatment for the cure of contraction, provided these instructions are properly followed. You can expand a hoof a half inch in the first six weeks of treatment. Once the normal dimensions are restored, of course no more expansion must be applied. I need hardly say that in cases such as Figs. 83 and 84—from photographs of foot and hoof in my possession—in which structural alterations have taken place, even in the bones of the foot, the result of long years of gross neglect, that although some improvement may be effected, a cure is impossible.

By the term "wry hoof," is meant a hoof that is contracted on one side only, —usually the inside heel and quarter of a front foot, though occasionally a hind one is similarly affected. The outside grows out wide and shallow, tilting the foot to one side (see Fig. 87). Neglect to reduce the surplus growth on the outside aggravates the trouble, seriously disturbing the pastern and foot. I have seen two cases where the inside wall had turned in and overgrown the frog, so that the animal was actually walking on the inside of the hoof. Neglect of the feet in colthood, causing distortion of the foot and pastern while the bones are yet supple, followed by gross neglect in not keeping the hoofs properly pared, is the cause of wry hoof. The principle of treatment is practically the same for wry hoof as for other forms of contraction, except in the manner of reducing the hoof to normal dimensions, for which see dotted lines in Figs. 87 and 88. To expand the contracted side of the hoof, draw down a small clip on the inside of the heel of

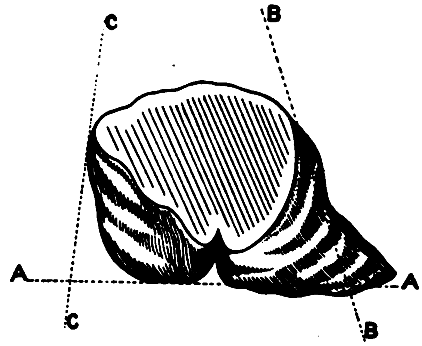

Fig. 87. REAR VIEW OF WRY HOOF. OUTSIDE OF A A AND B B IS SURPLUS HORN. THE CONTRACTED SIDE SHOULD BE EXPANDED TO LINE C C.

the shoe on the sound side of the hoof. This clip is to fit down into the lateral lacunae. Punch a small hole in this clip to carry the point of an expansion spring on that side of the hoof. Insert the point of the spring into the hole in the clip on the one side and into the contracted hoof on the other side. Nail well round to the heel on the sound side of the hoof, but only on the inside toe of the contracted side. The pressure of the spring thus applied will slowly force out the contracted side. If you find the growth of wall is tardy on the contracted side, stimulate the coronet on that side of the hoof only. If the foot and pastern are somewhat distorted—as is generally the case—and

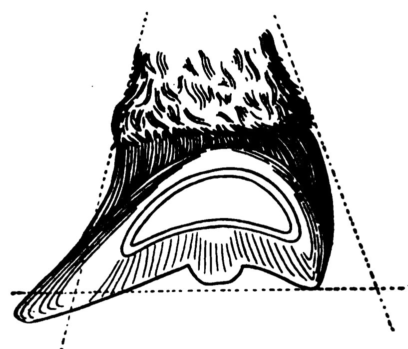

Fig. 88. VERTICAL CROSS SECTION OF WRY HOOF —FRONT VIEW. DOTTED LINES SHOW HOOF TO BE REMOVED AND EXPANSION NECESSARY.

the animal is full grown, the bones and articulations being set in that position, they will remain so; and in such cases the hoof will always grow abnormally wide and long on the one side, while the other side will contract. The only time to obviate this deformity is in colthood. Once the animal is grown, all

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you can do is to keep on restoring—as nearly as possible—the normal dimensions of the hoof at each shoeing, about every three or four weeks, because the abnormal growth of hoof to the one side greatly aggravates the distortion of foot and fetlock.

Where the sole only is contracted, normal conditions may be restored by reducing the hoof to normal dimensions, poulticing for a few days, and following this by the use of bar shoes, a leather sole, and tar and oakum.

(To be continued.)

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QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

Corns—I should be very much pleased if some brother smith would give a sure cure for corns on horses' feet.
E. O. BROWN.

How to Temper Gun Springs—Will some brother smith give me a method of tempering gun springs and articles of a similar nature? W. L. PHILLIPS.

Water Foundered Horse—I would like to know through the columns of THE AMERICAN BLACKSMITH, the best method to shoe a water-foundered horse.
P. H. SENN.

How Sharpen Horse Shoe Rasps?—I should like some brother of the craft to tell me if it is possible to sharpen horse shoe rasps when they get dull, and how?
J. H. L.

A Question on Wagon Tires—I should like to know why it is so difficult to shrink wagon tires so as to stay tight on the wheels, as they are when cut and welded. G. W. BOOTHE.

Axle Work and Tempering Gun Springs—I should like to know the best rule for setting buggy axles and laying off wooden axles; also the best method of tempering gun springs. W. HARGUS.

Fastening Spokes and Metal Wheels—Will some brother smith tell me the best method of fastening spokes and metal wheels, which are loose both at the hub and at the tire? CHAS. SHERMAN.

A Painter's Question—I should like to know how to use chamois skins, pumice stone, water, rubbing stone bricks, etc., so as to best secure a good smooth surface for painting. C. D. BRIDDELL.

Ring Bone—When shoeing for ring bone on the outside of a horse's foot, I use a very heavy calk and let it run down the middle of the shoe. By tapering the toe of the hoof, I find that much relief to the foot can be secured. A. G. SMITH.

A Plow Welding Question—I should like some brother smith to tell me how to make a good plow point without burning when taking the welds on the upper parts. What is the best kind of coal to be used, and how should the fire be made for this purpose? P. G. COLLINS.

Curb—I should like to know if there is any special way to shoe a horse which is a little inclined to be curbed in both legs. He will be three years old in May. I have blistered him but without effecting any improvement, and would like to know if there is any special shoeing which will help. CHAS. SHERMAN.

Cutting Nuts from Bolts—Regarding the question of Mr. Bruton in the January issue, would say that my experience is that the chisel and hammer is the cheapest and best tool for this purpose, although I have a pair of bolt clippers which are extremely useful in the places where I can use them. IRA MUNSON.

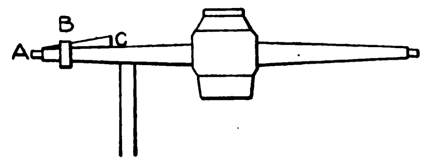
Oil Furnaces for Brazing—I would like to have some information regarding oil furnaces suitable for brazing. I would like to know how to make such a furnace, or where they can be bought. I am at the side of a large grist mill, and have a large number of castings to repair at the present time. W. B. WOLF.

Cracking of Steel—If Fred Barney will temper his drills and tools in warm water, keeping the cold air from striking them, as he takes them from the water, he should not have any trouble from temper cracks. If the heat is taken uniformly, the fault usually lies in the cold air and cold water and not in the steel itself.
B. B. MALLORY.

Rubber Tires—Will some one who has had practical experience with rubber tires, please explain the process from start to finish? I have a tire shrinker and wonder if it could not be used to shrink the flange tires, with some attachments.. What is the best apparatus for tightening the wires, and what method is best for brazing them? J. H. JENSEN.

Oil Furnaces—Noting an article in the December issue on the oil furnace, I should like to know where I could get information as to how to make such a furnace. I wish to put one in my shop for welding boiler tubes and other work, such as ordinary blacksmithing. I should also like to know whether I could get one which would also be suitable for melting iron. PETER HANSON.

How Keep a Shoe on? To Draw Old Spokes—Will some good brother tell me how to keep a shoe on a horse? He throws his right front shoe. I have tried different plans on him, but all have failed.



A GOOD METHOD OF DRAWING OLD SPOKES.

To draw old spokes, make three or four bands about 1½ to three inches out of 1½ inch band iron. Slip the band, B, over the spoke, A, then fit a good hickory wedge, C, inside the band next the spoke, and drive on the wedge. I have drawn some very bad spokes in this way. J. P. WINGARD.

Three Blacksmithing Questions—Is the water tuyere iron the best for general blacksmithing, and if so, how low down should the same be put?

How is a hollow fire built and of what benefit is the same?

How should a piece of round iron be scarfed which is to be jumped on to a piece of flat iron so as to stand perpendicularly on the same? EDWARD ADAM.

Construction of Small Furnace—I would like very much to hear from any one who has had experience in this line of work, as to how to construct a small furnace to heat springs for the purpose of tempering them. I have to make a lot of springs three feet long, ⅜-inch thick and four inches wide, and would like to know about a furnace to temper them. Please help me out. W. J. YOUNG.

A Tempering Question—We have been tempering gun springs by heating to a red, dipping in water and drawing the temper by reheating. Having been told that there is a way to temper them by simply dipping in a specially prepared solution, we would like some brother to tell us how to make the solution through the columns of THE AMERICAN BLACKSMITH. LEMMOM BROS.

Small Gas Engines—Speaking about a one-horsepower gas engine, the Weber Gas & Gasoline Engine Company, of Kansas City, Mo., states that while such engines may, for ordinary purposes, be large enough, the usual trouble with engines so small is that they are very soon placed on a 1½-horsepower or larger pull, which is about the same as overloading a horse. The consumption of gasoline by the engines built by this concern, they inform us, is proportional to the pull, and further, that such an engine, while it costs but little more than a one-horsepower engine, can take care of larger loads without any trouble and without the likelihood of wearing them out and sending them to the gas engine bone yard.

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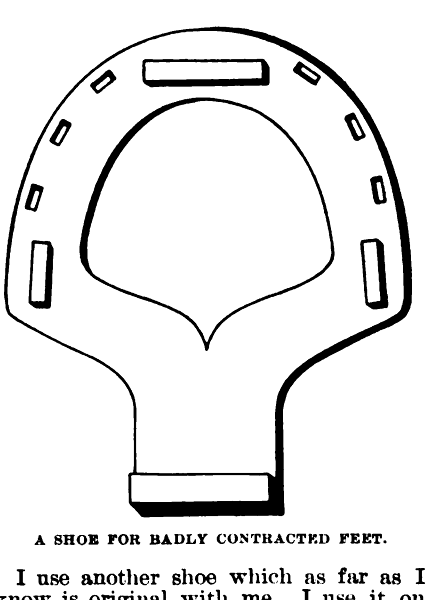
Tempering Mill Picks—In reply to the question of Mr. E. Sager for tempering mill picks, my advice would be to heat the same as you would heat a cold chisel, and dip the pick about one half of an inch deep into a can of mercury until it cools. From my experience this will give the very best results that can be obtained.

I should be very glad as a blacksmith to tell my brother smith anything that I can in the way of tempering tools. E. YOCUM.

To Make Shoes Stay On—In answer to Brother W. H. Hahn's question about the above, I should say in the first place that it is necessary to have a full bearing and to make the shoe fit the foot, but do not rasp the foot down to the shoe. Do not cut a groove to clinch the nail in, and only rasp until smooth. Use the Putnam nail and turn it down instead of twisting it off. They will twist in the foot before twisting out and also you avoid tearing your hands and apron. W. F. REMINGTON.

The Gas Engine in the Shop—I have been noticing a great deal in THE AMERICAN BLACKSMITH about gasoline engines. My experience is that the Canfield Gas Engine made by P. B. Canfield, of Binghamton, N. Y., is an excellent engine for the blacksmith. I have a three-horsepower Canfield engine, and with it in my shop am running an eighteen-inch blower, an iron lathe, a wood lathe, a drill, emery wheel, rip saw and a jointer. By means of another belt, I drive with the engine a saw out-of-doors, which will cut at the rate of from fifty to sixty cords in ten hours. C. HALL, JR.

A Shoe for Corns—I notice on page 58 of the December issue that Mr. J. H. Dietrich claims to have an original form of shoe. I have been using this same kind of shoe for several years myself, although not for the purpose which he does. I use them for a horse which has a quarter cut off on a barb wire and which has grown a false quarter.



A SHOE FOR BADLY CONTRACTED FEET.

I use another shoe which as far as I know is original with me. I use it on badly contracted feet, or feet which have very sore corns; also in cases of navicular joint lameness. I have had very great success with it. The accompanying drawing shows the shoe. The flat piece goes directly over the frog and has the heel turned up on it exactly as on any shoe. It is a splendid shoe if a horse is working on pavements and I would recommend it in such cases. T. R. THOMPSON.

Tempering Mill Picks—If Mr. E. Sager will take one-half ounce of corrosive sublimate, one ounce of salammoniac, one hand full of common salt, to one gallon of rain water, he will find this a splendid tempering compound for mill picks. He should use great care in heating his picks to hammer them, and not to get them above a cherry red. After he has hammered them, let them cool off perfectly cold before tempering. When he gets ready to temper, heat the picks to a low cherry red as far up as he wishes to temper, plunge into the solution and leave until cold. Do not draw the temper. Treat the other end of the pick in the same manner. B. B. MALLORY.

Case Hardening — Referring to the method which Mr. Willard Mann gives on page 58 of the December issue for case hardening with prussiate of potash, it seems to me that his method is only skin deep. In my opinion the following is the best known way for case hardening: Pulverize and dissolve in one quart of boiling water, an ounce of blue vitriol, an ounce of borax, an ounce of prussiate of potash, an ounce of charcoal and half a pint of common salt. Add this to one gallon of raw linseed oil. Finish the work to be case hardened for polishing. Heat it to a cherry heat and immerse the piece, stirring the mixture while it is cooling. In this way you can make edge tools out of iron, or cold chisels for cutting soft metals, such as brass, copper, babbitt and soft iron. E. YOCUM.

The Apprentice Question — I enclose money for my next year's subscription, which I consider a dollar well invested, even though I am nearing the day when I shall cease to be in active service. If I could wield the pen to my liking, I would challenge some brother smith to write upon some questions not yet dealt with. For instance, I should like to know how and where we are to get the smiths which will be needed soon. Are we instructing those who are to fill our places? I do not know of one young man in all my acquaintance who is receiving instruction in the craft. A few years ago I had occasional applications from those who claimed to be skilled workmen, but in the past year, I have not had one applicant. This may be due to the prosperous times, but I hardly think so. WM. L. HINMAN.

An Opinion on Power—With regard to power in the shop, two men can take a 2-horsepower gasoline engine and make more money with it than five men can without power.

I have a 3-foot grindstone with which I can grind my tools and make $200 a year grinding plow points and saws, besides running my band saw, lathes and other machinery. I have a 6½-horsepower boiler and engine. If I were going to use gasoline I should not want it in the room I worked in, as I don't think it is healthy to inhale the fumes from gasoline.

I have my shop on the bank of a small river. I am going to put in a current-wheel and get power from that. Any blacksmith whose shop is near a stream of water can put in a dam and a race, have an undershot wheel and get all the power required at a very small expense, as no fuel at all is needed. W. W. HERRING.

Toe Clipping—In general I am not an advocate of toe clipping and will give my reasons. In fitting the shoe, the farrier usually claps the red hot shoe on the foot, burning in his clip, and also scorching the sole of the foot, which draws out all the moisture. The floorman tacks it on, hammers the clip into the toe which raises a great deal of mischief to the horn, which in its downward growth, meeting with the resistance which the clip offers, turns inward upon the inside toe, causing pressure and inflammation. From the pressure the bone is absorbed at the toe, often causing seedy toe. In the large cities, the smith thinks it is absolutely necessary to clip for heavy pulling on pavements, but there is too much stress put on this. Some even advocate side clipping also. I simply give it a wide berth, as it is injurious and not necessary, in my opinion. WILLIAM F.

Lehigh University Register—The Register of Lehigh University, South Bethlehem, Pa., just issued, shows an attendance of 581 students, from twenty-seven States and six foreign countries. There are fifty-two in the teaching staff.

Twelve courses of instruction are offered at the University; the Classical Course, the Latin-Scientific Course, courses in Civil, Mechanical, Metallurgical, Mining, Electrical, and Chemical Engineering, Analytical Chemistry, Geology, Physics and Electro-metallurgy.

The following prize scholarships will be open to competition at the annual examinations in June: Two in the Classical Course of $150 and $100 each, and one in the Latin-Scientific Course of $125 annually in addition to free tuition. Provision is made for worthy and needy students whereby they may postpone payment of tuition until after graduation.

Tempering Mill Picks—In answer to the inquiry of Mr. E. Sager for tempering mill picks, I will give my receipt which has given me satisfaction for the past thirty years. I will first give my plan for drawing bits, as there is as much in this as in tempering. I use charcoal, and heat slowly, never above a high cherry red. When the heat is raised, I first use the fuller on each side about one inch up from the bit. Then I draw my bit down to $\frac{3}{16}$ by 1¾ inches long, and always use plenty of cold water hammering and never upset the end, but cut off with a chisel. For tempering, I use the following: Six gallons of rain water, one and a half pounds of salt, two ounces of salammoniac, one and a half ounces of corrosive sublimate, two ounces of alum. Pulverize well and dissolve. If you can get ashes of white ash, add two handfuls. This will take all the scale off and leave a silvery color. I would advise trying this. WILLIAM F.

Removing Broken Bolts—Noting an item on page 59 of the December issue about removing broken bolts from an engine foundation, I will give my way in which this problem may be solved. Mr. Gardner tells us that the bolt is broken about five feet from the bed plate. I would withdraw the part that could be taken off from the top, and as the opening in masonry is two feet by four feet six inches, I would insert a forked wedge between the nut and the washer at the bottom end. Then having forced the bolt down sufficiently to get an alligator wrench between the nut and the washer to hold it, I would take the nut off by means of a wrench to suit the size of the nut. Next, I would put the bolt back up the hole by wedges and short pieces of iron an eighth smaller than the bolt. I hope that I have explained this sufficiently so that it can be understood. I do not think it would be a very difficult operation. GEO. MADDOCKS

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Welding Steel Axles—I have seen several ideas given in regard to welding steel axles. I think the best way to weld steel axles is to "V" weld them, that is, to split one end and scarf down in the shape of a V, and then fuller the other end to fit. Heat the split end and close down on the other piece. Then put in fire and heat red hot, bring out and cover with "Cherry Heat." Put back into the fire and take a welding heat, bring out and have helper strike with the sledge and finish up with flatter. If properly done you cannot see the weld. I do not think any more about welding steel axles than I do two pieces of iron. This is also the best way I have ever found for welding large rods of all sizes and kinds. I have welded all sizes from one inch round and square, up to three and one half inches, in just a common repair shop. I have been working at the blacksmith business for thirty-five years and have had a number of experiences of different kinds, having done general work of all kinds. B. B. MALLORY.

Splints—I have been reading an article on page 54 of the December issue about splints on horses' legs and the causes. After a practical experience of over thirty years, I would say that of the many causes of splints which have come under my notice, I could trace almost every one of them to improper leveling of the foot. I have never seen a horse, that has never been shod, with a splint. A great many men do not look on the hind legs for splints, but they are there in my opinion very often, and are very destructive to the usefulness of the horse, for the reason that we do not look for the splint there until the inflammation set up by the action of the splint has resulted in spavin, and the usefulness of the horse is almost at an end.

I have worked for over twelve years on the race and light harness horse without having a splint develop. I have used the foot leveler ever since there was one made. They are very good, but any good track shoer knows that they have lame places in them, which no one as yet has been able to straighten out, though someone probably soon will. T.R.THOMPSON.

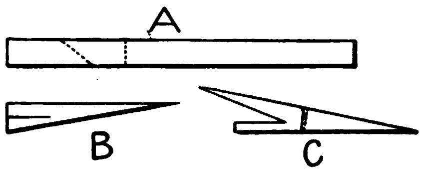
A Shoeing Letter—I am a young smith and would like to ask some of my older brother craftsmen how to shoe a horse that cuts his inside quarters. He is a pacer, and is used for track and light road work.

I was much interested in the letter of W. L. G. in the December number, for I thought where I lived was the only place that the "farmer blacksmith," the "can't wait" man, "Old Windy" and "Cheap John" resided, but I see I was mistaken.

Regarding the several items as to how shoes can be made to stay on, it is my opinion that too many of us make the shoe stay on too long. There was a horse brought in my shop to-day which I had shod five months before, and since which time the feet had never been touched. The average farmer will let his horse go as long as the shoe stays on, and yet they complain of their horses not traveling well or of interfering. I believe that a horse ought to be shod every four or five weeks, and that eight weeks is the longest a shoe ought to be left on from the standpoint of the welfare of our good servant, the horse. W. L. P.

Shoeing a Turned-under Foot—In answer to brother W. Trammel, I would say that a turned-under foot should first be cured or straightened, which can easily be done in from fifteen to twenty days. Secure a poulticing boot and use a flaxseed poultice as hot as your hand can stand. This is to be put on the foot after shoeing the horse with a shoe of the following shape: Cut out a V on the turned-under side one inch from the center of the toe. Turn down clips at the junction of the bars and heel and make a wide web convex shoe. After twelve hours of poulticing, use a screw dilator and expand the shoe until the horse shows just the very first sign of uneasiness, when you should be sure to stop and walk him an hour and a half or so. Then use the poultice again. Repeat this operation the next morning, use the expander once a day, walking him after each treatment. On the crooked side, from the center in front to the heel, apply the following at the coronet, rubbing it well in with the finger: Three ounces of olive oil to one ounce of stronger ammonia. Apply this once a day until well. W. F. REMINGTON.

Plow Lay Points—I have seen that a number of brother smiths inquire about plow lay work, and hence I will give my way of pointing plow points. I use $\frac{3}{8}$ by $1\frac{1}{4}$-inch lay steel and cut it as shown at A. Having cut it in pieces such as shown at B, I forge it out, split and shape successively as shown at C. The right hand piece is drawn out to fit under the share and the left hand to fit under the bar.



METHOD OF TREATING PLOW POINTS.

Heat, place on the anvil at about the point where the dotted lines are shown, with the bar side to the left, if for a right hand plow. Then bend the prongs down and together until it fits the point. Heat the point, put on the lay, clamp, and it is ready for welding. I use borax, sand and salt for this purpose to start, and finish with anvil dust. I have laid about fifty in this way in the last month at the rate often of from eight to ten a day. My charge for this work is from thirty-five to fifty cents, depending upon the size of the point. A. T. WRIGHT.

A Letter on Shoeing—Horseshoeing is not a trade but a science of a high order, requiring of the man who practices it a thorough and scientific education concerning all the anatomical structures of the foot and limb. It is unreasonable to expect an apprentice to comprehend a subject of such complexity, when he receives his only instruction from his master horseshoer, who in turn has no more anatomical knowledge than the one whom he tries to teach. The great need to-day of the horseshoers of this country, individually and as a body, is a college to secure higher training and skill in the practice of horseshoeing. It seems to me that the horseshoer of to-day is but a repetition of the horseshoer of a hundred years ago, and if proper steps are not taken, the horseshoer of to-morrow will be but a sample of today. We have but to look into our streets to find lame horses at every turn. The unbalanced foot is very common, and causes more damage and destroys more horses than all other diseases. Why is it that sound feet are scarcely to be found on any horse, and that perfectly balanced feet are almost as scarce as stars at midday.

The owner often asks whether the shoer does not pare his horse's feet too much. Can anyone pare a horse's foot properly when he does not know where to commence or where to stop? H. N. MUDGE.

Tempering Mill Picks—I notice that some of my brother smiths are asking for a good receipt for tempering mill picks. I will give one which has been in use for a number of years. Take a barrel, set it in the ground near the forge and fill it with well water. Make a brine strong enough to hold up an egg or potato. Take a piece of alum the size of an egg, pulverize one-half of it and add to the brine. Put the other half in a bag and nail it in the inside of the barrel about half way down and let it dissolve at leisure. Cover the barrel and keep it clean.

This however is not all that is required to make a good pick. You must have a good steel and know how to work it. After your pick has been drawn to shape, much care must be taken in heating and hammering. Never upset the steel. Never strike the pick on the edge after hammering on the flat. After you take it from the fire, edge it up, and keep it straight. Each heat should be lighter than the one before it. The last heat, hammer very lightly. Take about three heats to finish it after it has been drawn. Use water all the time when you are hammering, and a great deal of it.

When tempering, heat slowly and do not let the piece scale. Do not draw the temper. The secret is to make the pick as hard as possible, and yet at the same time to have it sufficiently tough. Draw the pick across a window glass, and if it cuts it is all right. I use blacksmith coal when drawing the pick down, and then hammer it off with charcoal. W. G. W. T.

Cure for Contraction—Noticing an inquiry in your paper for a cure for contraction, I will give you my treatment, which in my twenty years' experience has never failed. Much depends upon the smith, although the owner of the horse must perform a certain part in order to cure this disease, unless it has run into ossification of the lateral cartilages, which, if confirmed, is incurable. I will first explain a little of the foot in its normal condition and also some of the causes of this disease.

The frog being placed at and filling the rear part of the foot, assists to a material degree in the expansion of the foot. It is formed internally of two prominences on the sides, and a cleft in the centre, presenting two cavities with a sharp projection in the middle and a gradually rounded one on each side. It is also composed of a substance flexible and elastic. What can be so well adapted for the expansion of the foot when a portion of the weight of the body is thrown on it? How readily these irregular surfaces yield out and return to their natural state! In view of this, therefore, the horny frog is a powerful agent in opening the foot.

One cause of contraction is in the owner's neglect in allowing the foot to get dry and hard, and another is caused from very bad shoeing, bringing the heels of the shoe in too much and nailing too close to the inner wall, causing soreness and fever, which will start contraction.

The first and most important part of the treatment is to get the hoof soft. In order to do this, use a bran and lye poultice. There is no other remedy equal to this. It performs two functions, softens, and at the same time relieves a great portion of the soreness. To poultice, I take a block of wood a little larger than the foot, cut off an old rubber boot leg, tack my block inside, put in my poultice and slip it on the

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foot. Tie the top to the leg. Have the poultice changed about every ten hours for three days. Then comes the smith's part. Dress the foot down well, not touching the frog, turn a bar shoe to fit the frog, giving the bar a frog pressure and not allowing the heel to rest on the shoe. After the shoe is properly put on, use a sweating liniment, corrosive sublimate, gum camphor, alcohol, one ounce of each, spirits of turpentine, eight ounces. Grind the corrosive sublimate fine, then add alcohol, and shake well, after which add the camphor and turpentine. In two days it will be fit to use. Apply once a day above the hoof, extending it up from the coronet about two inches. Three applications is all that is required in most cases. When well blistered, dress with lard. Wash the foot every two or three days with castile soap and when dry grease with lard. Repeat this until all scurf is removed. If a permanent cure is not accomplished, repeat the liniment. My results are excellent. WILLIAM F.

Treating Tool Steel—Replying to the inquiry of Mr. Fred Barney in the December issue about the cracking of steel while hardening, in my experience with different steels, I have found that it does not always indicate a poor steel, or the wrong steel, if it cracks while being hardened.

There are generally other causes of cracking, which can usually be avoided by taking proper precautions in the heating and dipping to prevent strain in the steel. In my work every day, I have large numbers of tools and dies of various forms and sizes to forge and temper, and have had very good success, very seldom losing one.

After forging a tool, I always reheat it slowly, to a uniform refining heat, and put it aside to cool slowly, thus relieving the strain set up in the steel by forging. Then when ready for tempering, I heat slowly to a uniform refining heat and harden. To relieve the strain set up by hardening, and get a good job of tempering, I proceed in the following way, which is, no doubt, familiar to a number of tool smiths: First, I bring the piece to be hardened to an even heat (avoid overheating) Then plunge it into the bath, and before it is set or cold remove quickly. If it should be a large piece, put it immediately into a bath of raw linseed oil, or fish oil (I prefer the linseed), and leave it there until cold. Then I polish it and draw it to color or temper desired. To draw the temper we use either hot lead, hot sand, a hot plate, or gas plate, according to size and shape of the piece. If it is a small article, I proceed as follows: After removing from the water bath, hold it immediately over the fire or in the furnace until it heats sufficiently to "hiss" when touched with the wet hand. Then polish quickly and draw to temper desired. Drop it in the oil to cool slowly. I have found the above described method very successful, more so than some ways which I have heard of and tried. I also find that it pays to experiment, but don't experiment on new or good tools and dies. Use old ones for that, or better still, find out before you make your tools just what kind of steel there is in the bar to work with. Take off a small piece and try it.

In hardening, if clear water will not make the job hard enough, there are a number of different baths which are often used with success. I sometimes use the following bath for heavy work, or for low carbon steels: Fill an ordinary barrel nearly full of clear water, add six or seven handfuls of common salt, half a dozen large spoonfuls of ground alum, and half a dozen spoonfuls of powdered saltpetre. Sometimes I add a little salammoniac.

In dipping a job to harden, the workman generally has to use his best judgment, for the manner of dipping depends on the shape and size of the job. I always try to cool the heavy parts of a piece first, thus reducing the strain. This is my experience. W. J. TODD.

An Interesting Letter from Canada—I, for one, am much pleased with the success that followed the publication of THE AMERICAN BLACKSMITH in so short a time since its first issue. But to still add to the usefulness of a trade journal in order to make it of the greatest benefit to the thousands of readers, we should not wholly depend on the editors to give us new pointers in our profession, but should aid one another by contributing to its columns articles such as we may have gained knowledge of by long or short experience in the business.

Although it is not expected that the contributions must be couched in such a style as would be expected of a college graduate, neither is it necessary, as plain shop talk style is often much preferable to the high flown effusions of a graduate of the best university. It is not the style or tone of the contributions that makes it valuable, but the information which it imparts to others, and I believe that in the line of general blacksmithing more information can be gained by the interchange of ideas, methods and manners of doing our work, than in any other trade in the country. Nearly every blacksmith has to be an inventor, in order to do justice to the many difficult jobs that are brought to him to make or repair. He gets puzzling cases in horseshoeing, and is expected to be able to correct a trotter into a pacer and vice versa by shoeing—to regulate the gait and make a four-minute horse go in 2.20 all by shoeing. He is to correct all faulty actions, and stop interfering, forging, cross-firing and a host of other defects in that line. Besides he is expected to be a veterinarian in curing such diseases as contraction of the feet, flat-footedness, corns, thrush, misshapen hoofs, etc. Then when the season is on, he must know all about putting in condition the implements for tilling the soil, and later on the repairing of mowers, binders, rakes, drills, disks and even engines on threshing machines, besides many other things which he probably never saw before. Now, in repairing such jobs, we often have to invent a way to do it and we may succeed in most cases, but we often spend much time by not taking the best course, and therefore the information gained by the interchange of ideas through a journal, such as THE AMERICAN BLACKSMITH, would be of great mutual benefit, not alone to the young beginner, but to all, no matter how clever or how long they have been in the business.

I have, as an example, been at that kind of work forty-two years, and I find that when closely reading a trade journal that I have very much to learn yet, and have been materially benefited by adapting the methods of others. One thing I wish to draw the attention of the readers to, is this: Questions are often asked as to how to do this or that job, and are usually answered by some one, but what I consider wrong is that the person getting the information gratis seldom has the good sense to state what success he has obtained, or to thank his informant for his kind assistance. If that were more generally done, such as J. C. Shay did in the January number, it would be much more of an inducement to offer advice and help others than when kept in ignorance of the results of the advice furnished. CANUCK.

An Interesting Shop Letter—Power and Mill Picks—Please renew my subscription to your paper for one year and find enclosed $1.00 for same. I consider the "American Blacksmith" the very best journal of its kind now before the blacksmiths, and those who are not acquainted with its valued pages are the losers, indeed. The "Queries and Answers" column is well worth the price of the paper for any smith to read and profit thereby. We find various ways of doing work, but how many of us ever experiment or profit by them? For my part, I never see a new way of doing a job of work but that at my first leisure moment, I try it, and I have found several jobs that could be done much easier by following these suggestions than my way of doing the same work.

I enjoy the talks on "Power in the Shop" for I am interested in the same, and I will give you a slight description of my shop.

In putting power into a shop, I would advise, do not be afraid of getting too much power—better too much than too little. It is cheaper in the long run to have a ten-horsepower engine doing four-horsepower work than to have a four-horsepower engine pulled to a full capacity all the time. I have a four-horsepower gasoline engine made by Fairbanks, Morse & Co., Chicago, Ill. Having had varied experience with several makes, I consider this engine to be the best on the market. With this I run a 16" by 72" iron lathe, Little Giant trip hammer, Champion No. 400 blower, Western Chief drill, Reynold's tire bolter, emery wheels, both grinding and polishing; grind stone, disc sharpener, spoke tenoning machine, and for summer use a fan. I expect soon to put in a band rip saw, spoke machines and hub bore. I have plenty of power for all these various machines at once and some to spare. When I first bought my engine customers asked why I got so large an engine. My only answer was "'Twill be economy in the long run" and as they see one by one some new piece of machinery added, they wonder whether I have power enough, so I say, do not be afraid of getting too much power.

I note in the December number a query for a first-class receipt for tempering mill picks. I have one that was handed down to me by my grandfather, one of the most successful smiths and gunmakers of pioneer Ohio days, and one that I have used many times with best of success. To my knowledge it has never been published before, so I will give it. It consists of one ounce of cyanide of potash, ½ ounce of bicarbonate of potash, and ⅛ ounce of bicarbonate of soda. Mix to a fine powder, heat the tool to be tempered to a cherry heat, and immerse the tool in the powder. When the tool has cooled until it will not absorb any more of the powder, put it in the fire again, and heat to a very dull orange heat and plunge (straight down) into lukewarm water. Do not draw any temper. If this plan is carried out exactly, you will never ask for anything better. I have used it with best of success on drill bits for drilling, tempered springs, etc. Great care must be taken not to force the tool, but to let it have its own good time and it will do the work. For any ordinary drilling, I temper my bits in oil. I can get better results from oil than water for any ordinary tempering. FREEMAN VICORY.

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④ THE
AMERICAN BLACKSMITH

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Shops of Progressive Smiths.

If you run or work in a shop in which you take pride as being a well kept and modernly equipped establishment, the prize offer made on a following page will interest you. Send in a photograph and description in the course of the next two months. We want to secure pictures of the best shops in the country for reproduction in these columns.

The American Association of Blacksmiths and Horseshoers.

The few brief notices which have appeared in the columns of THE AMERICAN BLACKSMITH, during the last three months, regarding the American Association of Blacksmiths and Horseshoers, its aims and purposes, have awakened widespread interest, and as a result, a great host of letters have been received from all sections of the country, testifying to the fact that the time is ripe for a movement of this kind.

On behalf of The American Association, we desire to thank all who have written and displayed an interest in this matter. Up to the present time, the number of communications have been so great that it has been found impossible to reply to all of them, but in a very short time literature and other items regarding the plans of the Association will be forwarded to all who have expressed their interest in the matter. We wish to remind our many friends who have taken this interest from the very start, that the work is a large and ambitious one, and cannot be accomplished in a day. In fact, it will require considerable hard and persistent work. The Association and its official organ, THE AMERICAN BLACKSMITH, intend to do everything in their power, but it is of course necessary to have the undivided support of all craftsmen, the ones who are so vitally interested in the matter. Naturally, the more who take part in the movement, the quicker and surer will be its success.

We wish to hear from every one who is directly interested in the matter of securing better prices for work and obtaining Lien Laws for protection from bad debts. It is a well-known fact that some men are born leaders and organizers, while others make staunch workers when organized and directed. We need leaders in this movement. Therefore, the services of several enthusiastic and energetic blacksmiths can be used to good advantage in every State, and we should be glad to hear from any such who could devote some, or all, of their time to the work of getting the smiths in their respective States and Counties in line.

Special Announcement Concerning the April Issue.

The publishers have decided to make the April issue of THE AMERICAN BLACKSMITH a special spring trade number. It is not proposed to do this by decorating the cover with gaudy colors, but to maintain the same general form which each issue of the journal at present has. The material for the reading pages will be selected with more than usual care and with special reference to making it an unexcelled number.

In addition, it has been arranged to include with the April number, as an art supplement, a reproduction in twelve colors of the splendid picture painted for THE AMERICAN BLACKSMITH by Raphael Beck, and entitled "The Village Smithy." This will be mailed with the April issue, free of charge, to every regular subscriber. If you or your friends in the craft are not already on our lists as subscribers, you should by no means miss the special opportunity which is thus offered, and you will make no mistake in sending in your name at once for your yearly subscription, to begin with this issue. Special inducements are also offered for immediate subscription, as you will see by referring to the advertising columns. The picture will be an exact fac-simile, on a reduced scale, of the oil painting itself, the result of the highest skill of the lithographer. It will also be finished up with the canvas effect to make it a faithful reproduction of the original oil painting—a splendid picture for framing, and a most handsome one.

The central figure is a fine looking blacksmith, who is shown pausing for an instant at his work to look up at some children who have just entered the shop. The details are worked out with remarkable fidelity to life, and all who have seen this latest production of Mr. Beck, pronounce it one of the best works of this well known artist. We are very glad to be able to reproduce this splendid painting for the exclusive use of our friends, and, as noted above, will present it with the compliments of THE AMERICAN BLACKSMITH to all regular subscribers.

Artistic Specimens of Wrought Iron.

One of the peculiar characteristics of wrought iron is the wide range over which its utility extends. Endless are the varieties of form and use to which it lends itself with equally good results.

The slender, light effect of a combination of graceful lines in an ornamental iron fence and gate is exactly what is needed to finish off a beautiful residence—to bound the premises effectually without obscuring the view of fine buildings and artistically planned

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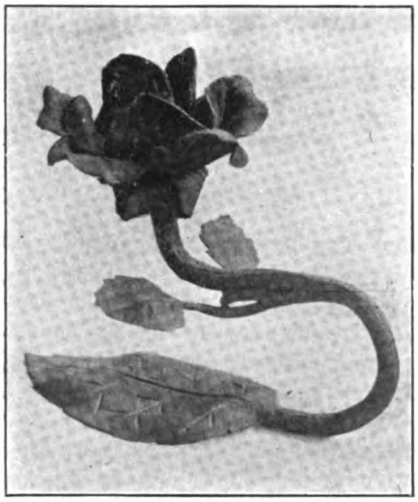
lawns. There is, however, one strong objection raised to the employment of fine work for this purpose—its extreme brittleness under the action of frost.



A UNIQUE CANDLESTICK OF WROUGHT IRON.

It sometimes even happens that a mischievously inclined person, passing on a frosty night, will crop off a whole row of delicate points from an iron fence, like so many poppy-heads. However, for any but outside fences this objection is of little account.

For interior decoration, wrought iron has a pleasing, antique appearance, entirely peculiar to itself. A vast number of different effects may be secured, too, by the different modes of finish. For example, an ornament in the rough, unpolished state of the metal will look quite unlike a similar one highly polished.

The accompanying engravings illustrate three very interesting pieces of iron work. The first is a delicate wrought iron candle-stick of floral design. The second represents an artistic lamp made with globe-support. For this photograph, we are indebted to Mr. C. D. Hampson, of St. Louis. The third engraving is after a photograph of a small iron residence-gate, from the forge of the George B. Meadows Wire, Iron and Brass Works Company, Limited, Toronto, Canada.

Kinks and Conveniences in the Wagon Shop.—1.

BY D. W. M.

The setting of axles, which have been bent in an accident, is a frequently occurring job in any shop where repairs are done on carriage work.

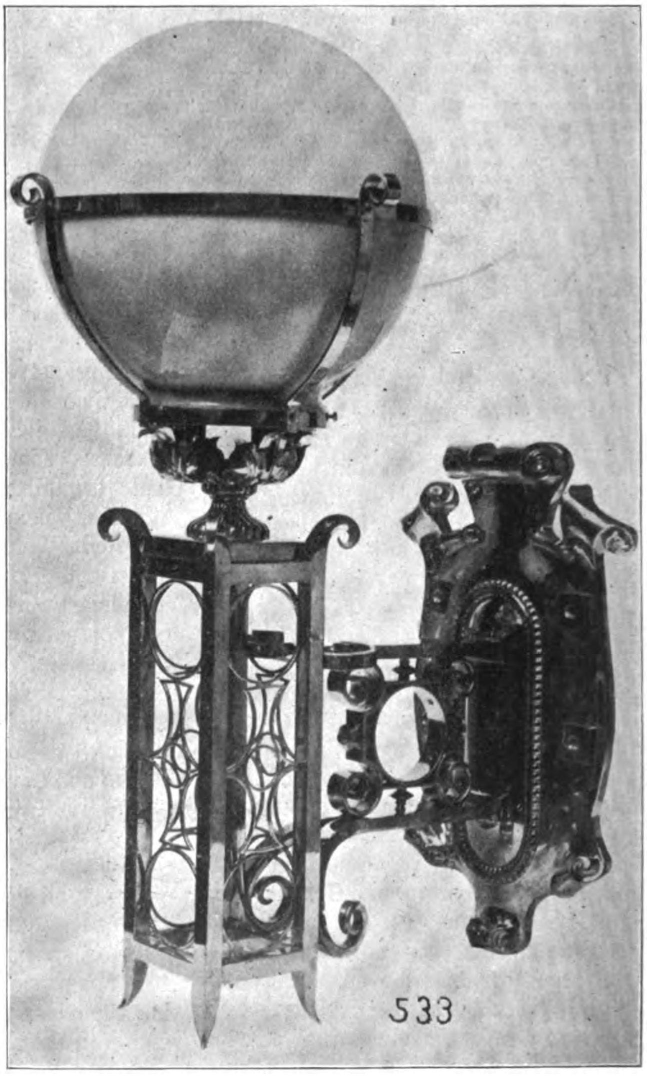
To take off all the clips, remove the axle from its wooden cap or bed and put it in the fire to heat, not only spoils the paint, but also the quality of the steel in the axle. It also involves so much time and labor, fitting the axle to its bed and getting the correct "set," that modern workmen with any up-to-date ideas avoid it by using a much simpler process. Since axle-makers have learned to use a tougher steel and the "converting" process has taken the place of the old "case hardening" for axle arms, they are less brittle and therefore less liable to break. A number of hand tools are sold now-a-days for setting axles cold, most of them on the principle of thumb-screw or hand-screw pressure. Some of these tools require the wheel to be removed while the tool is adjusted to the arm and stock, and the pressure is exerted just back of the collar. With an axle-gauge, set to the axle-arm at the other side of the vehicle, to use as a guide, the bent arm is brought to place. Other tools permit the wheel to remain on the axle. The idea is that the axle is more liable to remain true, and not bend when confined in its box than when out of it, and less liable to bend just forward of the collar instead of behind it. Hence, many prefer to leave the wheel on the axle. By measurement of track, and diagonally from butt of hub to upper edge of tire on both sides (that is, right and left wheel), it is found whether the axle is set properly or not. These are convenient tools to have. Both kinds will be found useful at times.

To set an axle cold on the anvil often does irreparable damage. Sometimes the thread end of the axle will fly off, cracking at the last thread groove. Sometimes the axle-arm itself will crack and fly off at the shoulder, or at some point where a deep scratch has been made by a grain of sand getting into the box.

In case the thread end drops off, there is a tool made which will be found very convenient. It drills a hole in the end of the axle, cuts the thread in it and on the plug, which is to be screwed in very tight. It also cuts a thread any size to fit the axle-nut.

Where no axle setting tool is at hand for setting axles cold, the following device may be rigged up in any shop, and will be found not only effective and rapid in its work, but convenient. It is necessary, however, to have floor space enough to accommodate a vehicle, which any carriage shop must have in any event.

Two eye-staples are fastened firmly in the floor, far enough apart to permit of use on both sides of a vehicle at once: A strong wooden lever, properly ironed with a hook at one end, a wooden block hollowed at one end to permit of fitting on the hub-band and covered there with leather to prevent its bruising the paint. A chain with hooks at one end (but with the inside of the hooks square to permit fitting firmly



LAMP AND GLOBE SUPPORT WORKED OUT IN WROUGHT IRON.

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around the axle without slipping and bruising of paint) and an 8-hook complete the outfit.

When the vehicle is run into place, the chain is adjusted, the block put into position either over or under the hub-band, as the case may be, the 8-hook is put on the axle, the lever brought into position, bearing on the block and hooked on the 8-hook, and the axle gently bent into position. If to be bent upward, the chain holds to the floor and the pull is against it. If to be bent downward, the chain is fastened to the axle at the other side of the vehicle, while a wheel board is placed under the axle near the point of bending.

Any shop can provide itself with this set of tools and it will be found powerful enough to bend the heaviest axles. Moreover, the bend is confined to a point just back of the collar. By using a longer chain, a forward or backward bend can be made just as readily as upward or downward, but it may be found necessary to use a brace to prevent the gear swinging around, which is easily arranged, propping it against one of the eye staples. This set of tools is not like a compact tool, and cannot be taken anywhere, but it has its uses and is very effective and free from some of the defects which all the small hand tools have.

(To be continued.)

Talks to the Jobbing Shop Painter—1.

M. C. HILLICK.

The Uses of Chamois Skins, Pumice Stone, Rubbing Stone, Water, Etc.

An appreciative reader of THE AMERICAN BLACKSMITH desires to know how to use the above named material so as to make a smooth surface. It must be understood, of course, that these materials apply to only part of the problem of making a surface smooth. Lead and roughstuff coats, and varnish coats, are likewise necessary, along with skill of the trained painter in developing a level and smooth surface.

Rubbing stone, or brick, as it is variously called, is a composition material wrought into blocks of different sizes, with which the foundation of roughstuff, usually consisting of from three to five coats of roughstuff, is rubbed to a surface both level and smooth. The Eureka Rubbing Stone is an American product, and may be had in grades running from fine to coarse. The medium grade makes a very nice stone for rubbing a carriage body. Then there is the Schummache Rubbing Brick, a material of German manufacture, besides an American-made rubbing brick, either of which may be had in various degrees of fineness, and are especially suited for carriage work. These composition rubbing brick and stone have almost wholly displaced the block pumice stone, or lava, which twenty years ago was chiefly used for rubbing roughstuff. The block pumice stone was a crumbly, soft, shelly material, and small particles were continually breaking off and rolling under the block, scratching and gouging the surface, and in the hands of an inexperienced workman all sorts of surface bruises were constantly made. A very fine textured surface can be rubbed with the natural lump or block pumice stone, but it takes expert knowledge and skill to do it. With the rubbing stone or brick, this trouble is avoided, hence its popularity. In rubbing roughstuff with block pumice stone, or with the composition brick, keep the surface washed clean, and use plenty of clean soft water. This prevents the stone or brick from "gumming" up, affords a good cutting surface, and clears the surface of all gritty or gummy substances. A generous supply of clean, soft water is indispensable in the paint shop, and especially is it needful in the rubbing of roughstuff and varnish. The pulverized pumice stone or, as it is not infrequently called, pumice-stone-flour, is obtained in numerous grades of reduction, from No. 1½ to No. 00, and even finer. The No. 00 and No. 000 is best adapted for carriage work. Pulverized pumice stone is used for rubbing varnish. Long before the application of rubbing varnish coats, the surface is supposed to be, and should be, in fact, perfectly level. The coats of rubbing varnish are applied for the purpose of furnishing a deep, full body of varnish with which to hold out the finishing coat of varnish and give it a sharp, clear brilliancy. These coats of rubbing are surfaced with pulverized pumice stone and water to make them smooth, and give the finish the desired mirror-like effect.

SOME VERY ARTISTIC ORNAMENTAL IRON GATE WORK.

This, then, is the office of the pulverized pumice stone, *i. e.*, to rub down and make smooth the varnish coats. To apply the pumice stone and rub it, heavy felt, or ordinary carriage top cloth, may be used, but the ready prepared felt perforated pads, to be had of almost any dealer in paint trade

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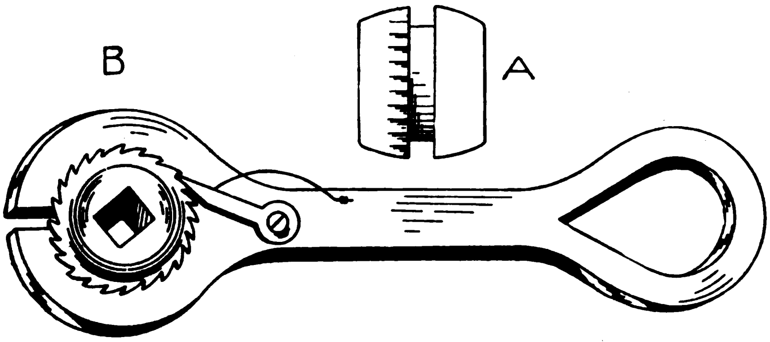
supplies, are to be preferred. These pads may be bought in different thicknesses of felt, from $\frac{1}{8}$ to $\frac{3}{4}$ inch. For rub-



A HOME-MADE WRENCH FOR REMOVING TIRE BOLTS.

bing large surfaces without moldings, the thicker pads are best, but for cut-up surfaces, with moldings, the thin and more flexible pieces are handiest. In rubbing varnish or roughstuff, rub with straight-away strokes of the arm, and avoid circular, or criss-cross motions which are liable to disfigure the surface.

The chamois skin is an important part of the varnish surfacing equipment. Under the guise and title of chamois skin, a good many sheep pelts are palmed off upon the unsuspecting painter. The genuine chamois skin is a tough, strong leather, yet very soft and fine of texture, from which the lint is quickly worn. It has to an extraordinary extent the property of taking up water and wiping a wet surface dry. On the contrary, the deftly disguised sheep-skin is loose textured, does not wear well, and will not dry off the surface like the true chamois skin. The latter keeps soft and flexible, whereas the sheep-skin, or any other substitute skin, gets hard and handles badly.

It has been a difficult bit of work to buy a first-class sponge for carriage work, for several months past. A sponge, to be of the best service to the painter, should be a soft, fleecy growth, clean in respect of fibre, and exceedingly tough in texture. In fact, it should be tenacious enough in its parts to withstand plenty of hard service, and yet fleecy enough in fibre to use upon the finest surface. It is economy to buy the best chamois skins and the best sponges. The values of these things are not measured by the prices paid for them.

When used sufficiently to discolor them, wash the chamois skins and sponges in warm water with soap. Then rinse in clean water, squeeze dry as possible and hang away to dry out gradually. In a word, by way of concluding, all the materials above mentioned should be kept in dry, clean compartments, away from dust and dirt and careless handling.

Intimate knowledge of the materials comes only with practice. Careful attention to detail in each process will, in a short time, build up a firm foundation of experience that will ensure satisfactory results.

A Useful Bolt Wrench and Its Construction.

G. NABLO.

I have seen many wrenches for taking off tire bolts, but none that I like as well as the one shown by the illustration. I will therefore give a description of how to make one, which can be used either for quickly taking off or putting on the nuts on tire bolts.

Take a piece of shaft steel, one inch in diameter, and cut off about $1\frac{1}{2}$ inches. Square the ends and taper slightly, as shown at A. Next drill or punch a hole through the center of the block and follow it up with a square punch or mandrel of sufficient thickness to square the pole all the way through, just the right size to fit the nuts of $\frac{3}{16}$ tire bolts for buggy wheels. The next thing is to cut a groove, as shown at A, and that can best be accomplished by having it cut in with a lathe. It can be done, but not so well, with a mill saw file. Next file in the notches but not quite to the end, so as to have the ends smooth. Next make a shank as shown at B, by using soft steel, punching a hole in one end and enlarging the same to fit the block in the center of A. Shape it as shown. Then cut it open, bend apart, and close on block, as shown. Next fasten a dog with a light spring to keep it in place on shank, and the tool is ready for use. In using, one simply claps the left hand on the block, holding it against the felloe and nut, and with the other hand use as a ratchet. By reversing block, nuts can be quickly taken off or put on as required. This little tool when properly made will be found very useful, and is not difficult to make by any good mechanic.

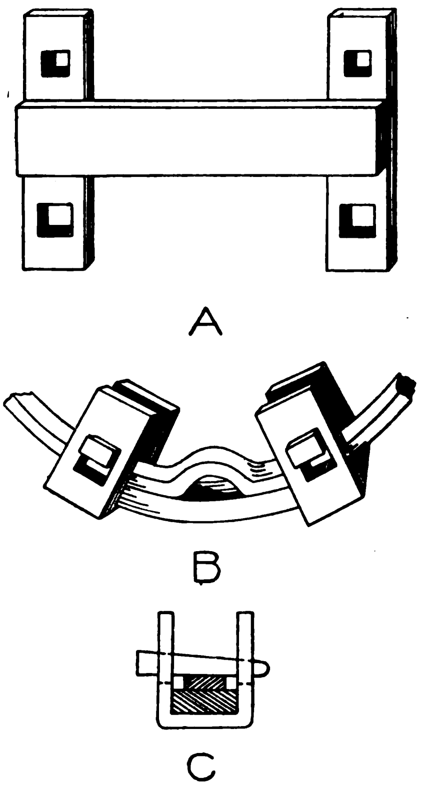
Every smith of any ingenuity has his own particular devices which answer his purposes better than anything else, but the above tool, I think, is sure to meet with approval wherever tried.

A Convenient Device for the Handy Setting of Tires.

A. N. ESTES.

During the hot weather when the buggy tires which have been running a year or so are all loose, tire setting is one of the best paying parts of the smith's trade. It occurs to me to describe my plan of resetting tires for the benefit of those blacksmiths who do not possess a tire shrinker. The tool which I have, I made myself in about two hours, and it works to perfection.

I first take a piece of tire iron eleven inches long, two inches wide and three-quarters of an inch thick. To this at each end I weld a cross piece of the best half-inch Swedish iron, two inches wide by eight inches long, making four wings or ears, as shown in the figure at A. My next step is to punch four holes, those on one side of the main bar being a $\frac{1}{2}$ inch by 1 inch and on the other side $\frac{1}{2}$ by $1\frac{1}{2}$ inches. These holes are to accommodate two keys. I



A NOVEL CLAMPING TOOL FOR SHRINKING TIRES.

next proceed to bend up the ears of the tool, after which I shape the main piece to a circle to accommodate the tires which are to be shrunk. The finished piece with tire in place is shown at B.

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In setting the tire, first measure it to find out how much it needs to be shrunk. Take for your starting place the first space to the right of the double hole, or capped joint in the rim, and shrink at this place one-half the amount which you wish taken up. Then change to the right of the next double hole and shrink at this place. In order to do the shrinking with the tool which we have described, take a good heat on the tire and bend it over the horn of the anvil. Place the tire in your tool, drive the keys in tight and then hammer down the bend in the tire, hitting first on one side and then on the other so as to prevent kinking. At C is a cross section of the tool, showing tire held securely in place by the keys binding upon it. This will result in a good job. The tire will be thick only at this place, and is much better than hammering over a kink and then welding it down, as I have seen some smiths do. The latter proceeding invariably results in a burst when running over rough roads. Also, any smith knows how hard it is to cut and take up an old tire without a helper to hold it while you punch the holes. For this reason I think it is much easier to shrink by the use of the tool which I have just described. I can shrink a tire $\frac{1}{4}$ by $\frac{3}{8}$ of an inch in one heat.

THE WELL CONDUCTED SHOP OF JAMES A. HAYES, CHARLTON CITY, MASS.

The reason you shrink in two places is that your tire will then go back on with the bolts in the old holes very much more easily than if you shrink the tire all on one side, for if you do this, your holes in the tire will miss the holes in the rim nearly all the way around. The buggy tire is one of the most difficult jobs which the smith has to deal with to give entire satisfaction. It may be said that more wheels are ruined by being improperly set than the public has any idea of.

Take a single buggy which has run for two or three years until the tire needs resetting badly. Some of the wheels will be straight on the face side, others will be out of dish, or have too much dish. The same measurement which will do for one will not do for others, so that great judgment must be used. For a wheel which is out of dish, place it on your wheel bench, screw it down, tighten up your wheel all around and after the rim is well set down on the spokes, saw through one joint with a good, coarse saw. This will make an open joint, so that your wheel will not be rim bound when the tire goes on. You can shrink your tire so that it is from $\frac{1}{16}$ to $\frac{3}{16}$ of an inch smaller than the rim. Make your wheel and tire so that you can put it back just in the place it came off. Put your wheel on two trestle benches with the face side up. The benches should be placed close to the side of the shop, and a cleat nailed to the wall, high enough above the wheel so that you can put a lever under the cleat and on top of the small end of your hub. By means of such a lever arrangement, you can pry your wheel into dish.

If your wheel has too much dish in it, before you put on your tire, tighten your wheel up and saw the joint as above. Then shrink your tire until your wheel and tire measure just the same. Next put on your tire. In some cases it will dish your wheel too much. Again if your wheel has more dish than it ought to have, say $\frac{1}{2}$ an inch after the tire is taken off, you can have your tire $\frac{1}{16}$ of an inch larger than the rim, or you will dish it so much that you will ruin the wheel, or the appearance of it. Of course it would do some service after that, but it would never be a first-class wheel again.

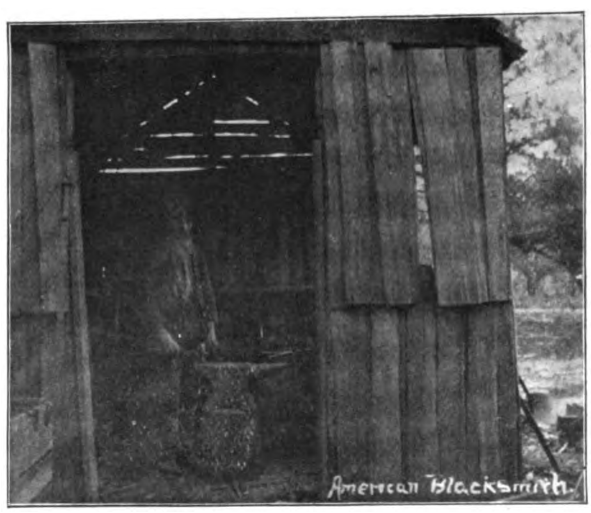
Shrinking and setting tires,—perhaps no other job is of more frequent occurrence in the season to come. Many patented devices are advertised for the purpose, of which, like every other patented article, some are excellent and others not so good.

A Prize to the Best-Appointed Blacksmith Shop.

Concerning the up-to-date blacksmith and his opposite—of the Tom Tardy stamp—much has been written and said, but not too much. In fact, not enough can be said to encourage the smith to rise to the occasion and throw off the worn-out customs of old times.

In passing through different cities and villages, one cannot help noticing how varied in appearance are the establishments that bear the name of "blacksmith shop." It is not the size nor the scale upon which business is carried on, but the general air of the place, that makes the difference. A very small shop, whose owner is a poor man (just starting out perhaps), is often absolutely up-to-date and full of life and business. On the other hand, a large concern, owned by a smith of long experience (and set, old-fashioned methods) may have that tumble-down, falling-to-pieces look that indicates a shiftless, neglectful owner. The former is on the ascending track, the latter on the descending, for intelligent management is bound to win.

The accompanying engravings are from photos of two shops that may be taken as types. The first is owned by Mr. James A. Hayes of Charlton City, Mass. A certain spick-and-span air about this shop indicates a manager of scientific principles. The other cut represents a shop in North Carolina, of which nothing need be said.



A TUMBLE-DOWN SHOP IN NORTH CAROLINA.

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In order that the readers of The American Blacksmith may exchange ideas regarding the best-appointed shop, a prize will be given to the person sending to The American Blacksmith, P. O. Drawer 974, Buffalo, N. Y., a photo, or photos, of the establishment standing nearest the high-water mark of merit. Any one may compete for this prize, whether he be the owner of the shop or not, the only condition being that persons sending in photographs in competition shall be regular subscribers to The American Blacksmith. Photographs should be clear and should be accompanied by the name of the proprietor, a brief description of the class of work done in the shop, and a short list of the tools and their make. This competition will remain open until May first. In this connection also, we should like to receive photographs of the poorest appearing shops, those of the unprogressive, tumble-down order. All names will be omitted if such are published, and suitable reward made to the person sending in photograph of the shop which we consider shows the worst conditions. Some of these may serve as a glaring example of how the American blacksmith's shop should not look.

The Railroad Blacksmith Shop.—5.

W. B. REID.

Why 973's Frame Broke.

A new engine, 973, of a large, powerful type, was recently designed and constructed. Although scarcely a year in service, she came into the shop lately badly crippled with a broken frame. The two front toes or rail braces were broken entirely off, and the main braces between the pedestals broken in three places. Fig. 24 shows how it looked.

The companion frame showed no defect whatever. The engine had been in no collision, nor had it suffered unusual shock of any kind. The frame appeared of excellent design, its massive proportions disarming any suspicion of overloading. Why did it break? "It broke of its own accord because it had to," remarked old Jerry Overalls in reply to a query of his gang-boss; and there is probably more significance in the expression than appears upon the surface. A glance at the frame shows the breakage to be due to two causes: First, too great tension or strain in the back of the frame seen in the long bow-like sweep of the back. Secondly, careless, inferior workmanship in the welding of the braces, evident in the coarse, brittle appearance of the broken parts, occurring in each instance at the point of the weld. Had these braces been welded thoroughly, they might have resisted indefinitely the tension in the back of the frame. In giving way, they simply allowed the frame to spring back to the original curve left there in process of manufacture. But why this original curve? Many years' experience in locomotive contract shops enables me to answer the question.

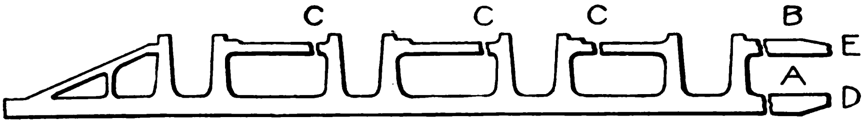


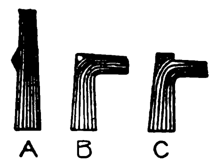
Fig. 24. FRAME OF ENGINE 973, SHOWING FRACTURES.

Working under a schedule of prices, often affording little if any margin, the frame-maker, as a rule, is not over particular in the methods followed in turning out the work in paying quantities. Quantity rather than quality, the quickest rather than the best methods are naturally chosen, resulting ultimately in expensive frame repair. When welding pedestals in place, it is a common practice to leave a curve the whole length of the back of the frame, calculated to pull straight with the shrinkage of the braces, which in the frame (Fig. 24), are welded in six places. Supposing (which is not always the case) that the first three welds are allowed to cool entirely before the three last or binding welds are taken, this would still leave, at fair estimate, $\frac{3}{4}$ inch of shrinkage. A very slight curve the whole length of the frame would meet this requirement, and, if the braces were substantially welded, probably without much detriment to the frame.

Still the strain is there, and under conditions of hurried production is likely to be excessive; the more especially when we consider, along with this, another bad practice, largely followed, of straightening or lessening the curve upon the back of the frame by hammering or peening the same across the anvil. Heavy forgings whose surfaces are to be planed should never be straightened in this way. The peening simply acts as wedges at the points so treated, affecting only temporary results. The iron will relax and assume its original bend as soon as the surface is planed. An old frame, whose surfaces are already planed, can be straightened safely in this way. But the tension of an unfinished frame-back, it will readily be perceived, might be doubled by this practice. The excessive curve upon the back of 973's frame (Fig. 24), seems to indicate the conditions that have just been described.

Inferior workmanship in the welding of the braces was also a contributory cause of breakage. The scarfs are often hastily and improperly made. The V plugs are heated or "roasted" to an extreme degree to ensure welding in one heat, while the brace is very often not hot enough. A perfect amalgamation of the parts under such conditions is simply a physical impossibility. The fibre and elasticity of the iron are destroyed, as seen in the coarse, granular or crystalline appearance of the fractured parts, illustrated also to some extent in the conduct of the frame under the tool of the planer, when the iron, following the tool in fibrous, elastic ribbons upon each side of the scarfs, crumbles into granular particles at the points of the weld.

Another element of weakness is the forging of the extension or stub upon the pedestal, to which the brace is welded from the solid. This makes a weak, cross-grain iron where both the weld and bolt hole of the pedestal binder occur (Fig. 24, C). A better, if less speedy, method is to forge the pedestal as in Fig. 25, A, bending the same in the V tool under the hammer,



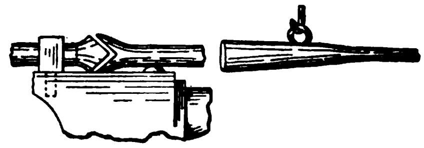


Fig. 25. PROPERLY FORGED PEDESTAL SHOWING UNIFORM GRAIN OF IRON.
Fig. 26. METHOD OF REPAIRING FRONT END OF LOCOMOTIVE FRAME.

B, then cutting out the recess at the top, C. This gives a uniform grain of iron, as shown by the lines of direction in Fig. 25, and carries the weld safely beyond the hole of the pedestal binder. This method, we are aware, may not always be practicable, especially in the case of the extremely heavy frames we are considering, still, it emphasizes the necessity of greater care in forging such parts as these from the solid.

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A frame can be made free from strain if necessary time and care are taken. The back should be perfectly straight to begin with and straight when completed. The shrinkage of the braces can be equalized by heating one of the pedestals immediately after making the binding weld in the brace. The pedestal bending slightly towards the brace relieves all tension. An examination of the two front braces, or rail splice, which we mentioned as being broken entirely off (Fig. 24, E, D), showed the iron of both to be exceedingly coarse and granular. The upper brace (Fig. 24, A), being an extension of the frame back, indicates the poor quality of the whole frame. This point is of some interest and importance, showing that mere ponderousness, so characteristic of locomotive frames of recent design, may not be a proof of proportionate strength, compared with the lighter locomotive frames of older construction. And for the simple reason, that the difficulty of working and handling frames of such unwieldy size is likely to result in the quality of the material being sacrificed to weight and proportion.

The same is true of the building of the frame as of the forging of the parts. The examination of many broken frames of this class would seem to justify this conclusion. The appearance of the broken brace (B, Fig. 24), shows it to have been welded by a lap scarf—a very excellent way if properly done. But here also, we find the proof of hurried, careless work. Part of the surfaces have that glazed slaggy appearance, familiar to the smith, where a weld has been attempted with imperfect, dirty heats, a few patches, here and there, of a clean, broken, fibrous appearance, showing how slenderly the parts had been held together. The weld was made under the steam hammer. The parts being dirty, and probably poorly scarfed, slipped beneath the blow of the hammer. After a short time in service, this brace broke at the weld, throwing the whole burden upon the upper brace, which, being of poor quality, also broke, as shown in Fig. 24, A. A contributory cause of weakness was the presence of a large, tapered, splice bolt-hole.

Jerry Overalls was right, 973's frame broke because it had to. It was built that way and sooner or later the result was inevitable. We repaired the frame as follows:

The back was first straightened. The braces were then welded. After each binding weld, a good heat was taken in the centre of the brace and a heavy square bar of iron wedged between the pedestals. This stretched the brace, in cooling, sufficiently to overcome the shrinkage. For the repair of the front end, two new pieces were forged, scarfed and welded with separate heats, as in Fig. 26, which shows the frame laid upon its side, lengthways, across the anvil-block; the pedestal braced against a square block, in the hole of the anvil, to resist the blow of the ram with which the parts are driven together. Two good, slow side heats completed the job.

SHOP OF MR. SANFORD HILL, PEEKSKILL, N. Y.

A Typical York State Shoeing Shop.

The accompanying engraving shows a very neat shop, being a reproduction of a photograph sent us by Mr. Sandford Hill, of Peekskill, N. Y. The shop is 21 by 40 feet, with an addition in the rear of 20 by 20 feet, where the stock is kept. The shop runs two fires, and is principally occupied for shoeing work. Mr. Hill states that he has had nineteen years' experience, making a specialty of road and race horses, but he also modestly states that he thinks he has lots to learn yet.

Fuel Costs of Power.

BILLY BUNTZ.

Power will prove beneficial in any shop. It makes work easier, quicker of performance, invites trade, increases the output and enables the user to meet competition. To be *economical*, however, much depends upon the *kind* of power. Some prime movers cost more for maintenance than the hire of labor for running small machines by hand, and, of course, with such, a man's pocket-book needs a tonic.

This is where the fuel cost of power comes in. In order to prove profitable, a power must be not only inexpensive as to repairs, but *economical in fuel consumption* as well. This fuel economy amounts to considerable, even in a small unit, as one kind of engine may burn fuel costing a couple of dollars or more a day, while another may be only one-half or one-third as expensive. Using an engine which is costly in fuel is like having a pocket with a hole in it. Unfortunately, however, a fuel-glutton can't be choked off. It is therefore well when contemplating the installation of power to consider the practice of other folk and profit by their experience, rather than buy any kind of power and discover you have made a mistake when it is too late to change.

The cost for fuel per horse-power per hour or day in some cases is difficult to practically compute. After it is figured, it usually comes out differently in practice. In order to figure the fuel cost of a steam engine it is necessary to know the price of coal or wood, its quality or the number of heat units a certain quantity of it contains, the area of the heating grate, the kind of feed-water heater, the draught or smokestack, the number of flues, the size of the boiler, etc. When these are accurately computed and the engine installed, a coal strike sends prices up into the garret, and you are burning a lot of money for very little service. This is to say nothing of cleaning flues,

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raking clinkers and waiting on steam. A steam engine transmits to the driving pulley only 10% of the fuel energy which the coal contains, while the gas engine transmits about 35%.

With wood at only $2 a cord, a year ago a smith in a Missouri town was operating a steam engine at a cost of 75 cents a day for fuel alone. He found it profitable to give it a rest by installing a gasoline engine, the fuel for which cost him but 25 cents a day. Pirtle & Co., of Wilsey, Kan., who have a 2½-horsepower Weber engine, say they have used it eight months whenever needed, in pulling an emery wheel, drill-press and other small machines, at a cost of only $5 for gasoline. Surely no cheaper power could be desired.

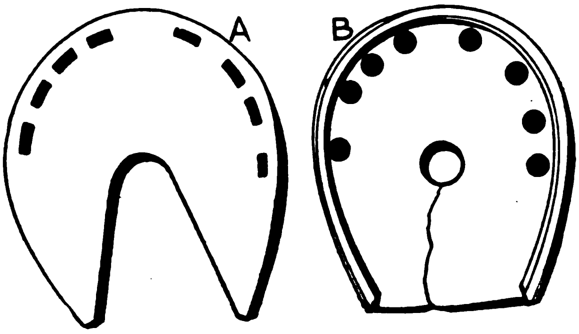
Electric power is a little fancy for the small shop, as the average smith knows little about electrical appliances. Then again, a generator has to be used, and a generator requires power to run it. In the cities the current is furnished by a power plant at a cost of several cents per kilowatt (equal to 1.34 horse-power) per hour. As the charge schedule for electric power is generally arranged on a sliding scale, which makes the cost higher for small quantities than for large quantities, the small shop gets the higher end.

The charge for current in several cities is here given, being figured on a horse-power basis for convenience.

In Philadelphia the charge for current is at the rate of 7½ cents per horse-power per hour. Thus, a 2½ horse-power would cost 18¾ cents per hour, or $1.87½ for 10 hours' run. However, a discount of 33⅓ per cent. is allowed where the current is used all day, which would make the net charge of $1.25 per day. This is a fair average of running a shop by motor. In St. Louis the charge for current is at the rate of 6 cents per horse-power per hour, or 60 cents per horse-power per day, which would make a 2½ horse-power cost $1.50. In Minneapolis, electric current costs 7½ cents per kilowatt for the first two hours; 5 cents per kilowatt for the next three hours, and 2 cents per kilowatt for the next five hours. In Portland, Ore., the charge is at the rate of $9.50 per horse-power per month, or $23.75 for 2½ horse-power.

Those gas engines which have a mixer for vaporizing the gasoline into gas are the most economical on gasoline. The consumption by a small engine is only one gallon of gasoline per horse-power per ten hours, or 2½ gallons a day for a 2½ horse-power. This is assuming that the engine is running all day long. If it is used only half the time, the consumption will be only half, or if at times the engine is pulling only one or two small machines requiring, say one horse-power, the consumption by a 2½-horse-power engine would be the same as though the engine were of only one horse-power, the extra power being held in reserve by a governor. Consequently, the cost for gasoline is proportional with the load the engine is pulling, and the smith gets the benefit of receiving power at a cheap rate.

The cost per gallon for gasoline varies in different cities. In Minneapolis it is 12½ cents a gallon when delivered by a tank wagon, or 15 cents a gallon by the barrel. In Hartford, Conn., gasoline is 14 cents a gallon; in St. Louis, 12 cents; in Portland, Ore., 19½ cents.



TURKISH HORSESHOES. A, STYLE USED TWO CENTURIES AGO. B, SHOE NOW USED IN TURKEY.

It costs more to run on gas than it does on gasoline. The consumption of city gas by the best gas engines is about 25 cubic feet per horse-power per hour. Thus, a 2½-horsepower gas engine would consume 62½ cubic feet per hour, or 625 cubic feet in ten hours, which, with gas at $1 per 1,000 cubic feet, as it is in most cities, as in Philadelphia, St. Louis and Hartford, Conn., would cost 62½ cents per day, or about one-half as much as electric power.

Aside from the fuel cost of a gas or gasoline engine, with an engine of this kind the smith has his own complete power plant, which, being a simple one, he can handle it easily, starting up or shutting down as many times a day as he likes.

Herman Schmidt of Hanover, Kansas, says his 2½-horsepower engine costs him only about 20 or 25 cents a day for gasoline. The engine is in the cellar and is belted to a shaft near the ground, thence to a countershaft near the ceiling, and from it to a second countershaft. There are 12 pulleys carrying 500 feet of belt and driving the following machines:

Little Giant trip hammer, made by Mayer Bros., Mankato, Minn., emery wheels, band saw, forge blower, grindstone, disc-sharpener, drill-press, turning lathe and a 7-inch buhr feed mill.

Mr. Schmidt is delighted at receiving so much power at so little fuel expense, and says he will gladly give information about his shop to anybody. He says his Little Giant Hammer is all right, and he thinks it the best for the smith shop. It requires only about one horse-power, he says, and a gas engine is just the thing for pulling it, together with other machines.

A Price Schedule from Arkansas.

The following is a list of prices and costs, which prevail at the present at Western Grove, Arkansas, as sent to us by O'Daniel & Price of that place.

Shoeing, No. 1 to No. 3,	$ 0.70
Shoeing, No. 4 to No. 6,	1.00
New tires, each,	35
Setting old tires, each,	.20
New buggy tires, each,	1.00
Removing and filling, per spoke,	.15
Sharpening straight plows,	.05
Horseshoes, cost in shop, per pound,	.04½
Toe steel,	.04½
Store nails, per pound,	.14
Peidmont coal in shop, per ton,	14.75

The Turkish Horseshoe, Old and New.

Different nations employ very different devices to serve the same purpose. It is interesting to notice these differences and to trace the reasons for them.

Mr. M. Raeplinger, of Church Creek, Md., sends us a model and an interesting description of the Turkish horseshoe. He has his information at first hand, describing what he himself has seen. It is interesting to note that, although Mr. Raeplinger is a blacksmith over fifty years of age, and eight years ago had never heard a word of English, he can now read and write the language very well.

In Bosnia, Turkey, the horses in common use are ponies, consequently the shoes are very small. Where our horses are shod with a rim of iron, which leaves the center of the sole uncovered, the Turkish shoe consists of a solid disc of iron, with a small rim welded on around the curved edge, as shown at B. A circular hole in the

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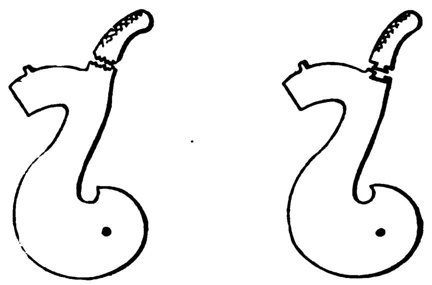
center, of about half an inch in diameter, runs out in a slit to the back of the shoe. This hole and slit enables the smith to adjust the shoe, shear-fashion, to the pony's hoof. Eight nail holes appear around the front of the shoe, by means of which it is fixed to the foot.



REPAIRING A BROKEN GUN HAMMER.

These shoes are made by machinery, says Mr. Raeplinger, as it would not pay a smith to make them by hand. But the oddest part of it all is that the horses are shod only upon the fore feet—the Turk considering that enough to protect the horse's hoofs from stones and stumps.

In olden times the Turks made their horseshoes somewhat differently. The Hungarian farmers sometimes turn up specimens of these old shoes in plowing their fields. At A is shown a Turkish horseshoe, dating back to the year 1683.

Pointers on Flue Welding.

WM. BALDWIN.

As to welding flues, I shall try to give a plain and simple idea of the way I weld them. First of all, I cut my tips about eight inches long. Then cut off the ends of all the flues far enough back to have them good and sound. Heat the end of the long flue and place it over the point of the anvil horn, resting the end on a bench of some kind a little lower than the horn of the anvil. Begin to scarf about ½ of an inch of the flue, so that when you are finished the scarf will be about ½ an inch long. Always scarf a flue in one heat. Care must be taken not to get too high a heat.

After you have scarfed all the flues, begin with the tips, and swell them out over the horn. Next take the flue and rest the scarfed end on the anvil, and the other end on the floor; heat the tip again, and drive on just solid enough to stay on well. See that the tip fits down on the flue tightly on the outer edge. Then lay down again and proceed as before, until you have them all fitted. Next coke enough coal to finish welding all the flues. Make a clean fire, place the flue level in the fire, with a good backing of something solid behind the flue tip, so as to keep the flue and tip together while in the fire. Now make a crotch out of box iron, or any thin iron, to fit in the hardy hole to rest the flue in. Proceed to heat, keeping wet coal packed tight on both sides of flue and tip, turning until hot all around. Then put on borax. Be careful not to burn, and when you have a welding heat in one place, turn, and hammer lightly and quickly, turning all the time.

I have used this method with great success. When tips are over eight inches long, they are hard to keep in place. Some smiths use a rod through the flue with nuts and washers, but I can tip a flue while I am changing the rod from one to another. All I consider necessary to make a perfect job is a good, tight lap, a good, clean fire, and a great deal of experience.

The Repair of Broken Gun Hammers.

ADAM T. WIBLE.

I give herewith the way in which I mend breechloading gun hammers, and having a great deal of this work to do, thought that it might be useful to some brother blacksmith who would otherwise have to wait until a new one was ordered and run the risk at the same time of not getting a hammer which would match.

To repair the work, I file a dovetailed slot in the old bottom part, hammer out a suitable piece for the top part and notch it to fit the hammer. I then rivet and braze which gives a very satisfactory job.

The Blacksmith's Work in Utah.

J. H. JENSEN.

At your request, I will write a few lines about the different classes of work which prevail here at different seasons of the year. I would say in the first place, however, that I am never idle, for when orders do not keep me busy, I keep myself busy, stocking up with clevises, wagon wrenches, king bolts and queen bolts, such as are called for during the busy months.

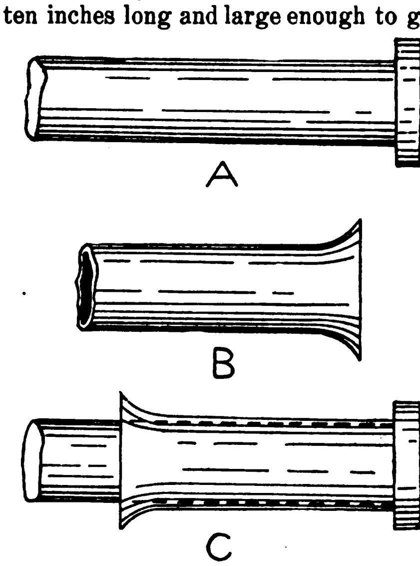
February is my dullest month, and, as a rule, there is little work in March, although this month is somewhat better, as some wideawake farmers bring in their work at this time, before I am extremely rushed. April is a busy month, as a rule, for the farmer is putting in his crops, and the plows, harrows and seeders must be taken care of. There is still a good deal of plow work in May, and some wheel work also. June, as a rule, being quite hot, there is considerable tire work, and also mowers, horse-rakes and derricks to be repaired. In July, tire work principally prevails. I have sometimes reached as high as fifty a week besides wood work and other odd jobs. August is about the same as July. I also have thrashers in these two months to look after. September is a good month for tire work, and the last part of the month some plow work also is brought in. In October tire work and plow work occupies the most of my time. In November I have a slight amount of tire work. In December, which is one of our winter months, I do considerable work on ice tongs, but of late years have had little or no sleigh work. January has been very good with me this winter and I have built one pair of bobs, and a hay derrick, besides other odd jobs.

There is always a whole lot of different kinds of work throughout the year which are too numerous to mention. My work is of a varying nature.

Flue Welding.

JOHN KOLSTROM.

I take a piece of steel shaft about ten inches long and large enough to go



A VERY GOOD METHOD OF WELDING FLUES.

into the flue. To this I weld a good, strong head, as shown at A. I next take a new piece of flue, cut it in lengths of seven inches, opening the ends while hot, and scarfing them, as at B. I next thin the old flues, not shown in the figure, so that they will easily go into the scarf on the short pieces, B. Heat the mandrel and place the short piece on it as shown at C. Then drive the old flue inside the piece B. Next tap the edges down with the hammer, take a good heat with borax and tap with a light hammer while you are turning in the fire. Use a small, strong fire.

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The Things to Talk.

ELLA WHEELER WILCOX.

Talk happiness; this world is sad enough
Without your woes. No path is wholly
rough;
Look for the places that are smooth and
clear,
And speak of those to rest the weary ear
Of earth, so hurt by one continuous strain
Of human discontent, and grief, and pain.
Talk faith; the world is better off without
Your uttered ignorance and morbid doubt.
If you have faith in God or man or self,
Say so; if not, push back upon the shelf
Of silence all your thoughts till faith shall
come;
No one will grieve because your lips are
dumb.
Talk health; the dreary, never-changing
tale
Of fatal maladies is worn and stale.
You cannot charm, nor interest, nor
please
By harping on that minor chord—disease.
Say you are well, or all is well with you,
And God will hear your words and make
them true.

HEATS SPARKS WELDS

Cheer up! Winter is on the wane.

How many dollars lost last year by bad debts?

A good blacksmith is greatly needed at Shindlar, S. D.

What's your opinion about your present prices for work?

The country shop now begins to sing a song of plow shares.

Have you profited by the universal opinion regarding power in the shop? What kind have you adopted?

To run down a competitor shows only that you have to convince people, by words, of your own superiority.

Do not be content to sit still half way up on the ladder of success. Other people who keep on climbing will walk right over you.

Pride yourself on keeping your shop, or your particular part of it, neat, clean and tidy. It may take a little effort, but it's worth while.

Under which head will you enter the photographs of your shop in our prize competition — the best-appointed or the worst-appointed?

The blacksmith's apron was used by King Arsaces of Persia as a sacred banner in B.C. 250, and was called by the Persians "Darafsa-I-Kawani."

Are you in line for a copy of "The Village Smithy?" All subscribers will receive a splendid reproduction of this handsome painting, by Raphael Beck, as an art supplement with our April issue.

Horseshoeing at the "Village Smithy" is the subject of two of the largest and most beautiful tapestries in the Palace of the Escurial, Madrid, Spain.

Our grandfathers had none of today's advantages in the way of improved tools and labor-saving devices. Are you doing any work just as your grandfather did it?

King of his own dominions, however humble, is the shopowning blacksmith. The man who works for an employer all his life, even at a higher wage, never attains to this position.

New blacksmith fires will be installed by the Canada Switch and Spring Company, Montreal, Quebec; The Thomas Wright Company, Jersey City, N. J., and Mr. T. Hoffmire, Bloomington, Ill.

New fires will be put in by the following firms: Schenectady Railway Company, Schenectady, N. Y.; Risdon Iron and Locomotive Works, San Francisco, Cal., and Robert Holmes & Bros., Dansville, Ill. Signs of good times.

The approach of spring—the opening up of the year — must bring to mind the work of last spring and lead to comparisons of present methods with those of last year. Are they favorable? What improvements do they suggest?

A new factory for the manufacture of wagons, sleighs, etc., will shortly be built by Mr. E. G. Gensmer, Sauk Center, Minn. The Great Lakes Engineering Works, Detroit, Mich., are also about to equip their blacksmith shop.

The smith's vocation indicates the trend of civilization's progress. In olden times he fashioned the sword, shod the war horse, and renewed the dungeon chains. Today he makes the plow, shoes the dray horse and repairs the intricate, new farming implements.

The foreman blacksmith is not always he who knows the most, but is rather chosen for his ability to handle his men most intelligently, and to plan the execution of the shop's work to the best advantage. Those who use their heads go quickest to the front.

The blacksmiths and helpers employed by the Chicago Shipbuilding Company at South Chicago followed the example of the boilermakers, iron shipbuilders and ship-carpenters recently and went on a strike. The unions demand a nine-hour day with advanced wages.

Catalogues tell the tale of improved tools and advanced ideas. Write to the manufacturers in your line and get their latest publications. They are always glad to send them, and even if you don't intend to buy at once they are a good thing to have on hand, if one wishes to keep in touch with new ideas.

Are you interested in the American Association and its campaign for lien laws and higher prices? Full information for starting County Associations will be furnished to any smiths in counties where such organizations do not exist. By such plans the benefits of mutual agreement among the smiths can be secured. Even if only a small start be made, the advantages will be most apparent, and the organization be gradually worked up to include every shop in the county.

A jack-of-all-trades many a blacksmith must be in order to undertake all the jobs brought to him, but there is no reason why he should be "master of none." One special class of work is always more to his liking and more in his line than others. He may have just a little trick, peculiar to himself, of turning out a certain piece of work. In the midst of the widest diversity is always a chance for making a special study of some given branch. It pays to excel even in one small kink; for this is an age of specialists. Look out for your specialty.

Is there any one of our readers who does not approve of the American Association of Blacksmiths and Horseshoers, its aims and purposes? Thus far every one has spoken in favor of it—and why not? Every honest, hardworking blacksmith should be insured against bad debts by lien laws. He should get his money for the material and labor put into the work, together with his small margin of profit, promptly and without fail. He should join with his associates and command greater respect by advancing and maintaining his prices for work proportionate to present increased cost of materials and living expenses. If this is not done, the shops that are always busy, whether the times are good or bad, make more profit in dull times than when the whole country is prosperous, which is a condition that never should exist, and which should be remedied.

He reasons like a lawyer, does Tom Tardy. When asked, the other day, how and why he did work so much cheaper than other smiths, Tom replied, "Well, you see, it's just this way." Then he went on to tell how there are three other smiths, all within short distance of him, and the four of them have each been trying to secure the balance of the trade. Tom found himself falling behind in the race—in fact, he said he had no trade at all. So instead of finding out wherein lay the superiority of his rivals and setting about to excel them, he commenced to cut prices. To make a living thus, he was obliged to buy the cheapest materials on the market, and repairs and improvements in the shop became out of the question. Being unable to afford any help, he cannot take time to do really careful work. This cheap system attracted a certain class of "cheap Johns," who now have become Tom's established patrons.

And so he jogs along, living from hand to mouth; and so he will continue, until one fine day his business will just go out of existence like an old burnt-out candle.

This is entering the field of competition from the wrong end. If Tom Tardy had set a high standard with high prices, high class materials and work, he might have gained a high class patronage — people who want good work at any reasonable price, and the other three smiths would have had to look out sharply for trade.

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American Association of Blacksmiths and Horseshoers.

Aims, Notes and Suggestions.

The American Association of Blacksmiths and Horseshoers has been duly incorporated under the laws of the State of New York, and by reason of such incorporation has now the necessary authority to institute, organize, and grant charters to local county associations in any or all States of the Union. As to the name, we wish to explain that it is intended to include every branch of the craft allied to blacksmithing, or going under that general name, such as wheelwrighting, wagon or carriage building, general repairing, horseshoeing, blacksmithing of every kind and class.

The movement now on foot under the auspices of the above named Association needs but little introduction to the regular readers of THE AMERICAN BLACKSMITH, but as this issue of the journal will go to many craftsmen hitherto unacquainted with the work now being instituted for the benefit of the smiths of this country, it is thought best to recapitulate the points which have been told in preceding issues.

The American Association of Blacksmiths and Horseshoers has been formed for the purpose of promoting the material, every-day welfare of blacksmiths, horseshoers, wheelwrights and repairmen. There are many much-needed reforms and benefits which cannot be secured by individual effort, but which the united and concerted influence of the craft as a whole should be able to gain without question.

The Lien Law.

The smith, whether he be a horseshoer, blacksmith or wagon builder, is usually obliged to make his payments for stock to his supply house or dealer within a comparatively narrow margin of time. When, on the other hand, he comes to put his time, labor and material into work for customers, the pay to cover this and his small profit should by every right be forthcoming with equal promptness from the customers, in order that the smith may meet his bills as mentioned and provide for his own living expenses. Such, however, is not always the case, and much money is totally lost by the smith's inability to realize on bad debts. In order to collect this, many measures are adopted, some more or less effective, but few affording the absolute certainty of collection and protection which the craftsman should have. Other trades have what are termed Lien Laws, which allow the craftsman to put a lien on the article which he has worked on and thus secure payment. In Minnesota also the blacksmiths and horseshoers have the protection of the Lien Law. They can file a notice of lien at a cost not exceeding 25 cents, and proceed to collect their pay, all the cost of such action coming out of the man who owes the bill.

The great benefit from such a law is readily apparent, and it only remains for the craft, itself, to see that it is passed in the respective States. It is the purpose of the Association to direct and organize the efforts of individual members, to enroll them under one banner, working with this end in view. Your efforts are needed, and we feel that it will surely be lent in view of the great saving which such a measure means. No other mechanic in the world works harder with his head and hands than the smith, and he earns every penny that he gets. Therefore, he is more than rightfully entitled to legislation to protect him from "dead beats" and to enable him to collect money which is due. It is often well to refuse work for which the pay is doubtful, but it would be far better to do all the work offered, and under the protection of a Lien Law so that there will be no question about the money. There is no doubt of the many advantages of such a law. The thing is to get it passed in every State. We have set about doing this; we need your help and you need ours. There are practically no objections to be raised against such legislation, and few oppose it. The united influence of the blacksmith craft is the principal thing required, and it will cost but comparatively little effort on the part of each individual smith. The further details will be explained to those interested as the matter takes shape.

Higher Prices for Work.

The price question is also a most vital one at the present time. In spite of the fact that the cost of material and living expenses have been on the increase for some time in the past, in most districts, the prices which the smith is charging for his work are the same as they have been for years. As a result, in these days of prosperity the smith is in reality getting less instead of more money, as he has to work harder to obtain a certain amount of necessities and comforts to live, for himself, and those depending upon him. This is radically wrong. The most apparent reason why prices have not been generally advanced for the work of the smith is because of a lack of co-operation, organization, mutual agreement, or whatever we choose to term it, between the parties whose interests are involved. From all over the country we hear of wages being increased and salaries advanced, so that it is high time for the smith and his neighbor to come together and agree upon higher prices, which will properly compensate them for their labor. The scheme by which it is proposed to effect this benefit of increased prices is by the formation of an Association in the various counties all over the country; each of these county associations having the power to fix the price for its own district and for that territory only, and receiving a charter from the parent or American Association of Blacksmiths and Horseshoers, but having full control of its own prices and decisions affecting its own welfare. Such associations would be in effect mutual organizations for the purpose of maintaining prices at a proper level. Their aims should be high and the benefits great. In some sections of the country, small organizations of this kind already exist without any connection with a general association. It would be well for associations of this kind to unite themselves with the American Association at Buffalo, if in sympathy with the principles of the general association, and to receive a charter therefrom. Such small organizations should be extended to embody the entire county in which they are located, if this is practicable.

A Good Start Made.

Work has already been actively begun in New York State, and representatives of the Association are at work covering Genesee, Livingstone, Erie, Orleans, Chautauqua and other counties at the present time, and all the blacksmiths, horseshoers and wheelwrights of these counties are being visited personally to enlist their influence.

Before this issue of THE AMERICAN BLACKSMITH goes to readers, a meeting will have been held in Batavia, N. Y., for the purpose of organizing the craft in Genesee County, New York. An Association has already been formed in Erie County, in the neighborhood of one hundred strong. The following have been chosen officers of this Erie County Association of Blacksmiths and Horseshoers: President, L. M. Kelly, Lancaster, N. Y.; vice-president, B. Moritz, of Hamburg; secretary, R. E. Davis, of North Collins; treasurer, H. J. Twist, of West Seneca.

At the last meeting of this Association, prices for shoeing were adopted,

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which it was agreed should not be changed inside of ninety days. It may be mentioned that as a result of the agitation given this matter in Erie County, a number of the shops advanced their prices for work even previous to the agreement by the Association proper, so that the benefits of the movement are easily to be seen.

Those who are interested in this movement to obtain the protection of Lien Laws and to secure better prices are urgently asked to co-operate with us at once. Reference is made to the blank on page X of this issue, which kindly fill out and return to the American Association of Blacksmiths and Horseshoers, at 453 Washington Street, Buffalo, N. Y., in case you are in sympathy with what is being done and with the purposes of the organization. Enthusiastic blacksmiths, who have their own and their craft's welfare at heart, can aid this work greatly by proceeding at once to get the shops in their own county in line and organize them into a county association for their own mutual advantage. We will be glad to send plans for forming these county associations from this office to any who are interested in the matter, and will lend them our interest and support towards the formation of such county associations. The latter will then receive a charter from the general or American Association at Buffalo. This work of organization can be accomplished very quickly by a few interested smiths in each county, and we would be glad to hear from those who could devote a portion, or all, of their time to work of this nature.

The movement will necessarily go slowly at the start, for all States cannot be covered at once by the representatives of the American Association at Buffalo, N. Y. The movement at first will, as is proper, consist more of a campaign of education and information of what is to be done, to pave the way for active, direct work later. However, it lies within the power of men in every county to make an immediate start, as explained before.

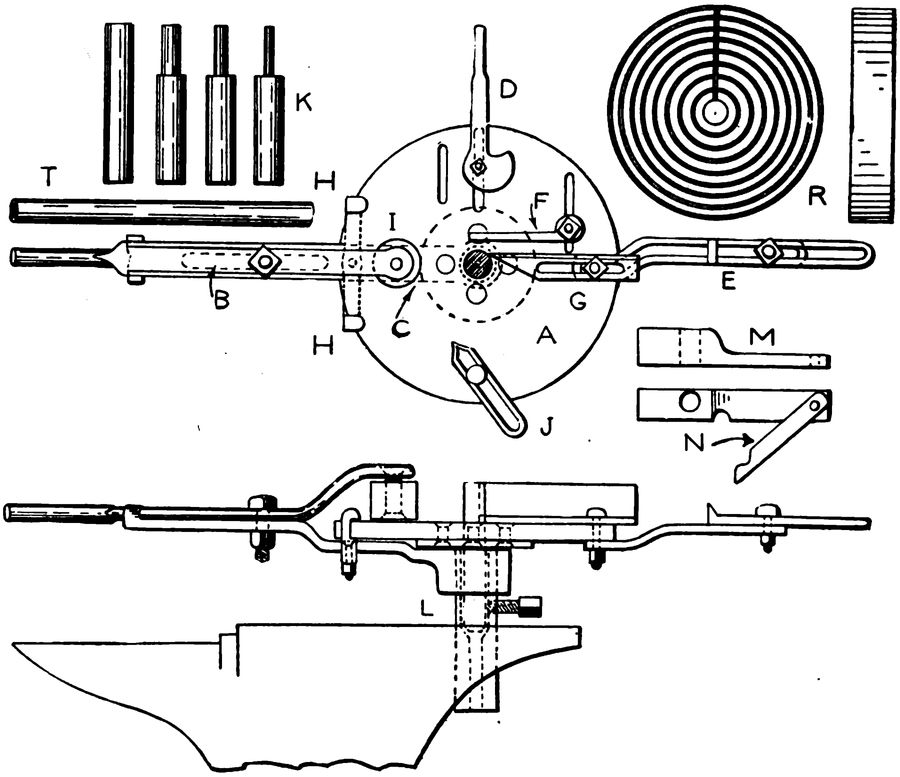
Let it not be forgotten that great reforms and improvements have never been the work of a day. They almost invariably require conscientious, united and persistent work. We are making this appeal for support to all members of the craft, and certainly the support which they can contribute will not equal in any way the benefits which would result if the purposes of the Association are successful. There is certainly no reason why they should not be. Let us hear from you therefore, sending the blank on page X and telling your own particular views regarding the matter of Lien Law and higher prices. There are several other benefits which will follow as a natural result, wherever a county organization is successfully formed, but the two just mentioned are the principal ones.

An Eye Bending Machine of Wide Range.

The drawings on this page show two detailed views of an eye bending machine, which will do work of an extremely wide and varied character, and which forms a tool of the greatest usefulness for all shops where a number of similarly shaped pieces in the nature of angles, I's and U's, are required from time to time. The construction is such that it allows of ready adjustment for different forms, and the whole is adapted for use by hand on an anvil. We are able to show this handy tool, owing to the kindness of Mr. William Vanderlinden of Chicago, Ill.

The tool will bend from ⅜ to twelve inches, and from ¼ to 1½ inches round iron. It will also accommodate flat iron of the same sizes. It can be also arranged to bend square corners of any size from ¼ to 1½ inches round iron, and also can be used for making angles of any degree.

Referring to the figure, A is the table or bed plate of the machine. B is the lever and C the bottom lever. The part D is a clamping device, which may be adjusted as indicated for different sizes of stock. At E is shown a gauge and at F a clamp plate, which is used for holding the iron; G represents a guide plate made of angle iron, and both these plates are adjustable; H are termed the safety or guide hooks. At I is shown the wheel or roller which is carried on the movable lever, and which is the part that does the bending. A distance gauge is shown at J. King pins of various sizes, as indicated at K, are needed to fit in the hole of the table. L shows the stand or post.



A VERY USEFUL EYE BENDING MACHINE FOR VARIOUS KINDS OF WORK.

For bending circles of large diameter, an assortment of rings is used which can be slipped over the king pin. These are shown at R. For the purpose of bending square corners, the piece M is employed, which is placed over the king pin with a bolt in the back of it. N indicates the gauge which is used for the purpose of bending "U" bolts. When heavy bending is required, a pipe lever, T, may be slipped on over the end of the shorter handle to secure greater leverage.

This machine is operated very easily, and is quickly set for any work. It is very useful for small orders, and can be used for a vise also, with the clamp lever D.

It must always be an object of every mechanic to combine within a small

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compact tool, as many uses as possible. Hence, the wide variety of work to which this tool may be turned must be counted one of its very important advantages.

A Year in an Iowa Blacksmith Shop.

J. G. HOLMSTROM.

The following is an account of a year of work in Caresco, Ia.:

Horseshoeing is carried on all the year around in cities, but in the country there is very little in the summer. From March first to November, wagon work and tire setting keep the blacksmith busy. In March the plow work commences and lasts until June—going on all summer, to some extent, where breaking is done. In August it sets in again and continues until the freeze comes. Corn plows are repaired from May on to July.

Then the harvesting implements are in evidence—mowers and binders—while from the first of June until the middle of July, hay racks, hay rakes, hay loaders, etc., are brought in. Threshing now begins, and thence forward to freeze up the shop is kept going with separators and engines.

Winter sets in at about November, and the smith's work from that time on to March consists principally of sleigh work, varied during February, March and April with repair of seeders and drills.

This is the outline of a blacksmith's usual work during a year in the Northwest.

An Improved Sandboard Plate.

SAMUEL L. ADAMS.

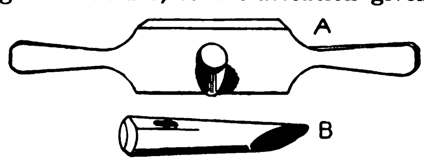
My experience of forty-eight years in Utah as a blacksmith has proved to me that the right style of sandboard plate has not yet been adopted. The round bushed thick cast-iron plate takes out too much timber and weakens the sandboard. It is also a well known fact that the hole in the sandboard plate becomes elongated, and as the plate wears away, the wood on the back side of the sandboard is worn through, and in cases where men are neglectful, a new sandboard has to be made. I think my device will obviate, and save both king bolt, plate and wood. In this case no groove would be cut in the king bolt to render it easy of breaking.

I do not punch a clean hole out of the plate, but I cut one side of the hole and drift the other, thus making the lip that takes the wear of the king bolt on the back side of the sandboard. At A is shown the sandboard plate looking downward upon the lip, which extends at right angles to the plate proper, and which is from three to four times as long as the plate is thick. B represents the tool to drift the hole. I find it well to have a die plate for use with the tool when punching the sandboard plate to form the lip. The bevel faced punch will crowd the wad to form the lip backward into the die. This any smith will readily understand.

Treatment of Steel.*

H. W. RUSHMER.

This subject has been covered so thoroughly by pens far abler than mine, that all I will endeavor to do will be to repeat and emphasize a few points, which to many appear so small and trifling, that they are unworthy of notice. The great changes wrought in the production of steel and improving the quality at the same time are due, in a great measure, to the attention given



AN IMPROVED STYLE OF SANDBOARD PLATE.

to those things which in earlier years were considered so small and trifling, and which they believed could not have any influence in the final results.

An eminent metallurgist a few months ago forcibly expressed himself on this matter in the following language: "The influence of the apparently little on the obviously great is recognized and we say with Browning:

> 'Well, sir. The old way's altered somewhat since,
> And the world wears another aspect now,
> * * * *
> The small becomes the dreadful and immense.' "

Many of the failures in steel which caused so much mischief in the past are being investigated, and it is encouraging to note that nearly all these supposed mysteries are accounted for and in many instances remedies applied.

It is true we still have many failures, but it is generally due to the fact that in our haste we have failed to remember some of the well defined laws governing the conditions.

There being a constant desire to reduce the cost of production, cheaper stock is resorted to which is unsuitable for the purpose, and then the inattention given in treating it is the cause of many failures. It appears to be the impression with some that the cheaper the steel the more abuse it will stand; this is wrong, for in fact, it should receive a better treatment. Those who have had their patience tried by being compelled to use this cheap, carelessly treated steel are apt to lose their confidence in this king of metals. When they recall the little truism, "true as steel," they say surely it must be a delusion, or they will blame the manufacturer for sacrificing quality for quantity, for his present product will not compare favorably with that of the past. This is a mistake, for we have better steel to-day than ever before, and when we see such intricate shapes successfully hardened and performing work which exceeded all expectations, it speaks well for all concerned.

As chipping chisels are quite a factor in all large shops and at times give an endless amount of trouble, a few words on this subject will no doubt be timely.

The operation of making and dressing chisels appears so easy and simple that it is scarcely given any attention, and many are of the opinion that a cheap grade of steel is perfectly suitable for the purpose. There are various reasons why good steel should be used for this purpose; viz., they must hold a good cutting edge, they undergo many redressings, they are subjected to impact, and they are often used by inexperienced workmen. Cheap steel, when reheated and retempered many times deteriorates very rapidly when compared with good steel. This cheap steel has a very open and loose structure; also, it contains a greater percentage of the impurities; these impurities envelope the grains and prevent the necessary cohesion from taking place between the grains. The vibrations which take place when a chisel is struck a blow from the hammer, are very conducive to fatigue in poor steel, and in this condition a chisel will break in a very short time. These vibrations do not exert such a marked influence on good steel, and furthermore this rule will also apply to iron in the same respect.

In making chisels care should be taken to clip off the corners; if not, they will draw over and overlap the interior metal, which will produce a split point. I believe in edging up, or, in other words, upsetting edgewise when the point of the chisel is very thin, and being at a dull red heat, is the cause of more chisels breaking than any other treatment it receives, unless it be over-heating for hardening. The smith should

* Paper read before the Chicago N. R. M. B. A. Convention.

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aim to do most of his edging up before the chisel is drawn down too thin; if it should spread a little wider than the width of the steel, it would be better to leave it in this shape than to edge it up when it is very thin.

In order to obtain the best results a good hammering to pack the steel is very essential, but it should be properly done. The chisel should be evenly heated and the process of packing should commence at the thicker part of the chisel first, gradually increasing the amount of hammering on reaching the point and aiming to give an equal amount of it on each side. At times we have a difficulty with chisel points snapping off; there are good reasons for these failures. First, when a chisel is unevenly heated and quenched in this condition it is left in a state of unequal tension. Then we find areas with different degrees of hardness, also the transition from the hard areas to the soft being so abrupt, the chisel is left in a state of great weakness. Secondly, the point of the chisel is heated to the proper temperature, but just back of this (say about $\frac{5}{8}$ of an inch) the color is scarcely visible. It is quenched in this condition. This chisel will break at the junction between the hardened and the unhardened parts. The smith will then test the fracture with his file; finding it very soft, he wonders why it broke.

When steel is quenched between what is called the neutral and hardening zone, or in other words just before it arrives at the true hardening heat, it is in its weakest condition, and this accounts for the point jumping off. This can be remedied by hardening the chisel further up where it is thicker and stronger and then drawing the temper accordingly.

A practice which should not be tolerated is when the chisel point is heating too fast and it is checked by dipping it into the water (just for an instant) and then placed in the fire again.

In dressing chisels many are returned having considerable temper remaining; generally they are thrust into the center of the fire; here the change is so sudden that the tenacity of the steel is impaired, and at times will cause surface cracks. The use of sulphurous coal is also quite a factor in causing unsatisfactory results.

It seems almost unnecessary to mention that quick heating and overheating in any part of the treatment is the cause of many failures.

We will make a number of chisels from the same bar of steel and will declare they all received precisely the same treatment; but, will the final result support us in this claim? I believe not, for there must have been a variation in the treatment somewhere, for the machinist (who is a careful man) will state that some broke very easily, while others were exceptionally good; until we can explain why this is so, we should refrain from upbraiding our friend when he returns with these chisels broken. Many efforts have been made for the purpose of taking a short cut on this undesirable task of chisel dressing, but the old method still prevails to a great extent.

Some have recommended the use of lead, others cyanide of potash, which is heated in a ladle or pot to the proper temperature, and the chisel points placed in this till they attain the desired heat, but if these mediums are not kept at the proper temperature, the results will be very unsatisfactory. Some advise heating the points in the fire, and then quenching in oil or a mixture of tallow, prussiate of potash and resin; then again tin that is just brought to the melting point is used. It is claimed that when quenched in any of these mediums the temper need not be drawn; it will be ready for use. For my part I do not believe that they are worth considering.

Some practice drawing the temper very slowly in oil or sand which is heated to the proper temperature to give the required hardness to the chisel.

It would be well to give a little attention to the water emery wheels in use at so many places at the present time; they are usually too fine for the purpose intended, which causes them to glaze very quickly when used on hardened steel. They are the cause of many surface cracks which we see on the cutting edge of the tools, especially those made from alloyed steel. The tools are thrust against this glazed surface of the emery wheel with considerable pressure, and the wheel will not cut, but glide over the surface of the tool; this friction generates heat so quickly that it exceeds the conduction power of the steel. Consequently only a thin shell of the steel is heated, expansion must take place, but the internal condition of the steel being cold and unyielding this thin shell relieves itself by cracking. Then again tools ground on wheels in this condition will become soft as well as glazed, and this will require hardening again, but this glazed film prevents hardening from taking place, and we blame the steel for being deficient in carbon. These emery wheels will often take the temper out of the extreme cutting edge, which will not penetrate more than .001 of an inch beyond the surface, but it is enough, for the tool gives down very quickly, and on such tools as mills it is liable to break out the teeth.

In some places when tools are to be annealed they are placed in a furnace that is heated to a very high temperature. This is a bad practice, and should not be continued on such tools as mill-hobs, reamers, etc., for the small teeth are heated so quickly that it will cause a strain at the base of the teeth, and then if the old teeth are not entirely cut away (which is often the case), it will be disposed to crash at these strains when tempered. It is well known that steel on being hardened will change from its original size when cold, and generally an expansion will take place, but it is not unusual to have a piece that will show a slight shrinkage.

At times we will notice pieces of steel which conform exactly to the same size and shape, made in the same manner and from the same bar of steel, and which when hardened will show a slight difference in the expansion, and perhaps a piece or two will show a slight contraction. We feel confident that we heated these pieces the same temperature, but the eye is very easily deceived and every little increment or decrement in temperature to which the steel is heated, or even a change in the temperature of water, will have an influence in producing different results.

These variations being very small, would not count on many pieces to be hardened for ordinary work, but on such tools as master-taps and dies, it would probably render them worthless.

Some blame the steel for these variations, but I believe it is due partly to our method of hardening. The following I have copied from a little book which will partly explain this difficulty: "In pieces of steel, above a certain size, the hardness does not extend right through to the center. The surface, when it is suddenly cooled, contracts to a certain extent, and exerts a considerable compressive force on the metal in the interior, which, as it slowly cools, is forced to occupy a smaller volume than it did originally; whilst the hardened portion, which is in a state of tension, owing to its having been cooled suddenly, occupies a greater. If then the contraction of the interior be greater than the expansion of the exterior, the

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piece of steel, as a whole, will be smaller after hardening than it was before, and vice versa. The whole question turns on the relation of the volume of the hardened portion to that which has been only partially hardened.

Diseases of the Foot and Their Treatment.—14.

E. MAYHEW MICHENER, V. M. D.

Treatment of Penetrating Wounds of the Joints.

Injuries which open the cavities of any of the joints are among the most serious of all cases which the veterinarian is called upon to treat. A knowledge of the nature of such wounds, their common causes, and probable results, is of importance to everyone having to do with the care of animals. In no other class of cases is time a more important factor in determining the final outcome of the case, as a delay in the beginning of treatment may, and frequently does, make all the difference between success and failure, recovery or death. The purpose of the following is to indicate, as far as possible in a limited space, the outline of care and treatment of such cases until the assistance of a qualified person can be obtained, or if the situation is such that the owner or attendant must of necessity apply the whole treatment, then to indicate the course to be followed.

The serious or fatal consequences following a penetrating wound of a joint are due to the introduction within the wound of dirt and germs, which cause violent inflammation, causing the formation of pus or matter, and resulting, if allowed to run its course unchecked, in either death of the animal from exhaustion and septic poisoning, or that which is little better, a permanently diseased or stiff joint. Wounds opening the joint may be either punctured or incised. The former are made by the entrance of some sharp object without extensive wounding of the skin. A common example of a puncture is that caused by the entrance of a nail or the tine of a fork. Incised wounds are those in which the skin is cut or torn to greater or less extent, as from wire cuts and kicks inflicted by other animals. Punctured wounds are dangerous, largely on account of their trifling appearance at the time of injury, as on this account such wounds are frequently neglected until the inflammation of the joint is well established. Punctured wounds, if treated early and with energy, offer less difficulty than do widely incised wounds, other conditions being equal.

The symptoms of open joint may not be very apparent at once upon the infliction of the injury; especially is this the case where the wound is small, as from a puncture. At a time varying from a few hours to as many days however, symptoms of pain are manifest; the animal is noticed to go lame or to avoid the placing of weight upon the injured limb, and careful examination of the limb will disclose a wound apparently disproportionate to the amount of pain manifested by the animal; the neighborhood of the wound is hot and sensitive to the pressure of the fingers, and a greater or less quantity of amber-colored and viscid fluid can be detected issuing from the wound. If in considerable amount, this fluid, which is known as synovia or joint water, may collect on the surface of the skin or the hair in the form of a clot somewhat resembling slightly heated white of egg. Frequently the synovia is stained with blood, and after the formation of matter has become established in the wound, it is discharged along with the synovia. Commonly the pain and the discharge of synovia begin about the same time. Unless the case receive early treatment, the pain and lameness become more and more severe, the respiration and pulse become much disturbed, the body temperature becomes elevated from two to six degrees above the normal and the appetite more or less depressed. The animal may become wet with sweat and the face bear an expression of great distress. The animal commonly remains in a standing position as long as his strength will permit it, and, should he get down, will commonly have trouble in regaining a standing position without assistance. In cases in which treatment is successful, recovery may be complete in from a few days to four weeks, or longer.

Prevention.—A few remarks concerning two common and largely preventable causes. The use of sharp steel forks about the stable should be entrusted only to careful men. These forks should not be used in the dark and should never be left where the animals may accidentally come in contact with them. Another frequent cause is from kicks of other animals, especially from those shod with sharp shoes for winter work. The stalls should be so constructed as to prevent one animal injuring another, and each animal should be carefully and securely tied in its stall by a reliable method.

As to treatment, in no kind of injury does prompt and energetic treatment count for more than in this accident. The first requisite is to keep the wound clean and protected from the introduction of dirt of all kinds. With sharp scissors, clip the hair as closely as possible from around the location of the injury, protecting the wound if necessary from the clipped hair by covering any raw surface with a perfectly clean piece of muslin, which has been saturated with a 5% solution of carbolic acid, or preferably a creolin solution of the same strength. After the whole circumference of the joint has been clipped, the surface of the skin should be washed with warm water and good soap, after which the surface must be dried well by means of a clean towel. While waiting for material for applying further treatment, the surface of the wound should be protected by covering with clean muslin, saturated with one of the above named disinfectant solutions. If the wound is lacerated or is in such condition that it can be closed by the application of stitches, it should be done without unnecessary delay. Sutures or stitches are applied by means of a needle, and the operation requires some surgical skill to accomplish it properly. It is of the greatest importance that the wound be free from all dirt or foreign material when it is closed, as the presence of even a small amount of such substance may defeat the proper closure of the wound by causing inflammation and the formation of matter or pus. Punctured wounds made with small objects require no suturing. They must be well washed and bathed with the disinfectant, and likewise dried with a clean towel.

After the cleansing and disinfection has been completed, and in the case of lacerations, the sutures have been applied, the clipped area enveloping the entire joint should be well rubbed with a blistering ointment composed of Cantharides ointment, eight parts, to which one part of Red Iodide of Mercury has been added. A thin layer of the ointment should be spread over the surface after it has been well rubbed with it. Over the layer of ointment apply a layer of clean muslin, next apply a layer or two of prepared absorbent cotton and over the whole, to secure the muslin and cotton in place, plenty of bandages, which should be rolled in sections not less than three yards in length. To aid in retaining the turns of the bandage in place, the liquid silicate of soda is of great assistance. It is applied with the hand, or a flat varnish brush, to each layer of the bandage, and as it

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hardens in a few minutes it keeps the dressing in position. The time which the dressing is to remain on varies with the conditions of the case. Should the pain subside to a marked extent the bandage may be allowed to remain three or more days, if it keeps its place well and there is no other cause for its removal. If pain continues or increases, remove the dressing in one day or less, and should the surface be not uniformly blistered, more of the ointment should be applied where needed.

After the surface has been well acted on by the blister, the after-treatment consists of changing the dressing once daily, or less frequently in cases which appear to be healing without any discharge or much pain. The blister surface should be covered with carbolized vaseline, over which a layer of clean muslin is applied, and then the absorbent cotton and the bandages as in the first described dressing.

Internal medicines may be required in certain cases, but should only be given under the direction of a qualified person. The use of slings to support the animal and keep him from getting down may be required in some cases.

As the case begins to recover, the edges of the wound may show what is commonly known as "proud flesh," or a growth of granulating new tissue. To prevent this from forming in excess and thus causing a larger scar than necessary, these granulations must be kept down level with the surrounding skin. The application of finely powdered burnt alum will serve to do this; it should be applied to the raw surfaces two or more times daily, always removing any loose scab or crust formed from the previous application. The attention to this matter is important in order to save disfigurement of the animal by large scars or callous growths, which may form at the point of injury with great rapidity.

Another and different method of treatment of open joints has given fair results in some cases and consists of cleansing the wound as directed in the foregoing, and then by directing a flow of water, either pure or that in which some antiseptic has been dissolved, upon the wound for periods of several hours daily, or even continuously. The simple water irrigation can be easily arranged where there is a water supply, as in a city, or may be arranged at any place by elevating a barrel or other receptacle to get the necessary head. If a special arrangement of this kind is adopted, it is best to combine some antiseptic with the water, as for example 2% of carbolic acid or one part of corrosive sublimate to each 2,000 parts of the water. The stream is conducted to the wound through a small rubber tube, the end of which is so secured as to direct the flow upon the wound. A large stream is not required. The irrigation treatment has not given as satisfactory results as the blistering treatment in the writer's experience. Irrigation is to be preferred in certain cases where it has been found impossible to close an extensive wound by means of sutures and the swelling induced by blistering. In punctured wounds of the navicular region, of course, the blister treatment cannot be employed on account of the part being surrounded with the horn of the hoof. In such cases the use of irrigation will be found the only resort.

The whole treatment of open joint can be outlined in a few words: Rigid attention to cleanliness in every detail, rest as absolute as possible, early and decided measures with regard to the closing of the wound. Cases which live through a long period of pain, and result in a stiff joint, are rarely of use for service. In rare instances, certain animals of this kind may be useful for breeding purposes. If the case resist treatment, and suffering is intense, it is generally advisable to end its suffering by death.

(To be continued.)

The Scientific Principles of Horseshoeing.—17.

E. W. PERRIN.

Thrush in the Frog. Ossified Cartilages.

Thrush is one of the commonest diseases of the horse's foot—a disease of the sensitive frog, with which horseshoers and horsemen are well acquainted.

Thrush is characterized by the following symptoms: A fissure appears in the cleft of the frog, which emits a very offensive discharge. The fissure usually extends to the sensitive frog, thus exposing the vascular structure to the contamination of stable filth and other foreign substances, which greatly aggravate the disease.

Prominent among the causes of thrush, is the absence of that natural stimulus afforded by pressure, which in a normal condition keeps the frog healthy. It is a law in nature, that any organ of the body deprived of its natural function is thereby impaired in health; finally it loses its function from lack of use, wastes away, and atrophy sets in. So, depriving the frog of its natural function—which is weight-bearing—induces disease. Hence, high calks, which prevent the frog from performing its natural function, are a predisposing cause of thrush.

Next in importance is stable management. Horses' feet must be kept clean to be healthy. The uninformed may argue that horses' feet in the country are not kept clean, and yet

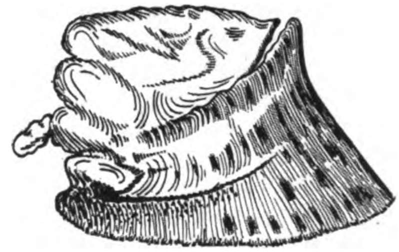

Fig. 89. AN OSSIFIED CARTILAGE, ANCHYLOSED, KNITTED TOGETHER BY BONY UNION.

they are more healthy than the feet of city horses that receive more attention. This is true, but the nature of the work they do and the conditions under which they live are very different. It must be remembered that the wet mud of a plowed field—the cool moist earth of the farm—is a very different composition from the earth of a stable floor, that is saturated with the irritant acids contained in stable filth. Stable filth decomposes the horny frog, causing it to split in the cleft, thus admitting stable filth to the sensitive frog in the same way that a wound in the human foot would be contaminated with dirt if not protected by shoe and stocking. The disease being once set up, the membrane, which in a healthy state secretes the horny frog, now secretes a black discharge, which has a very offensive odor.

Thrush is comparatively rare in well managed stables. In the British Cavalry it is very rare; the horses' feet are picked out and washed every morning, and on returning from drill or duty they are again washed. I point to this fact as showing that cleanliness has much to do with the prevention of this insidious disease. Contraction is also a cause, likewise too much paring. The frog should not be pared except for the purpose of removing ragged, semi-detached horn that harbors dirt.

To treat thrush, first remove all ragged horn that harbors dirt. Sometimes a frog may appear sound, but under the apparently sound surface it is all honey-combed. Don't be afraid to cut away all diseased horn, because the horn once separated does not heal—the fissure in the cleft does not grow

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together again. Therefore, since we cannot make the fissure join, we must direct our attention to setting up healthy action in the secretory apparatus which grows the horny frog, so that it will grow healthy horn. With this object in view, cleanse the cleft of the frog with peroxide of hydrogen; poultice the foot for a few days to reduce the inflammation, then syringe into the fissure twice a day the following mixture: Listerine, eight ounces, carbolic acid, two drachms, boracic acid, two drachms. When the inflammation has subsided, use a solution of sulphate of copper or sulphate of zinc. Use this dressing twice daily and tuck a piece of cotton saturated with the solution into the cleft.

Although frog pressure is indispensable to the health of the foot, it is not admissible when that organ is in a diseased condition—inflamed with thrush. Hence, it is necessary to protect it from pressure with a bar-shoe until it grows down solid, then fit the shoe so that the bar rests on the frog; or, if the frog is sufficiently developed to reach the ground with the shoe on, you may obtain pressure by direct contact with the ground with a plain shoe. If there be contraction with thrush it must be treated, for you cannot develop a healthy frog while the heels crowd in upon it. But above all, the feet must be kept clean, to carry out this treatment. To let the horse stand in a dirty stall is labor thrown away, for rest assured that stable filth will undo all your work.

Ossified Cartilages.

Ossified cartilages is, as its name implies, an ossified condition of the lateral cartilages of the foot. While the heavy breeds of horses are more predisposed to this disease, still it is common to all horses and mules that do road and street work. It is often difficult to diagnose it in the incipient stage on account of a part of the cartilage being sunk within the hoof, and the ossification invariably commences on the lower border of the cartilage, knitting it firmly to the os pedis, so that a cartilage may be ossified, even anchylosed—joined by bony union (Fig. 89)—at its lower border, and yet yield to pressure at that part which projects above the coronet. When the whole cartilage is ossified, it is readily felt with the finger, and in many cases the enlargement—calcareous deposit—commonly called side-bones, can be seen projecting above the coronet (Fig. 90). The outside of the front foot is most commonly affected, sometimes both sides, and I have seen it in the hind feet of draft horses. The early symptoms of ossified cartilages are a rise of temperature, with some lameness, which shows only at the trot, and some soreness as evinced by tapping the hoof with a hammer on the affected side. If both feet are affected the horse goes stiff and steps short, and is prone to stumble.

Hereditary predisposition is well marked in the lymphatic breed of draft horses, but the principal cause is concussion, accelerated by placing the whole weight of the animal on the wall of the hoof only, by contraction and by improper shoeing.

Ossified cartilages are incurable, so that treatment can only be palliative. Rest and poulticing the feet when the lameness is first detected may arrest the progress of ossification, and thus limit its extent, but once the cartilage is thoroughly ossified, it always remains so. With side-bones, as with ring-bones or splints, when the inflammation has run its course and the process of ossification is complete, the lameness subsides, provided, of course, that ossification does not cause anchylosis—bony union of some articulation, thus forming a mechanical impediment to the movement of the joint. In this latter case the lameness is chronic. In shoeing for ossified cartilages our efforts must be directed to making the animal travel with as much comfort as possible. To accomplish this, the shoer must study the needs of each case; for instance, where one side of the foot only is affected, the horse generally wears very heavily on one side. Don't raise this side with calks, which would add to the animal's discomfort. He wears heavily on the one side in endeavoring to save the side that hurts. Make the heavy wearing side of the shoe out of good steel, the other side of iron, and weld the two halves together at the toe. If you find that your horse travels in discomfort until he wears this shoe to some peculiar shape, observe that shape and follow it closely when next you shoe him. If the hoofs are hard and dry, soften them by poulticing; if contracted, treat for that disease; the pressure of a shrinking hoof on an enlarged cartilage causes great pain and does much to aggravate the disease. There is no system of shoeing so suitable for horses with side-bones as a good, thick rubber pad. In some cases the hoof becomes seriously contracted on the side affected, but this can be prevented by the use of expanders, as recommended in the article on contraction.

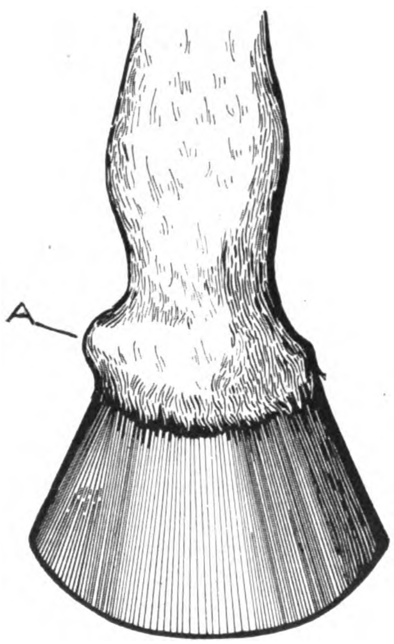

Fig 90. FRONT VIEW OF HOOF SHOWING OSSIFIED CARTILAGE PROJECTING ABOVE THE CORONET.

There are all sorts of "cure all remedies" advertised to dissolve and absorb bony deposits, such as side-bone, ring-bone, spavin, splints, etc., but I don't know of any of them that will absorb a bony deposit. Prevention is better than cure. We know that concussion is the most potent factor in the production of bony deposits, why not try to prevent it? There would not be half the cases of side-bones if people would have their horses shod with rubber, at least on the front feet. The rubber pad not only affords an equal distribution of weight, but it diminishes concussion to the whole limb, and the less concussion the less side-bones.

(To be continued.)

A Piece of Good News.

Just as we are going to press with this issue, a piece of good news comes to us on good authority. A Lien Law bill has decisively passed one House of the Indiana legislature. We congratulate the craft upon the prospect of securing such a law, and consider it good news for smiths in other localities, showing as it does that protective legislation of this kind can be obtained by proper effort. It is hoped that the movement instituted by the American Association of Blacksmiths and Horseshoers and backed by THE AMERICAN BLACKSMITH can be made to bear similar fruit in other States.

We should like an expression of opinion from our readers upon this subject. Is the time ripe for a united

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effort in your particular State to secure a Lien Law, and will you personally aid in the movement? Send us a list of the names and addresses of all blacksmiths, horseshoers and carriage builders that you know of in your State, and we shall enlist their support.

QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

Hardening Calks—I should very much like to know the best way to harden calks on horseshoes. S. ANDERSON.

Stock Required for Tires—I should like to know how to find the exact amount of iron to tire a wheel. H. W. BERGE.

A Question on Welding Axles—I should like to know the best way to prepare and weld a steel axle without using the split weld and without boring a hole through the axle. J. M. BEATTY.

To Shoe a Kicking Mule—Will some brother smith please tell me how to shoe a kicking mule? Whenever I lift his front foot he will kick me with his hind foot, cow fashion. C. E. MCKEE.

How Should Reamers Be Tempered?—I should like to hear from some brother smiths as to how reamers should be tempered and prevented from warping. I have a great deal of trouble in keeping them straight. GEORGE RIEGEL.

Shoeing a Cow-hocked Horse—I should like to inquire if a cow-hocked horse, whose foot has been deformed, as

DEFORMED FOOT OF A COW-HOCKED HORSE.

shown in the figure, could be shod so as to raise the foot into proper position, and if so, how? HERMAN HOFFMAN.

Removing Old Spokes—The following way to remove old spokes from the hub is one which I have used for a long time. Make a ring which will slip on the spoke easily and then drive a wedge between the ring and the spoke. By hammering on the wedge the spoke may be easily removed. W. BARBER.

A Few Blacksmithing Questions—Will some brother smith tell me which forge he considers the best? I want one with a deep fire pot. I should also like to know about die holders which can be used in a drill, and if there are any such on the market. I use taps in my drill, and can cut threads in nuts very quickly by holding them with a wrench. Please let me know. CHARLES S. OWEN.

Removing Spokes—To remove spokes I use the common ring and wedge method, but I usually flatten the spoke a little on the back and lay a small piece of band iron on this flattened place. Drive the wedge between the band iron and the ring. If the spoke starts hard place a block of wood or sledge on the under side of the spoke to take the spring. This is my way. C. JEPPERSON.

A Little Testimonial—I have had your paper for a year, and have found it very useful in my business. After working for fifteen years in the city I moved to the country, and not being accustomed to wagon work I found it difficult to handle, but since I have been taking THE AMERICAN BLACKSMITH I have been helped in a great many points and cannot do without it. Please find $1.00 in payment for the year of 1903. C. WARES, Fort Lee, N. J.

Removing Unbroken Spokes—Replying to a question by Mr. A. Bruton in the January issue as to removing unbroken spokes, our method is to screw the wheel down tight on the wheel-bench, and with a heavy hammer pound the spoke on the top just as close to the hub as possible. This jars or breaks the paint and glue, and by continuing as above the result will be that the spoke will become loose enough to pull out by hand. We have found this method very successful in our shop. O'DANIEL & PRICE.

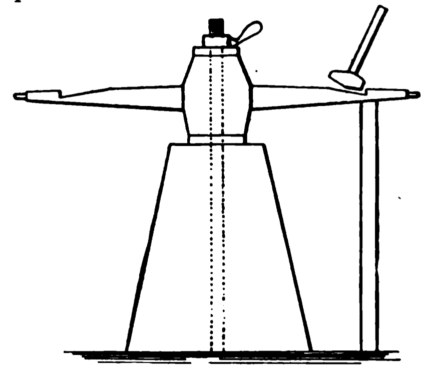
Hardening Reamers—Reamers require the most careful treatment, not only in making, but in hardening and tempering. It is usually well to anneal them before taking the finishing cut. When hardening, they should be slowly and evenly heated to a bright cherry-red, best done in an annealing box. They should be quickly and immediately quenched by immersing in an oil bath, holding the reamer absolutely vertical. Care should be taken to heat very evenly when drawing the temper. B. W.

A Typical Letter from Subscribers—Enclosed find $1.00 in stamps to pay for renewal of my subscription. I find THE AMERICAN BLACKSMITH a valuable paper for one engaged in that business. I have studied horseshoeing for more than twenty years, yet I find new practical ideas in every paper. I do a general business, have a 5-horsepower gasoline engine, run a feed mill, band saw, emery wheel, and expect soon to put in a circular saw. I find them a great help in the business. E. SWOPE, Morgan Hill, Cal.

Spoke Pulling—I saw in the January issue that Mr. Bruton wishes to know a good way of extracting old spokes. The way I do it is to have an oval ring made out of 1¼ by ⅜-inch iron, and also a wedge of iron about ⅞ by 1 inch at one end and tapered to a flat point at the other, making it about 5½ inches long. The ring is larger at one end than at the other for wagon-spokes, the smaller end being intended for buggy-spokes. To use the ring, slip it on the spoke, the wedge applied, and the spoke removed by applying a hammer on the end. W. R. JONES.

Another Spoke-drawing Method—To draw tight spokes which are not broken off, I first bore a hole in the side of the spoke about 2½ or 3 inches from the hub. Take a rod of iron three feet long and large enough so that it will not bend, and insert it in the hole. Next take a piece of tire about 2½ or 3 inches long, ½ inch thick and 2 inches wide, place it against the hub and under the rod about one inch from the spoke. Then by prying on the rod, or using it for a lever, striking on the top and bottom of the spoke lightly, the latter will soon be loosened and can then be withdrawn. G. H. MUSSICK.

Removing Old Spokes—Replying to the question of A. Bruton in the December issue, my method of removing old spokes is shown in the sketch herewith.



A GOOD WAY TO REMOVE OLD SPOKES.

I make a notch in the spoke with a saw and spoke shave, place a support under the spoke just outside the notch to prevent splitting, and drive it out as shown with great success. J. K. RIBLET.

A Home-made Shears—I am very much pleased with THE AMERICAN BLACKSMITH and think it is a very practical paper. I noticed in last November's issue a cut of Mr. C. W. Smith's home-made shears, and having none in my shop I made one. However, I made mine about three inches longer, and instead of the two links at the upper end I made a slight bend, so that the lever attached to it will come in contact with the movable part of the shears. I also raised my bolt up higher at the lower end, so that I can raise the shears up closer to the bolt, and in this way I get more leverage. I cut ½ by 1¾-inch steel without much trouble. I wouldn't be without it. WM. LICHT.

Tempering Stone Hammers—I give herewith my method of tempering stone hammers, in answer to the question of James Davis. My thirty years' experience in this work may prove of some benefit to my brother workman. First heat the large end to a good cherry red, seeing that the center is as hot as the edges. Plunge into lukewarm water, leaving there until cooled off. Heat the other end slowly to a good cherry-red, cool in water as above, 2½ inches, draw temper to a good copper color and cool off. The great trouble in tempering comes from over-heating the steel and not cooling off properly. Any tool having a thick stubby edge should be placed in the water at least 2½ inches and held there a little while, as the slower the temper or color comes, the better. A. J. COOPER.

An Interesting Letter—I am well pleased with THE AMERICAN BLACKSMITH, as there is not a dull page between the covers. The advertisements are attractive and the reading is excellent. I have been hammering on the anvil since 1873, and am

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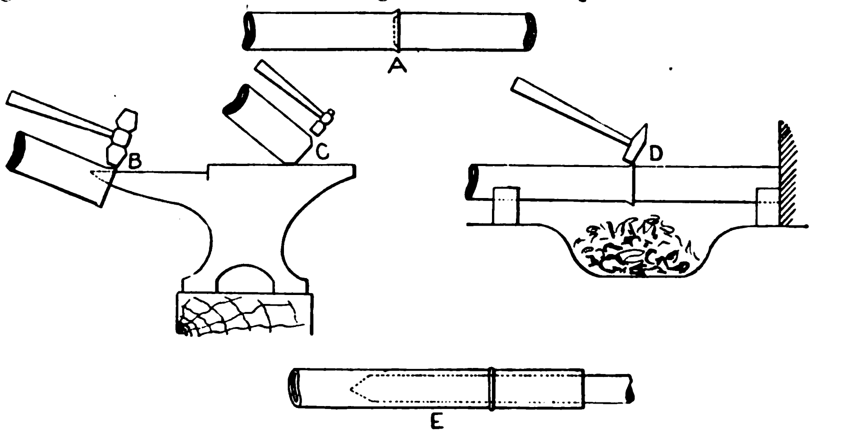
still in the harness looking for pointers, always using the other fellow's methods, if they excel mine. I have endeavored always to keep up to the times, and have usually been able to do so. Eternal vigilance is the price of holding your job in these days, and you have to hustle or the fellow in the next town will get in the lead. Every day adds a little to what we have already learned, and helps to make up the sum total of our knowledge. I find upon looking through THE AMERICAN BLACKSMITH that $1.00 could not be invested to better advantage. A. F. EMERSON.

Welding Flues—In reply to the question of Mr. Ottoson, in the January issue, I would say that I weld flues as follows: The first step is as shown at B and C, using a four-ounce double-faced shoeing hammer. The flues are to be shaped in this manner so that they will go in about ⅛ inch, as shown at A. Then place the parts in the fire, being sure that it is clean and deep, and heat to a red. Then pull the pieces apart and insert borax. Push together again and add more borax. Have the helper blow all the time and keep turning the flue around and around until it is brought to a yellow heat. Then, with a light iron-handled hammer, weld the flue in the fire and smooth it up on the inside in the manner indicated in the figure. Finally take another welding heat and set it aside to anneal, and you have a good job. WM. EXLINE.



HINTS ON WELDING BOILER FLUES.

Flue Welding—In answer to Mr. A. G. Ottoson's question on welding flues, in which he asks what kind of fire and anvil he should have, I would say that any good smith's fire is all right, and a common anvil, as flues are generally welded in the fire. To prepare the tube for welding, place one end over the horn of the anvil and give it an inside scarf, holding the tube at an angle, say one inch above the anvil. Draw down to a nice thin scarf at edge all around, take the end to be welded in and dress it down with an outside scarf with rasp or file so that it is nearly the same bevel as the other. Place the two together in a clean fire, take a slow heat and turn the tube to get the weld hot all around. Tap the tube on the end with an ordinary hammer until the scarfs are well together. Then take a light mechanic's hammer and weld the scarf down while still in the fire, turning the tube to insure an even welding heat all around. Dress down with rasp or file. If properly done, this makes a nice, smooth job, and a solid one, which is as good as new. W. P. JAMESON.

Welding Flues—Referring to Mr. A. G. Ottoson's question as to welding flues, I will give him my way of doing it. I have only a common blacksmith fire, blown by a common bellows, and have my tuyere iron set rather deep. I bank the sides of my fire and coke the center, and the fire is ready to receive the flue. I think a blower would be a better thing to weld flues with than a bellows. As for the anvil, will say you only need a common anvil for the purpose of scarfing the old flue. While drawing in the old flue, be sure not to make it any larger, or not as large as it naturally is, as the stub should be drawn to a thin feather edge and drawn large enough to slip over the old flue. Then put on some pulverized borax and proceed to weld by driving the stub endways. When the stub has stuck fast, take an iron hammer with an iron handle in it, and as you turn the flue weld the stub to the old part. Now fasten a mandrel in the wall close to your fire, take the flue while hot and slip over the mandrel and hammer it down smooth both inside and out.

After you have welded the flues, stop up the end and pour water in it until the weld is surely reached, so as to make sure that the weld does not leak. Should it leak, it must be welded over again. If this method is followed, you will be able to weld flues satisfactorily. J. S. SCHAFER.

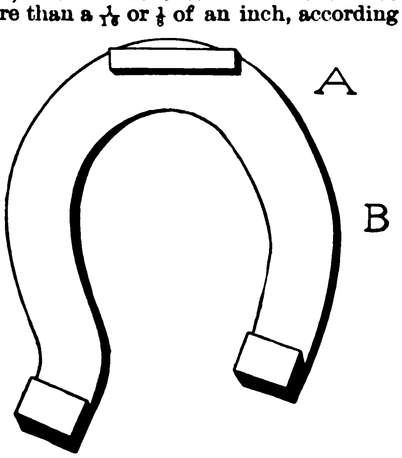
A Few Comments on Shoeing—During my brief experience of twenty-five years in the horseshoeing vocation, I have found those fully qualified to shoe and treat a horse with corns, quarter-cracks, contraction, coronary and tendon troubles, spavin, ringbones and dozens of other diseases derived from an unbalanced foot, and yet I failed to find one out of a hundred who could tell what caused the trouble and why the horse was lame. One must today get the anatomy, physiology and pathology so impressed on his mind, that when he looks at the horse and watches his gait he can tell wherein lies the cause of the trouble. Most shoers are familiar with the anatomy of the foot, but the larger portion are sadly in need of the knowledge of the leg.

A horse's limb must always be in the position in which nature intended. One can readily see that a shoe, although ever so well fitted to the foot, and ever so cleverly nailed on, may be a trifle high on one side, or at either end, and thus cause an unnatural contraction or extension, in either case causing an interruption of the regular work of the muscle as designed by nature. Again, the paring of the hoof, either too much on the side or either end, will produce the same results. While standing or in motion, the pedal bone is suspended in the foot by the laminae which hold it to the wall of the foot, but is not supported by the bottom of the foot. Fitting on top of this is the pastern bone, then the upper pastern bone, then the shank or cannon bone, which has on either side of it two small bones, namely, the splint bones, which are only attached by fibrous tissues, and on top of these is the knee. The instant we alter the bearing or way in which the weight is supported by the various bones and ligaments of the foot, we will have undue wear and tear, and harm ensues. Suppose we take a foot which stands higher on one side than the other. Then the whole leg is thrown out of bearing. What is the result? The instant the horse comes down on his foot, striking the highest part first, that acts as a fulcrum, or point about which it moves. The foot bears over, and we have two troubles as a consequence. In the first place, the leg tries to keep straight and it presses over to the side of the lower heel, and we have a pressure of the bone into the foot, resting as it does on the pedal bone, instead of coming down squarely on the joint. There results, immediately, pressure on the pastern or navicular bone, and there may be a bruising of the bone. Or the result may be, if the weight happens to strike a joint higher, that we have a bruising of the bone at the pastern, producing ringbone, or perhaps we may have stretching of the ligaments or tearing of the nervous vascular membrane.

To go a bit higher, at the upper part of the leg we have a central shaft, the cannon bone, with two small splint bones at the side held by a fibrous tissue. On top of them is placed the knee-joint. A crooked foot throws the leg over and we have a splint thrown out, because the horse fails to come down properly. I should like to hear from brother shoers on the topics mentioned above, and would like to see a free discussion, as it helps to get down to the fundamental truths upon doubtful points. H. N. MUDGE.

A Shoe for Interfering—As about forty-nine out of every fifty horses which I have ever shod strike with the foot between the toe and the quarter, I feel safe in saying that the plan of shoeing for interfering which I use will prove satisfactory in most cases.

The shoe should be a trifle straight from A to B, and the part of the hoof that projects over the shoe between these points should be rasped away. The hoof, however, should not extend over the shoe more than a $\frac{1}{16}$ or $\frac{1}{8}$ of an inch, according to what the thickness of the shell will permit. If too much is taken off it tends to weaken the foot. A shoe properly fitted according to this plan will cure some of the very worst cases. If the ankle is very sore, the horse will continue to strike from one to three days after



A SHOE FOR INTERFERING.

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being shod. Pare the feet as level as possible, with the outside a trifle the lower. If brother smiths who have never tried this plan will give it a test I think they will be pleased, and I should like to hear from them as to the results. A. L. SPINK.

A Shoeing Experience—I live in a country town, and after following the business for about twenty years, have quite a bit of experience in shoeing, as I am a close observer and have always tried to learn. For that reason I have subscribed to THE AMERICAN BLACKSMITH. I write to give my experience of the past summer with a horse that I shod.

A pacing horse came to my shop early in the spring, very much out of balance, cross-firing and bumping his knees. When I saw him, I was afraid that I could not fix him up, as I did not have much experience in shoeing fast pacing horses. I began work on him. I took off the front shoes and found that his heels were pared too low, so I pared down the toes as far as advisable, and took a pair of punched pacing plates, very light shoes, fitted them to the foot, rolled the outside of the toe and nailed them on. I then took off the hind shoes, and put on a pair of light hind shoes, punched plates also, and let him go out. I did not see him for about four weeks, when one day the owner came driving to my shop with a pair of knee boots on the horse, together with a quarter boot on the right front foot. I did not like the idea of not having done a better job, and told the man I would go with him to the fair ground, which is some distance, and see someone there, who was training horses, and who might help us out of the difficulty. The owner said however that he thought I could get along all right, as I had satisfactorily shod a trotting horse for him which interfered badly. Well, I decided to give him another trial. I had been reading the articles by Mr. E. W. Perrin, on cross-firing, but he did not give any ideas on pacers.

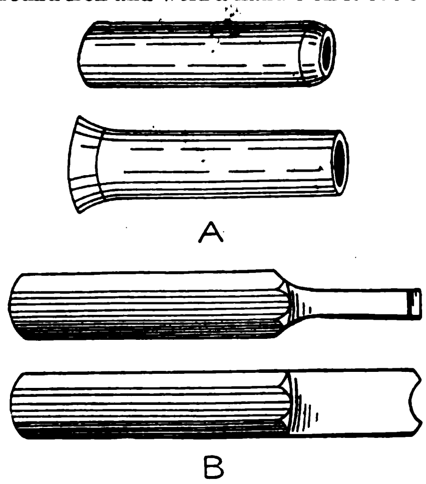
I took off the old shoes and noted how he wore them. I then pared the toes some more on the front feet and trimmed the heels well down on the hind ones. I then took another pair of those light shoes, and welded a strip to the inside of each front shoe about half an inch high at the heel, tapering and extending about 2½ inches towards the toe. I also rolled the shoe on the outside at the third and fourth nail at the toe. This made a side weight, and also raised the inside heel; the roll allowed him to get over the toe quickly. I then went to work on the hind feet. Taking a pair of light hind shoes with steel punched plates, I calked them up a little, and put a toe on about half an inch back. The horse had a low inside heel on his hind feet, and I put what is termed trailers on both calks, something like a mule shoe, only not so long. Having turned the shoe well out at the toe in nailing it on, I thought surely this must work, and it did.

I took off his boots and threw them in the buggy, and told the owner if he needed them, he knew where to find them, and he said the other day that they were there yet.

I shod that horse this winter with ordinary snow shoes, calked and toed like all other shoes, and he is going all right on them, so that you can see that when a horse is properly balanced, there is no trouble with his gait. C. W. Y.

Welding Boiler Flues—Replying to the subscriber who asked for a way to weld boiler flues, I will outline my way, although you may get better ones.

I use pieces about twelve or fourteen inches long. Draw the tube for a scarf back about ⅝ or ¾ of an inch, not making it any larger in diameter. This can be done by holding it level on the horn of the anvil. Next heat the piece and hold it up when scarfing on the horn, so as to make it a little larger. Fix all the tubes and pieces in this way, and then heat the pieces one at a time, and drive on the tubes while the latter are cold, which gives a good, clean and tight lap. Then make a hammer head out of ⅜ or ⅞-inch round iron and weld a handle on it out of



FLUES SCARFED FOR WELDING. A PIPE-CUTTING TOOL.

⅜-inch round iron, 24 or 28 inches long. Have a good deep fire, clean and well-confined and use plenty of borax at the weld as you heat. If you wish a good, smooth job, have a mandrel to drive it into the tube when you finish welding. Be sure to scarf the piece for the outside, so that the scarf will be towards you when welding.

It may be interesting to some to know that for cutting out large pipe or tubes, or for splitting boiler sheets, I use what I call a half-moon tool, making it a little thicker at the cutting edge. This is shown at B. F. L. MORGAN.

An Interesting Letter from a Veteran California Smith—Enclosed please find one dollar for your valuable paper, which I consider would be cheap at five dollars, instead of one. I don't think any young man in the blacksmith business can afford to be without it. If he is learning his trade, he can obtain more knowledge from one copy of your paper than he can in one year without it. I mean, if he will read it and follow the advice of older ones, who have had years of experience.

As for myself, I don't work at my trade any more, but I have my own shop and have a man running it for me. He has worked for me for the last ten years, commencing when he was eighteen years old. I have never docked him for one minute of lost time since he has been with me, and I don't think he has been absent from the shop ten days in the ten years. I asked him to-day when I got your letter, if he wanted the paper, THE AMERICAN BLACKSMITH, any longer, and he said, "I don't think I could get along without it." You can see for yourself what he thinks of it. As for myself, my hammering of iron is over. I have worked at the business since twelve years of age, with the exception of one year, when I was in the Civil War. My father was a blacksmith, and put me in the shop when I was very young, having me stand on a box in order to blow and strike. Now it might interest some brother of the craft to know what we get here for general blacksmithing. I will say right here that we do not get the prices now that we did when we first came here.

We get $1.50 for shoeing a horse with machine shoes from No. 0 to No. 4, and $2.00 for No. 5 and No. 6, that is, the largest shoes we have to use. We charge $3.00 for putting on or resetting buggy tires and $10.00 for putting on new ones, 1 by ⅜ inches, and $4.00 for putting on double wagon tires, $1.50 for setting buggy axles, $2.00 or $3.00 for double wagon axles, depending upon the weight. Our price for resetting old shoes is $1.00, but we hardly ever have to reset them, as our roads are very hard and gravelly, and four or five weeks is as long as a set of shoes will last on a livery or buggy horse. Californians as a rule are not so close as Eastern people. Back East I have had farmers bring in a string of old shoes, and tell you to pick out the best ones and put them on, all sizes and shapes and none of them fit for anything but the scrap pile, but I never had a Californian do that. I have had a few customers lately from the East bring in their old string as usual. I say to them, "You haven't been out here long," to which they reply, "What makes you think so?" "Why your string of shoes is a give-away." I pity any brother blacksmith who has a set of customers such as these. I worked in the East, or rather carried on a shop for seventeen years and found that they want you to wait a year for your pay, and if you ask them for it, and they haven't sold their last month's cheese or butter, they get angry and leave you. Here in California your bills are due and collected on the first day of each month, and I can tell you I like it much better. Now some brother blacksmith might like to have me say something about horseshoeing, for that is what I have made a specialty of.

For interfering behind, when making the shoe the highest on the inside does not stop them, reverse it and make them the highest on the outside and make the inside as straight as possible. File smooth, fitting close, and you will be surprised, as I was. N. W. OUTWATERS.

Has Your Subscription Expired?

If so, you will find a bill for next year in this copy, marked "Your subscription has expired."

If it has expired, we hope you have found the paper so valuable to you in your work that you will remain with us another year, and for many years to come. Thousands of subscribers have written that a year's subscription to THE AMERICAN BLACKSMITH is worth a great deal more than a dollar to them, or to anyone interested in blacksmithing, carriage-building or horseshoeing. Many say one issue alone is worth that much. This, however, is a matter for you to decide.

It is our purpose and endeavor to put out a paper worthy of the craft, and we would appreciate the aid and encouragement of a prompt renewal subscription from you. At the same time, also, tell us how we can make the paper more valuable to you.

We do not wish to take your name from our lists at the present time, and hence hope you will send us the money at once. No renewal subscriptions will be taken for less than one dollar per year.

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THE AMERICAN BLACKSMITH

A PRACTICAL JOURNAL OF BLACKSMITHING.

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That Subscription Prize.

It has been decided by the publishers to leave open for one month longer the contest for the subscription prize recently offered. Ten dollars will be given to the person sending the greatest number of subscribers to THE AMERICAN BLACKSMITH before May 1st. A great many small subscription clubs have been sent in, but we wish to emphasize the fact, that a small club of perhaps fifteen or twenty subscribers will probably win the prize. It is not too late for you to win. Will you put forth an effort? Even if you don't win the prize, you will be awarded a cash commission on all new names obtained in return for your effort. The contest closes May 1st.

Wanted: Up-to-date Shops.

One of the principal needs of the blacksmithing craft at the present time is to have shops that are up-to-date in every respect—in arrangement, equipment, conveniences, improved tools and finally in appearance, interior and exterior. THE AMERICAN BLACKSMITH is offering a prize of $5.00 for the photograph of the best shop. If you consider that your establishment is a model one, or will give hints to brother craftsmen on how best to arrange shops for blacksmithing work, send us the photograph of your shop, an outside view, and an inside one also, if possible, and give a list of the tools with which it is equipped for the work to be done.

Some Thoughts on Spring Cleaning.

It now behooves the practical blacksmith to do a bit of shop cleaning. The rubbish accumulations should all be turned out and classed under two heads—the useful and the useless. Often parts of old articles thrown aside may be used to advantage. Again, things that "might come in" are laid away, because the would-be economist muses, "a pity to waste them," though they will prove to be of no earthly use. Many people throw out everything except what they know will be of value, preventing much undue accumulation of worthless odds and ends. The smith should use his judgment, laying away the useful, and relentlessly destroying or disposing of the useless. An untidy shop is an abomination unto all comers.

Side Lines for Smith Shops.

Attention is called to a timely and interesting article on page 123 under the signature W. B. F. It deals with the question of vehicle making in the smith shop, and gives an idea of what can be done in this way as a side line. There is no doubt but that small shops can add largely to their profits by building vehicles entirely anew, or by building over old ones. It is work which can be done at odd moments, requiring but a small outlay and yielding good solid returns for the labor and material invested. It forms an excellent way to add to the income of small shops to buy or barter for old vehicles to be built over, even if the matter of building a few entirely new wagons each year is not gone into.

There should never be any spare moments in the smith shop. As a means of filling them in, the question of buying vehicles in the white from reputable dealers and painting them up to suit exacting customers, is well worth consideration. Here is an excellent way for the enterprising smith to add to his income without interfering with his other work.

Many other side lines will occur to the wideawake shopman. If he has power in his shop, feed grinding or wood sawing outfits may be made a means of lining his pocket. In many localities wood or iron turning lathes can be installed with profit. These are but suggestions—the smith would do well to ask himself: "In my particular locality what side line can I add to fill up my odd minutes and my pocket-book at the same time?"

A Representative Journal.

The blacksmithing craft has long needed what may be termed a representative journal, a paper in which every single smith, of no matter what class, could find that which would directly and indirectly interest and benefit him as to his vocation and his position in it. Such a need THE AMERICAN BLACKSMITH has aimed to fill, yet no one realizes more than the Editors, the great room for improvement that exists in these columns. The constant effort is to make the paper better each month, to make it suited to the craft at large, to make it a representative blacksmith journal in other words. The very ablest contributors are sought for, and their services secured, and the Editors are conscientiously striving to better the paper in every respect. It must be remembered that the field is large. What interests one blacksmith may not appeal to another. You may already be familiar with a great many things that are told in these columns, but all smiths may not have had the opportunity for learning that you have. We confidently believe, however, that there is no smith who cannot find enough in a year's issue of THE AMERICAN BLACKSMITH to warrant him calling it "his" paper. A portion of a letter just received from T. J. Kean, M. D., a well known veterinarian of Philadelphia, says: "I am very much pleased with

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the paper you are publishing. While I do nothing but horseshoeing in my establishment, the articles on machine and general blacksmithing are very interesting and instructive. I like to have the men working for me know something about the trade besides making and fitting a shoe."

The Village Smithy.

A fine painting delights at first sight, but instead of wearying one afterwards, it grows more into appreciation and gives greater pleasure with each succeeding inspection. There is so much in a really good picture, appealing to so many different moods, that only a little is revealed at a time. A good picture is like a good friend, appreciation increasing with acquaintance.

Raphael Beck's latest picture, "The Village Smithy," ranks high among the many paintings of this well known artist. He has caught the true spirit of the smithy, and fixed it on the canvas for the delight of those who have the sense of appreciation. "The Village Smithy" was painted by Mr. Beck expressly for THE AMERICAN BLACKSMITH. The copy, which we present free with this issue to all our subscribers with our compliments and esteem, is a faithful reproduction of the original painting. It has been made by the finest known color process, requiring the picture to be run through the presses twelve different times, printing as many different colors from carefully engraved stones. As a finishing touch, the picture was then given a roughened surface, resembling the original canvas. "The Village Smithy" makes a handsome subject for framing—the frame should cover the outer margin entirely.

We are very glad to be able to present a copy of this fine work of art to our subscribers. A few copies of "The Village Smithy" still remain on hand, and while they last, we will send one to any one ordering THE AMERICAN BLACKSMITH for a year. Also a copy of "The Village Smithy" and a sample copy of THE AMERICAN BLACKSMITH will be sent enclosed in a strong pasteboard tube, post paid to any address, on receipt of twenty-five cents.

An English Art Iron Work Establishment of Note.

In a flat, not particularly interesting tract of country, lies the English town of Thornham—just an ordinary old country village, with its flint houses and great roomy church, its quaint, quiet streets and provincial population of about 550. The traveller, passing down the village street, may notice an iron sign suspended in front of one of the cottages, and on it, done in iron, the words "Thornham Iron Workers" with

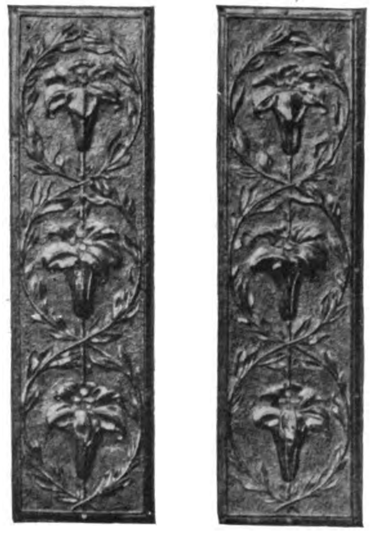

Fig. 1. A PAIR OF COPPER DOOR PANELS.

two sons of Tubal Cain hammering upon an anvil in the midst. A most unpretentious establishment, yet the firm (Ames-Lyde, Elsum & Company) claim the title "Iron workers to the King," and from this cottage-factory is turned out a class of ornamental iron rarely surpassed at the present day.

The beginnings of this Thornham industry are quaint, and will bear telling. Twelve years ago, a lady of the village, Mrs. Ames-Lyde, assisted by the school master, Mr. Elsum, started an evening class at the village school in bent iron-work. To this class, after working hours, came the village folk, going heart and soul into the undertaking. Many such fads are started in villages, which after a period of enthusiasm die out. Not so at Thornham. The idea had fallen in the right soil at the right season, for the work grew until the ambitious workers decided that they must extend their operations to a wider scale. To do this a forge was necessary; so the community put in a forge. This opened up an endless prospect of achievement, and instead of the night classes, day work was commenced. Besides wrought iron, many kinds of sheet metal work were successfully undertaken.

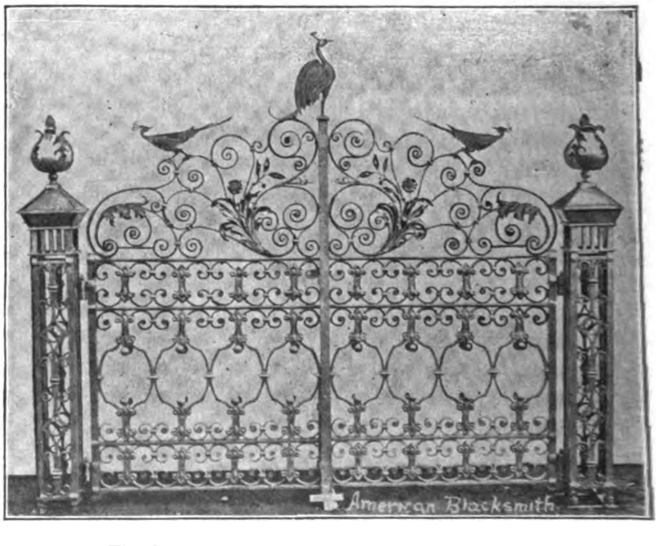

Fig. 2. A PAIR OF GATES OF UNIQUE DESIGN.

The work advanced, orders increased, and soon it became necessary to put in five forges, which kept as many smiths constantly employed, besides two bench hands, and five apprentices. As the business increased, the demand for special office room became imperative, so that a neighboring cottage was fitted up for this purpose. One portion accommodates the photographic apparatus and the library with its interesting collection of craft literature, while another part is devoted to the designing room, where the forms of the finished pieces are first worked out on paper. The staff now includes a special photographer and an artist.

The establishment is particularly fortunate in having a competent and zealous staff. Mrs. Ames-Lyde is a lady of great artistic taste, which finds expression with equal facility in the most delicate repouseé or the heavy iron work of grilles or railings. These designs are after the Spanish and Italian schools; and in order to gain new ideas, Mrs. Ames-Lyde often visits the Continent in search of models and photographs. It is an interesting fact that the head of this iron working establishment is a woman.

Some idea of the fine work done at Thornham may be gathered from the fact that, in designs of a floral nature, every petal of every flower is made separately by hand and welded on. In these days of rush and hurry and machine-made things, there are still some who can appreciate truly artistic hand work. The merit of the Thornham Ironworkers has attracted considerable attention. King Edward has placed

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several orders with them, and in fact, recognition has led to their having a great many more orders than they can execute.

The accompanying engravings are taken from specimens of work done at

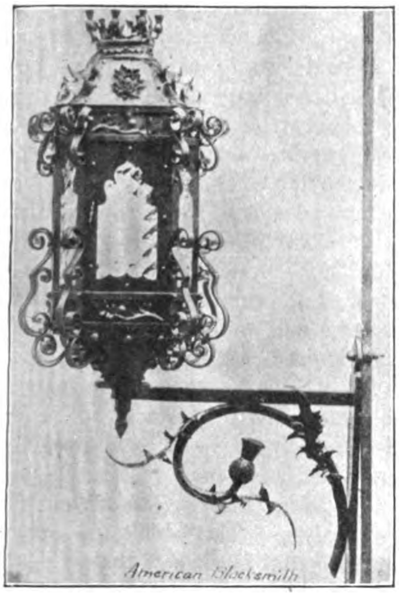

Fig. 3. AN ARTISTIC WROUGHT-IRON LAMP MADE AT THORNHAM.

Thornham. The first is from a photograph of a pair of copper door plates. Other engravings show a garden wall grille, a vase of carnations, used as a gate ornament, and a pair of gates of striking design. A photograph of one of a pair of lamps wrought for the late Queen Victoria is also reproduced.

And so they work away, quietly and steadily, fashioning by hand those beautiful specimens of metal work, the subtly artistic qualities of which the great world of machinery strives in vain to equal. It is like a glimpse of medieval times when iron work was a matter of art, and when the artist toiled slowly away for the love of his art and the beautiful things he made, thinking neither of the price they would bring, nor of the time which he spent in fashioning them.

A Paying Industry.

BY W. B. F.

Does it pay small shops to manufacture new vehicles or build over old ones? This question has been asked by a great many smiths at different times, and now I shall give my experience. In the first place, all country shops are more or less idle sometime during the year, and there is nothing that a smith can do. Then it is a good thing to have two or three old spring wagons to build over, or some new work, so that he can make use of his time. I build over two or three spring wagons or buggies every year. I do all my own work in all its branches, iron, wood and painting. I only hire help in my busy shoeing season. I have also built two new carryalls, or busses, a ten-passenger wagon and a light passenger wagon. One I sold for $175, and the other for $100, and when I build over a spring wagon, I get different prices, but always good pay for my time and the new material that goes into them. I have sold them as high as $45, and get a better wagon thrown in than was the one I sold before I built it over. So you see that you can always keep an old wagon on hand to make over, and you will always find ready sale for it, and at a good, fair price. I have been here four years next July, and I have built some dozen or more different kinds of vehicles. I find that it is the best paying work in the long run, for it is all done at odd spells.

Jottings About the City Smithy.

ROBERT McSAVENY.

In the shops around New York City, a man engaged as a first class blacksmith must be able to make anything from an engine rod to a cap for a mast; he must be a die maker, and a dozen and one other things. I find that the men coming from these railroad shops and presenting themselves as A 1 workmen know little or nothing of the style of New York shops. Here you have to work, and work quickly, do the job neatly, and when thrown down it must be finished. There are here many first class men in

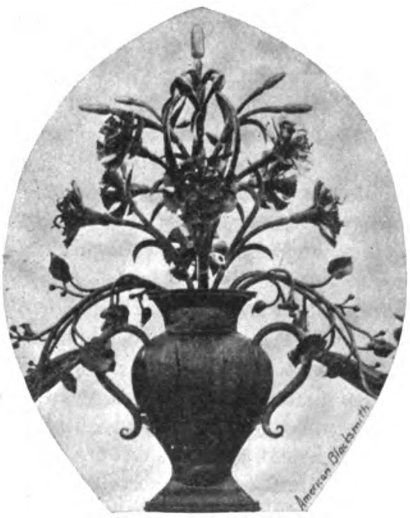

Fig. 4. A HANDSOME ORNAMENT FOR A WROUGHT-IRON GATE.

our business and trade who can turn out first class work; but when it comes to turning it out on paper, that is, explaining the mode of operation in doing a job, why, they would collapse. We have had dozens of them employed here, and I know from my own observation for years. In a place like ours, with such a variety of work and mixture of cranks, connecting rods, boat davits and well tools, down to spikes and worn out picks, a man has to have some curves in his arm, yes, and his back too. Not following the trade myself, but looking on at the different processes of numerous different men, I have noted the very many

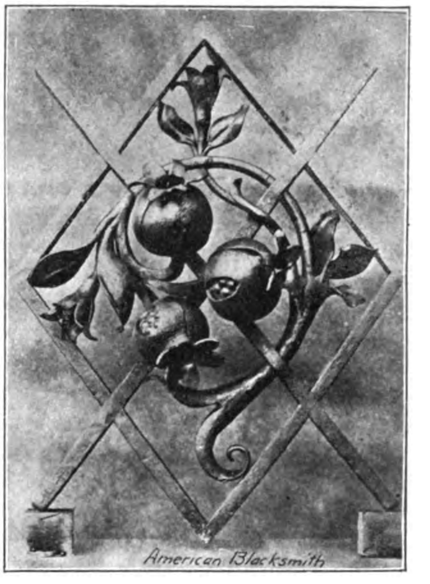

Fig. 5. A PORTION OF A GRILLE FOR A GARDEN WALL.

different ways of doing things. I like to speak about our very interesting business, and what more enchanting sight is there than that presented on a night in November, just around dusk, standing at a smithy door when a big heat is taken from the fire to the hammer, its glare lighting up the men's faces with a healthy glow, as the sparks and scale fly here, there, and everywhere. I am the son of a blacksmith, having been mixed up and connected with sledges and anvils since I wore kilts, but I don't think there is a finer sight.

Kinks and Conveniences in the Wagon Shop.—2.

BY D. W. M.

Besides wheel trucks of various sorts, and two-wheeled trestles described in our last article, there are other means of saving labor and time, and anything which will do that pays for itself many times over in a short period. To economize labor not only saves wages, but also shop room. It also saves time for customers, and by prompt service holds their trade and brings new trade.

To secure these results, make every arrangement to save carrying things by hand. In a shop arranged on several floors or spread over much ground, a system of calls, speaking tubes, or telephones, should be put in.

For receiving goods, slides may often be used to great advantage, especially if a descent from the wagon to store room can be arranged. If the shop is two stories or more, an elevator will pay, even if run by hand. But in the absence of that, the well-known incline with a windlass at the top is necessary. There are many shops having neither, which depend on getting their goods (which means entire vehicles as well as parts) upstairs by means of ropes and pulleys (frequently outside the building), and the load is swung into a big door on whatever floor it is to be received.

Some kind of power can always be used in a shop, even a small one. If not a steam engine, then a gas or gasoline engine may be used to great advantage. Such a convenience and economizer of labor may cost something by way of investment, but it saves its cost very quickly and increases business. Almost any one can get credit in the purchase of such a very necessary tool in a factory, because it is a wealth producer, and the man who buys one and installs it in his shop is safer financially than he who does not.

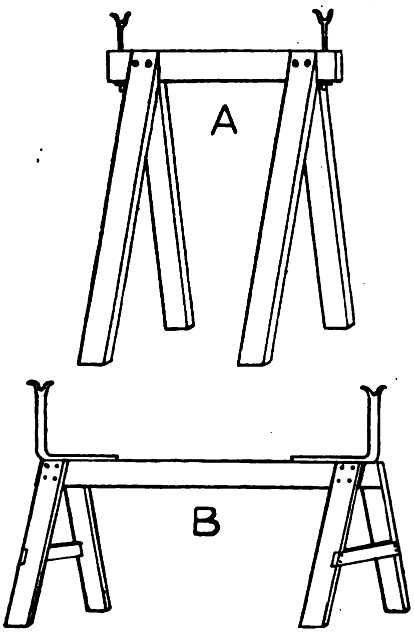

Fig. 1. TWO USEFUL TRESTLES FOR THE PAINTER.

To think of running even a small shop with hand power entirely is appalling to anyone who has ever used engine power. Yet foot power is applied to a great variety of tools for small shops, and it is not to be utterly despised. This class of tools has been so greatly improved of late years that many forms of light work can be successfully and economically done with them. Foot hammers for smith shops, foot blowers for the smith fires, foot power drills, boring machines, lathes, saws, grinders, sewing machines, etc., are quite useful for light work.

Another power, electrical, can be put in to run the elevator, the sewing machines, the smith fires, drills, etc. Where separate power cannot be afforded, and electrical power can be had, it is desirable to put it in, as one of the conveniences which may be counted a necessity, and a paying investment. There are many shop conveniences which can be put into profitable use provided there is power to operate them, which are out of the question otherwise. In favored localities water power can be utilized. Again, wind power is used in some localities, and various devices have been resorted to, to gain steadiness and continuity, one being the pumping of water into a reservoir, from which it flows through pipes to turn turbine wheels. But in any shop, no matter where situated, or how small or large, some form of power can always be afforded, as an aid.

Talks to the Jobbing Shop Painter—1.

M. C. HILLICK.

Shaft Trestle—Gear Trestle—Revolving Wheel Jack—Wheel Jack—Rubbing and Varnishing Frame—Water Barrel, Etc.

The carriage painter who struggles to meet twentieth century competition without the aid of a good equipment of labor-saving devices is, to say the least, badly handicapped. Not long since, a painter who for many years plodded along in a shop minus labor-saving devices of any sort, but who very recently has introduced many up-to-date appliances for handling work, said to the writer that by the use of these devices, he had increased the productive capacity of his little shop not less than 25 per cent.

No better time can possibly be had than now, to provide the shop with a few appliances of nominal cost, and easily made. For example, the shop needs at least a pair of shaft trestles for holding shafts during the process of painting and varnishing. Fig. 1, A, shows such a trestle, and the cut is self-explanatory. It can be made of such material, of such height and dimensions, as to best suit the individual painter. The prongs which go down through the bolster, and are fastened with a washer and nut, can be quickly made, at small cost, by our good friend, the blacksmith. Fig. 1, B, illustrates a gear trestle, and the way it is made is clearly understood from the cut. The upright arms for catching the axle arms will afford the smith another job in the making. Make the trestle wide enough to take the axle arms of the full width vehicle. And for ease of handling, make it as light as possible, while, at the same time, giving it requisite strength.

Probably the most important labor-saving device about the paint shop is the revolving wheel-jack, of which there are many designs. None, however, are better than the cast iron bottom jack (Fig. 2, A), which for $1.50 can be procured at your local foundry. Such a bottom will weigh about 50 pounds. Have it cast with a diameter of 18 inches. Have a round arm to insert in the bottom, and to this arm weld a stub axle providing axle stubs in sizes ¾, ⅞, 1 inch, and 1¼ inches. This will take on the various sized wheels which come to the shop. The advantage, among many, of such a jack is that it can be easily moved from one part of the shop to another. Moreover, such a jack holds the wheel securely and causes it to run without wobbling, an item of importance in striping.

Probably the most inexpensive wheel jack to be had is shown in Fig. 2, B. This jack has already been published in various journals, but the illustration will bear repeating in behalf of those who desire something that can be made right in the shop.

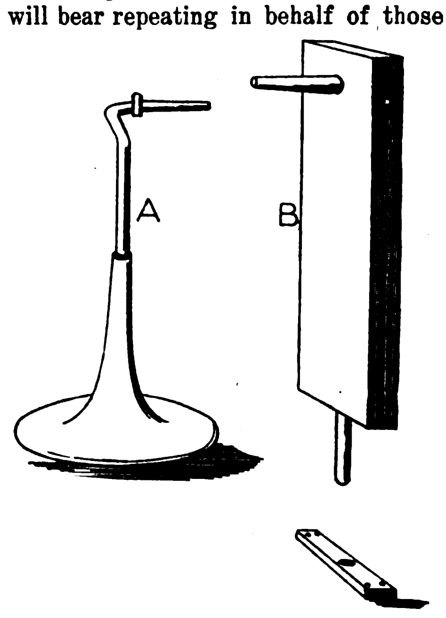

Fig. 2. A, A REVOLVING WHEEL-JACK.
B, AN INEXPENSIVE FORM OF WHEEL-JACK.

A 2 by 4-inch hardwood scantling, cut to a length of, say, 2½ feet, with an iron pin set in one end and a second one made with a taper and small enough to take a wheel with a ¾-inch box, bolted

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through the side at the other extremity, constitutes the main part of the jack. Then select a likely place for wheel work, and directly over a joist, bore a hole deep enough and large

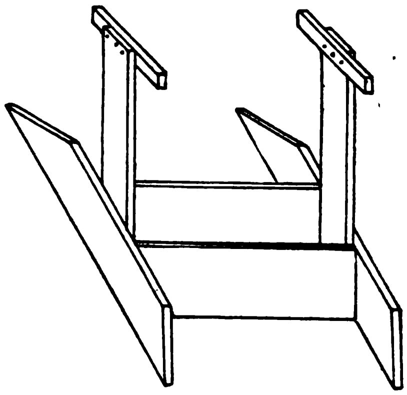

Fig. 3. RUBBING AND VARNISHING FRAME.

enough to hold the jack-pin. Screw the plate to the floor over the hole thus bored, set up the jack, and you are ready to begin work with a handy revolving jack. For striping, or for any process where it is needful to maintain a steady and true motion of the wheel, the jack shown at Fig. 2, A, is best, however. Fig. 3 illustrates a frame upon which piano, corning and similarly styled bodies are hung during the process of applying rubbing coats of varnish, and surfacing such coats. This frame, as may be seen, will hold two bodies, and as they are thus given a flat, upturned surface, heavier coats of varnish may be applied, than in case the body is set upright in its natural position. Hang two bodies on the frame. Varnish one side and one end of the first, then varnish the same part of the second. By this time the first body may be turned over and the remaining portion varnished, to be followed by the second, and so on. The body may be hung on this frame in rubbing it out of varnish. In fact, the frame is useful in every paint shop, and in almost all factory shops this design, or a similar one, is used. Make the frame of 1-inch pine stuff, length, 3 feet, height, 3 feet, width, 2½ feet. Bolt cross pieces 2 by 1 inch at top of upright, giving them a projection of about 7 inches each side of uprights. Uprights, sides, and ends should be at least 6 inches wide. Make strong and secure, as this is more essential than fine finish.

A good water barrel, or cask, with one end cut out in part, and slashed in to the chimes, as shown in Fig. 4, is a necessity in even the most unpretentious paint shop. Use this on the rubbing deck, or in the absence of this, where the rubbing is usually done, both the rubbing of varnish and roughstuff. Keep the barrel supplied with plenty of clean, fresh water. Into this supply of water the workman may dip his sponge in rubbing and washing up his surfaces. All buggy seats, by slipping the frame into the notch cut through the end of the barrel, may be held firmly while being rubbed. If the shop is outfitted with a hose attached to water works, a fresh and abundant supply of water can thus be had in the barrel at all times. Provide a rubber boot, or cover, made to slip over the end of the barrel when not in use. This will prevent accumulation of dirt and foreign matter in the water supply.

(To be continued.)

The Blacksmith's Work as it Goes in Kansas.

A. BRUTON.

I shall endeavor to outline as best I can the way the seasons hold in this section of the country.

Plow work generally begins about February 1st, and lasts until May 15th, and consists principally of plows and listers. Then cultivators, shovels, and weed-knives are in evidence until about August 1st.

Buggy repairing is generally steady the year around; wagon repairs, such as tire setting, from July to October. Of course, this depends on the wet and dry seasons. Cutting down wagons is for the greater part done during the fall and winter. Horseshoeing is work which is with us the year around, but principally in July, August and September and in January, February and March. This winter, however, there was a rush in December. I put on more shoes in one month than I ever did in the same time before.

Machine repairing is generally done in September, or in haying time, and the repair of thrashing machinery at the same time of year as mowing machine work.

I look for a rush of plow work early this spring, as plows have already begun to come in. We have received nine already to begin work on. Of course, they are only getting ready for spring work in advance, but it looks favorable for an early spring here.

I have a great deal of well-auger work which lasts through the summer season. I have also quite a number of stone-hammers to dress, and feathers and wedges to make for a soft rock which is found in this vicinity. I have also made some for hard rock, but for this, there is no special season of the year.

Of course there are special odds and ends of work coming in all the year around that fill in the spaces between times. The above is our routine.

The Hack Saw and its Use.

BY JOHN.

The hack saw to many is a new, and to all a most economical tool, if rightly handled and used. One reason so many of them break, is because of the altogether too small and straight handle, usually on the frame when bought. This cramps the hand, causes it to lose its grip, and a misstroke is made that breaks the saw. If the brethren will knock off that ill-shaped handle, heat and bend down the shank fifteen or more degrees, then fashion a handle one half longer and one and one quarter inches in diameter, or to fit the hand, less saws will be broken. I use a shank firmer chisel handle, but any chisel handle that fits the hand will do. Run the saw about one stroke per second; this allows the points of the teeth to cool off from the previous stroke, and the saw cuts better and longer. Don't jam the saw into the work; nothing is gained by it, and many saws are broken in this manner. It must be expected that a blade so thin and hard, doing the work it does, will be occasionally broken, but usually the hard saw has done more work, before it was broken,

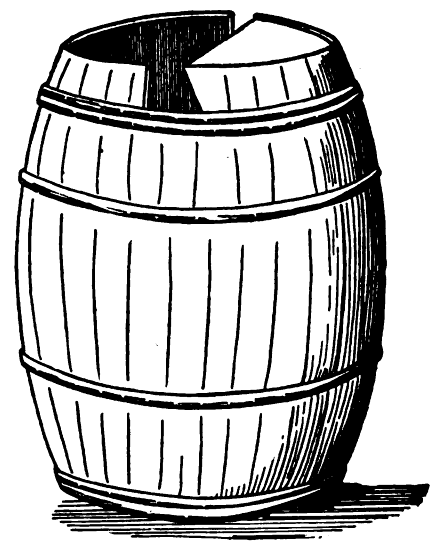

Fig. 4. A CONVENIENT WATER-BARREL FOR THE PAINT-SHOP.

than the soft saw was capable of doing at all. All old rust and scale should be removed before sawing. A nine-inch saw is best; those which are longer spring and break easier. After a long experience I use Goodell saws, made by the Goodell-Pratt Company,

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Greenfield, Mass. Had I known of the above things when I first began to use hacksaws, it would have saved me much annoyance, and not a few pennies.

Three Good Practical Recipes for Liquid Glue.

Take one quart of soft water and two pounds of the best pale glue, dissolve in a covered vessel by the heat of a water bath, cool, and add gradually, seven ounces of nitric acid (sp. gr. 1.335); when cold put it into bottles. It is very strong and does not gelatinize.

A liquid glue possessing great resisting power, recommended for wood and iron, is prepared as follows: clear gelatine, 100 parts; cabinet makers' glue, 100 parts; alcohol, 25 parts; alum, 2 parts. The whole is mixed with 200 parts of 20% acetic acid and heated on a water bath for six hours.

An improved liquid glue is made by dissolving 3 parts of glue, broken into small pieces, in 12 to 15 parts of saccharate of lime. On warming, the glue dissolves rapidly and remains liquid when cold without losing its strength.

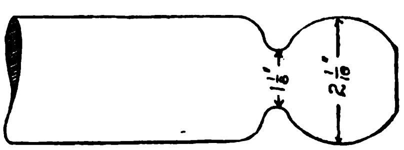

Fig. 1. FIRST OPERATION IN FORMING TOOL TO MAKE WRENCHES.

Any consistency desired may be obtained by varying the quantity of saccharate of lime.

Wrenches and Tongs with Swages for Shaping Them.

S. H. HOOVER.

I should like to recommend to my fellow-readers of THE AMERICAN BLACKSMITH the following tools for making wrenches:

First have a ball turned, as is shown in Fig. 1, a little flattened on the outer end. The dimensions on the figure show the size of ball for a standard ¾-inch wrench. I next make a blank swage, and sink this bar into it, just as when making a plain swage. Then I take care that the swage is well chipped out, so as to free the stock and prevent it from sticking. After having the swage made, in order to form the ball, use stock of about the size required to fill out the ball well. I use water to keep out the scale, squirting it in with a syringe arrangement. When the ball is formed, flatten it out to the required size, or for a ¾-inch wrench, 2 15/16 inches in diameter and ¾ inch thick. The handle part can be forged out later.

The ball after being flattened out, must be formed in the shape that it is desired for the wrench. In Fig. 2, I show the dies which are used for shaping and punching the wrench at this

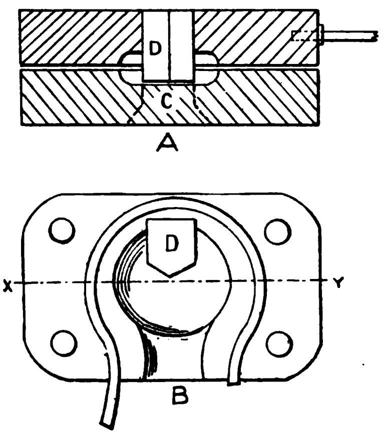

Fig. 2. DIES FOR SHAPING AND PUNCHING WRENCHES.

stage. The ball, after flattening and forming, is used to make the impression in the blocks of these dies. I always work up the edges sharply in the following way: I take a piece of ⅜-inch round iron, bending it into the shape shown in Fig. 2, B, and bed it in the dies about ⅜ of an inch away from the flattened impression of the ball. I then clamp it down and work the edges up good and high. Then heating it up again, I give a few more light blows of the hammer. I then have the die drilled and slotted out to suit the style of wrench with everything in place. Fig. 2, A, is a section on the line X Y of Fig. 2, B. At C, in Fig. 2, is shown the hole to allow the plug of the wrench to drop out free after punching. I use four dowel pins in the dies to guide them accurately together. The punch, Fig. 2, D, is made of tool steel and can have the end shaped at an angle, or round, as desired. The dies themselves are made of good Bessemer steel with case-hardened faces. I think any smith will be able to understand the foregoing brief description.

I can make machine wrenches or spud wrenches at seven cents apiece, using one helper, one smith, one heater and one hammer boy. This means that you must get out wrenches in very short order.

I also have a swage for the flat handles of wrenches, which is very simple. I first forge the handle nearly about the size wished, and then use the swage. The front and back of this swage must be chipped down so as not to cut. This swage rounds the edges and swells the center, which can be forged down to the required thickness. If placed in this swage a second time and flattened, it will come out very nicely. I can make either a single-ended or double-ended wrench in one heat, simply requiring to be straightened out a little.

I can also make a great many tongs in swages, as I shall endeavor to explain. I first shape a double ball, Fig. 3, A, in a swage made for that purpose, making the same of convenient size. For the lip of the tongs, I flatten out and shear off the end of the larger and outer ball shown at B. The inner ball is flattened the other way to form the place for the rivet hole, as at C. I then use a former to set the tongs to the desired shape, and they can be quickly finished up with a hand-hammer ready for welding on the handles. At D is shown a shape for the lips of the tongs, which I find the most convenient I ever used, as they will hold round, square, flat and octagonal iron.

Steel for Locomotive Forgings.

Extract from paper read before the Northwest Railway Club, by H. F. J. Porter.

In the early history of the locomotive there was no material available for its forged parts except wrought iron, and this material was sufficiently strong for the small duty that it had to perform. Subsequently, as the introduction of the Bessemer process developed the steam railway, and the demands for stronger metal became urgent, the substitution of steel for wrought iron in the forged parts of locomotives began.

Little was known at this time about this new material, and early attempts on the part of railway men to use steel forgings were very disastrous. The un-

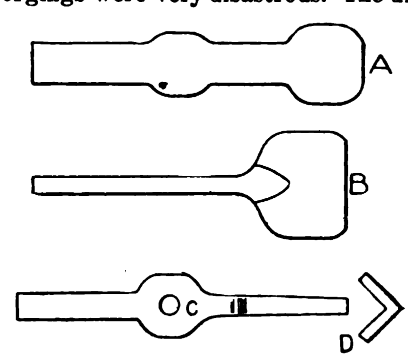

Fig. 3. A CONVENIENT METHOD OF MAKING A PAIR OF TONGS.

expected great mortality of forgings made of steel which was giving excellent results in other directions called for explanations. Chemistry, already assuming a prominent position in the Bessemer process, came forward to claim for itself a cure-all for the ills which

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were fast assuming a serious nature in the steel forging industry. It was given out that steel with a high percentage of carbon was brittle in certain service; that mild steel of definitely prescribed composition would be the ideal metal. Thus the tendency was encouraged to use a soft steel approaching wrought iron in the ease with which it could be handled in the shop, especially in machining. Still, it was found, in practice, that a harder steel, when great precautions were taken with its manufacture, possessed a remarkable quality of elastic strength combined with ductility or toughness. Tests were made to establish some relation between composition and resistance to stress. A testing machine was devised which would subject the bar, to be tested, to stresses similar to those which occur in actual practice in such forgings as axles, crank and cross-head pins, piston and connecting rods, where the fibres of the metal are strained successively in tension and compression.

	Elastic Limit Lbs.	Breaks Under Rev.
Wrought iron,	20,000	60,000
.15% carbon steel,	25,000	125,000
.25% carbon steel,	30,000	250,000
.35% carbon steel,	35,000	500,000
.45% carbon steel,	40,000	1,000,000
.55% carbon steel,	45,000	2,000,000
.65% carbon steel,	50,000	4,000,000
3¼% nickel steel,	60,000	5,000,000

Careful consideration of the results of these tests led to the recommendation of material for forgings, which should have a high elastic limit. In order to obtain this property, an increase in the carbon content, or the addition of some special element, was primarily necessary.

Owing to the appearance of the fracture in forgings broken in service, it had been supposed that they crystallized from shock or vibration. Tests of the character shown, however, soon proved that no such change in structure took place. It was further proved that materials of this kind are incapable of cold crystallization when exposed to the conditions of service mentioned.

Forgings made of the higher carbon steels continued to break in service, however, and engineers became convinced that there was something else which governed the life of steel forgings besides the chemical composition of the metal from which they were made. The metallurgist began to point to defects in the process of manufacture. Theories were put forward regarding certain features in the melting, pouring, cooling, reheating and forging processes. It was shown that certain defects were inherent in the ingot, due to improper methods of manipulation in its manufacture. Various methods were suggested to overcome them, the most successful being the "Whitworth Process of Fluid Compression." This process consists of compressing the fluid metal in the mould under hydraulic pressure, if necessary, up to 7,000 tons. By this means ingots could be obtained which were practically homogeneous throughout and free from internal defects.

It was also found that the small hammers, then in use for welding together small pieces of wrought iron to build up large forgings, were inadequate when called upon to forge down large-sized ingots to produce steel forgings. It is evident that for such work the pressure applied should be great enough, and of such a character as to penetrate to the center and cause flowing throughout the mass. This flowing of the metal requires a certain amount of time, and the requisite pressure should be maintained throughout a corresponding period. The effect of the rapid blows of a light hammer on a large mass of metal is absorbed at the surface, and the central metal is scarcely affected. Forgings produced under hammers of insufficient capacity were found to possess cracks and cavities in their center, due to uneven working of the metal. Thus heavier hammers were introduced, and, in turn, superseded by hydraulic forging presses.

Later, when it was found that unexplained failure still continued to occur, the microscopist advanced his theories, drawn from examination of the minute internal structure of the material, that heat treatment subsequent to the manufacture of the finished product would overcome all difficulties.

If we note the rate of cooling of a steel ingot from the point of solidification of coldness, we will see that the temperature falls with regular retardation the same amount in equal divisions of time until between 1,300 and 1,200 degrees F., a point (depending on the carbon content) is reached, where the temperature suddenly stops falling, and for a time either remains stationary, or perhaps rises for a short time, and then the same rate of cooling continues as before. This point, where the change of rate takes place, is called the "recalescent" point, and from chemical and physical tests we know that a change in the structure of the steel occurs here. This point varies slightly.

The fluid steel begins to crystallize at the point of solidification, and the slower the rate of cooling from there down the larger the crystals will be when the ingot is cold. At the point of recalescence, however, it would seem as if the crystallization, so to say, locks itself, for, after the ingot has become cold, if we reheat it to a temperature below this point, on again becoming cold we will find that the crystallization is not affected, but if we reheat it a little above the recalescent point, when it is again cold the crystallization will be found to be much smaller than before.

In fact, it is known that if steel is heated slightly above the recalescent point all previous crystallization is destroyed, and a fine amorphous condition is produced at that temperature. As soon as cooling begins again crystallization sets in and continues until the ingot is cold. As, however, the time of cooling from the recalescent point is comparatively short, the resultant crystallization is correspondingly small. It can be readily understood that when heat treatment can completely change the internal condition of steel, it should bear an important part in the manufacture of forgings made of that metal.

Let us for a moment consider the changes which take place in the condition of the metal as it passes through the forging process. Beginning with the cold ingot (which we will assume has cooled slowly and is, therefore, composed of large crystals), we first reheat it up to a forging temperature of from 1,800 to 2,000 degrees F., thus passing through the recalescent point, destroying all crystallization and producing an amorphous condition. As we put it under the forging press it begins to cool, crystallization at once setting in; at the same time, however, we begin to work the metal.

The work of forging tends to check crystallization, just as disturbing water which is below freezing point will delay the formation of ice crystals. The work of forging may or may not continue (depending upon the size and shape of the finished piece) until the temperature has fallen below the recalescent point, but during this time more or less crystallization has occurred, and has been disturbed and distorted. The work of forging has, moreover, proceeded from one end of the piece to the other, the part last worked upon having crystallized considerably before work was applied to it, so that the two ends may be entirely different as far as their internal condition is concerned.

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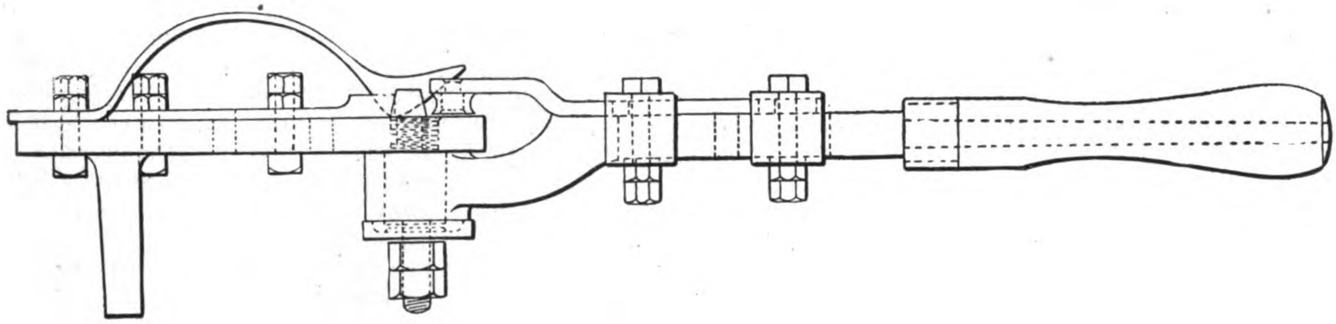

Fig. 2. SIDE ELEVATION OF TOOL FOR BENDING EYE-BOLTS.

If, as is generally the case, the forging is now considered finished, it is full of pulls and strains about which we know nothing, except that they may amount to several thousand pounds to the square inch. The extent of these strains is made evident when a forging, finished as above described, has a cut taken from it in a lathe, or has a keyway cut on one side. The strains in the fibres which are cut are relieved, and the piece invariably springs out of "true." To relieve these strains, the forging should be carefully and slowly heated to a temperature slightly above the recalescent point and then allowed to cool slowly. By this treatment, which is called "annealing," an entirely new crystallization is established, leaving the molecules of the metal completely at rest. If the forging, on being heated slightly above the recalescent point, is suddenly dropped into a bath of cold oil, no time is allowed during the cooling process for crystals to form, and the amorphous condition of its structure at that temperature is retained. This character of heat treatment is called "oil tempering," and is followed by further heat treatment to relieve the metal of any hardening effect due to the cooling process.

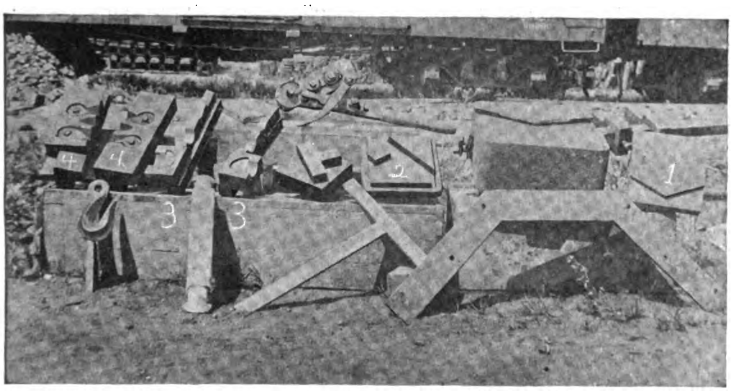

Fig. 1. THE UPPERMOST TOOL IS THE ANVIL EYE-BENDING TOOL.

An annealed forging has its elastic limit somewhat reduced as compared with its tensile strength, but its ductility is increased very considerably, as shown by its contraction and elongation in test pieces. The elastic limit of an annealed forging is invariably less than one-half of the tensile strength. By "elastic limit" I do not refer to the point usually determined by the drop of the beam in an ordinary testing machine, but rather to the carefully defined point obtained by more accurately determined methods, which is from 2,000 to 10,000 pounds lower.

This process of annealing to relieve internal strain is a very important one. These strains are apt to develop in service, thus constituting an initial load, and may throw a forging out of true, or even cause its complete failure, if they happen to act in the same direction as the external working stress.

We have already seen that bars of very high physical properties will not endure indefinitely repeated alternating stresses amounting to 40,000 pounds to the square inch. A forging strain of quite small intensity may easily act in conjunction with an external stress, closely approaching the elastic limit, and bring the total working stress up to a load which, acting continuously, would soon cause failure.

The lowering of the physical properties by the process of annealing may be corrected by a subsequent treatment of "oil tempering." In this treatment the forging is first reheated to a definite temperature and then dropped suddenly into a bath of cold liquid, which may be composed of oil, or any suitable fluid. The forging must be subsequently annealed, as before, to relieve it of cooling strains. The hardening effect of the sudden cooling is accompanied by a "setting" of the amorphous condition, brought about by the first heating, with the result that the irregular and often coarse crystalline condition existing after forging is broken up and a uniform and finer grain ensues. By the subsequent annealing, strains are relieved, and the hardening effect of sudden cooling is removed to a desired degree; at the same time the elastic limit is increased proportionately to the tensile strength, and a greater toughness is imparted to the metal, as shown by a higher elongation and contraction of area in test pieces.

In order to successfully temper a piece of steel, great care must be taken both in the process of re-heating it and also in cooling it in the bath. In reheating it, the surface metal is apt to expand away from the center and thus cause cracks in the latter, and in dropping it into the cold bath the surface metal is apt to contract onto the center to such an extent as to cause cracks in the former. In order, therefore, to successfully temper a forging, it should be hollow. By taking out the center it can be re-heated without danger of cracking, because the center metal is absent and the heat gets into the interior and expands both it and the

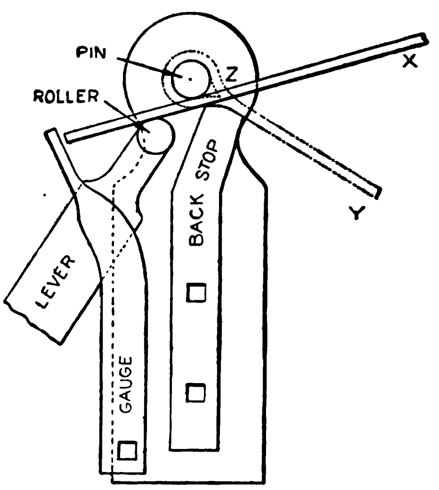

Fig. 3. METHOD OF USING EYE-BENDING TOOL.

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exterior together. Also, in dropping it into the cold bath there is no solid center on which the surface metal is contracted, and in that way the danger of cracking the surface during the cooling process is eliminated.

These theories of the metallurgist regarding the omnicurative properties of heat treatment are now in turn being modified so as not to be so sweeping. The result of a vast amount of experimenting in all directions has, however, taught us that the more we study the more there is to be learned, and now that scientific methods have been introduced and become established in our steel plants, and forge shops, they are not considered modern unless they are equipped with chemical, physical, metallurgical and microscopical laboratories with skilled experts in charge, who follow each forging through every process, holding it in complete control until it is finished.

Small forges and blacksmith shops, not so equipped, should confine themselves to wrought iron and mild steel forgings, which being of material elementary in its composition are susceptible of being handled in a crude manner. Only such concerns as are handling large amounts of products can afford to keep, continuously, a staff of skilled technists in the various sciences above mentioned, and they only are now considered competent to manufacture high grade products. Now that we understand better how to make them, steel forgings strong and reliable can be manufactured with a certainty heretofore impossible, and the lack of confidence so long established by early failure is losing ground rapidly.

Advanced ideas, and the practical applications of science are doing much in this, as in every other branch, to bring theory and practice into closer union. The manufacturing world has the benefit of the result.

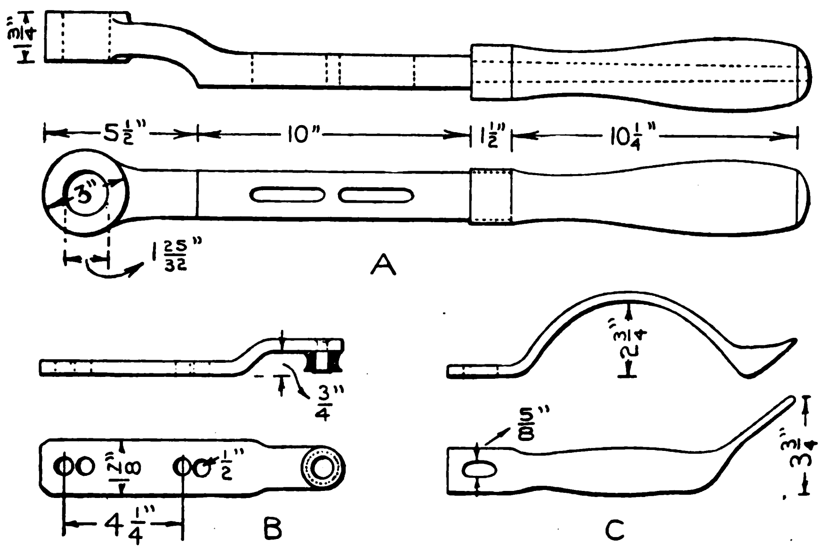

Fig. 4. DETAIL VIEWS OF HANDLE, BENDER AND GAUGE OF TOOL FOR BENDING EYES.

A Special Anvil Eye-Bending Tool.

Some time ago in the THE AMERICAN BLACKSMITH, in an article on Tools and Formers, by Mr. Daniel Fitzgerald, was mentioned, among others, a special tool for bending eye bolts. This tool was originally used for ¾-inch eye bolts, but was afterwards utilized for different classes of bending, such as grab hooks of square iron, gate hinges, gate hooks with an eye on one end and a hook on the other, together with all kinds of round hooks up to 3½ inches in diameter. At the request of numerous readers, we obtained and are now able to present detailed drawings, showing this very useful device. In the accompanying photo-engraving, Fig. 1 (see page 128), it is the uppermost tool shown.

Fig. 2 shows a side elevation. Fig. 3 is a plan view from above. The iron is inserted between the back stop pin and roller as far as the gauge. The first move is to bring the iron marked X over to the line marked Y. At the same time bring the lever around until the roller pinches the iron at point marked Z.

Figs. 4 and 5 show detailed views of the handle, gauge, body, back stop, and other parts. At A is the handle of steel with wooden grip. B shows the eye bender, with roller and pin of tool steel. Here the head is riveted so as to allow play to the roller. C is the gauge made of spring steel. At D is the wrought iron body, with steel set screw and pin. At E is shown the back stop, or hold back, made of steel. F shows the steel bottom washer. One eye pin, G, and two handle clamps, H, of steel are required.

To set this tool, a man not accustomed to it would do well to get an eye bolt like the one he wants to bend, put it on the pin, and then set his backstop and roller, so that they will pinch it in the neck.

We are indebted to the kindness of Mr. Daniel Fitzgerald, Foreman Blacksmith of the Chicago, Milwaukee and St. Paul Railway Company, for the drawings and particulars regarding the above tool.

From the explicit explanation and the sketches given, any intelligent blacksmith can, we think, understand this useful and ingenious device, and will, undoubtedly, find it of interest.

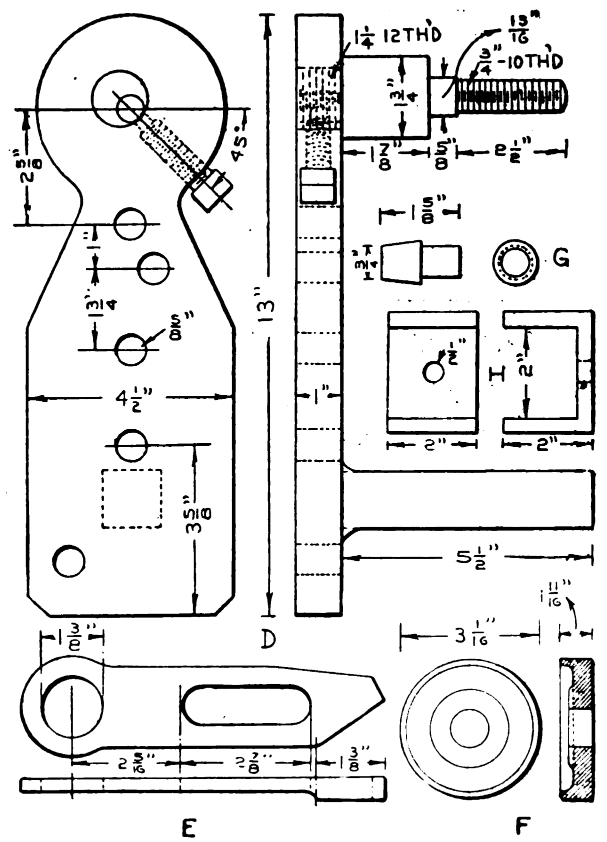

Fig. 5. OTHER PORTIONS OF TOOL FOR BENDING EYES.

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The Village Smithy.*

EDNA MANNERS.

When the early pinks of morning through
the eastern window stray,
To the shop the smith takes Toddles "just
to keep him from the way."
Soon the cheery forge is glowing and the
two work merrily;
'Midst the scrap-iron sits wee Toddles as
he shoes his horse in glee.

Oh, the busy hours fly quickly while the
neighbors come and go,
And they keep the smithy ringing, tossing
gossip to and fro,
But the smith drives home the shoe-nails
—steady hand and steady head—
He works on, nor stops to gossip; wife and
Toddles must be fed.

And old Jake he keeps a-thumbing down
the 'baccy in his clay.
He's the oldest and the idlest of the village
folk today.
Down upon the dead brick forge he leans,
and mourns its overthrow,
"Them new-fangled kinks!" he shakes his
head—old child of long ago.

Slow and thoughtful are his stories and
they'd wage from sun to sun,
For the hundredth time—the list'ners
know the end ere he's begun.
More to hear the toothless mumbling than
the tales their grandsires tell
Lounge the kindly group of loafers 'neath
the smithy's lazy spell.

Comes the sound of children's laughter,
and within the open door
Three little ones stand timidly and view
the smithy o'er.
Oh, a spot of deep enchantment is this
dim and blackened den,
And the smith, he's past all knowledge,
he's a wizard among men.
Eyes and mouths agape with wonder, the
good smith has looked and smiled—
Snatched a moment for the children, 'cause
wee Toddles is his child.

* Written expressly for the April number of THE AMERICAN BLACKSMITH.

HEATS SPARKS WELDS

April, spring's youngest month.

How about side-lines for spare moments?

Say not "Would that I could;" say rather, "I will."

What do you think of "The Village Smithy" picture?

Do you drive your business, or let your business drive you?

A good general blacksmith is desired by J. H. Hays & Co. of Metcalf, Ill.

Make a start on a difficult or puzzling piece of work and the finish often suggests itself. Well begun is half done.

Do you make the most of your time—lay down one tool only to pick up another, and do nothing without a purpose?

Send a photograph of your shop, outside or inside views, or both. Remember, we are offering a prize for the best appearing, best appointed shop, as shown by photographs sent us.

Your opinion on lien laws for blacksmiths, horseshoers and wheelwrights is desired. Also tell us about prices in your locality, and what you think can be done towards improving them.

Courtesy to patrons should be one of the fundamental principles of every establishment. The man with a pleasant word and obliging manner wins trade every time. Just try it.

Strike out on new lines and think and act for yourself. Because Tubal Cain set the example of doing a piece of work in a certain way is not to say that you must follow. Set your own example.

A situation is open for a good, steady blacksmith at Vermilion, S. D. Correspond with R. B. Shields, who wishes a smith with a good working knowledge of horseshoeing. A good chance.

Below cost—Beware of the man who sells things or does work for "less than cost." In these days of "Every man for himself," there must be a good reason for such seemingly reckless generosity.

There is great need today for trained men of all kinds. In every craft and profession it is the man with superior training, skill or knowledge, who forges ahead; the man who makes the most of his opportunities, who gets to the top of the heap quickest. It's worth trying.

If you strike a knotty piece of work, tell your troubles in these columns, and a brother smith will probably be able to give you the kink that will straighten it out. We want you to use THE AMERICAN BLACKSMITH whenever you have anything to ask or tell your fellow craftsmen.

No escaping smoke is a feature of the modern forge and blower system being installed nowadays in most large shops. A power-driven blower supplies the blast to the forge, while an exhaust fan sucks the smoke away through a down-draft hood at the rear of the forge. In these shops no smoke or gases escape—the air is good, pure and wholesome.

To grow old is a mistake. To become out of date and be classed as a "back number" is radically wrong. Let a man keep his mind active and his "hand in," and he cannot be laid upon the shelf, no matter how old he may be. It is never too late to learn. It is said that Cato, the great Roman statesman, learned Greek when he was eighty years of age.

It appears, from figures recently published, that a man with a common school education and a special training for his craft, has twelve and a half times the capacity for earning money that an illiterate, untrained person has, and a high school graduate has twenty-five times the capacity Of course, much depends upon the man himself, his application and perseverance in every instance.

In these days one sees alluring advertisements of mining and oil stocks. Generally speaking, "our folks," American blacksmiths, are better off by investing their surplus in new tools for the shop or in added comforts for the family. These schemes first appear in the city papers of large circulation, but the field is evidently becoming overworked, and they are extending to the rural districts.

More essential than gold to the world is iron. We need to look around us but little to decide which we could more readily get along without. Curiously enough, there is a great African people, the Baralongs, by whom iron is held sacred. It is said that once upon a time, the spirit of a great chief appeared and taught the tribe to "melt stones to make spears." Thus they obtained iron.

The oldest horseshoe in known existence is said to be one found at Uriconium, near Shrewsbury, England, an ancient city built by the Romans. Going back further, it is taken for granted from historical reference that the horses of Alexander the Great, used in his campaign into Assyria, about B. C. 400, were not shod. In the ruins of Pompeii and Herculaneum, the cities destroyed by the eruption of Mount Vesuvius, blacksmith shops have been found, but no trace of the horseshoe in any of them.

The skilled craftsman allows himself little worry over the prices his neighbor charges. He has little difficulty about getting his figure. When a customer says: "Why, Smith over here will do the job for so much," he replies, "Well, you can take it to Smith, if you like. I guess he needs it more than I do," and the work usually stays. At least this is what many, many letters from first-class craftsmen on the subject of prices tell us. If you have not reached the highest point of skill, read, study and work to that end —to a large extent prices or wages will then take care of themselves.

"Well, I don't know," said Tom Tardy. That's Tom's pet expression, for he is one of those kind of people whose opinions are very indefinite. We had been talking about power in the shop, and speaking about some of the great advantages of an engine. At length his brain began to work and he broke out,—"I ain't got no use for them new-fangled things; they're more bother than they're worth, all time gettin' out of order, or blowin' up and killin' people. Takes all a man's time to look after them." We asked Tom if he had ever seen one work, if he had been in a shop where they had an engine, or if he ever talked with a man who had run one. He said "No," at length, but added that his brother had a friend who knew a man that had been killed by some kind of a gas machine exploding, an acetylin' gas machine, he thought they called it. "I don't want nothing of the kind around," Tom concluded, and we left him tugging for dear life at his old, leaky, rattling bellows. That's Tom's way.

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The American Association of Blacksmiths and Horseshoers.

Under the auspices of the above association, meetings of the blacksmiths, horseshoers and wheelwrights of Orleans County, New York State, were held on March 12, 13 and 21, at which the county was successfully organized and a complete schedule of shoeing and wagon work adopted. The following officers for the county were elected: President, J. M. Buddington, Albion; vice-president, J. Brook, Medina; secretary, F. F. Halloran, Albion; treasurer, F. W. Donohue, Holley.

The meetings were fully attended and were very enthusiastic. We congratulate Orleans County upon effecting such a strong, harmonious association. Almost every shop in the county is represented.

Our representatives are now at work in four other counties of the State, preparatory to organizing them, and the outlook is bright for early success in these also.

The following is an outline of the principal aims of the American Association of Blacksmiths and Horseshoers:

A Lien Law for 'Smiths.

How many bad accounts are due you? How much better off would you be if you could collect every dollar that was owing to you for work? Think how much more you could do for your family. What would be your saving in time and worry, if you were positively sure of your money from every job, and your customers all knew they could not evade payment in any way?

Other trades have lien laws, which allow the craftsman to put a lien on the article which he has worked on, and secure payment. In Minnesota the blacksmiths and horseshoers have a lien law. If they shoe a horse, for instance, and the owner doesn't pay, they can file a notice of lien at a cost not exceeding twenty-five cents and proceed to collect their pay. All the costs of such actions, even filing the notice of lien, comes out of the man who owes the bill.

What benefit would such a law be to you? Will you join hands with us and get it passed in your state? No other mechanic in the world works harder with head and hands for his money than the smith, and he earns every penny he gets. He is rightfully entitled to legislation to protect him from "dead beats," and to enable him to get the money which is due him. It is well to refuse work for which no pay will probably be given, but is far better to do all the work that offers and feel there will be no question about the money. This is what a lien law will do. The smith has to pay promptly for the stock he gets from dealers to use in his work, or shut up his shop. On some of this work he is forced to wait and wait for his pay, a year or more in the case of many slow people. The lien law makes it possible for the craftsman to collect the money when it is due, and the mere existence of such a law and the power it gives to the smith has the effect of making payments come in promptly.

There is no doubt of the many advantages of such a law. The thing is to get it passed. We need your help—you need ours, too. There is usually no great objection to such legislation, as few oppose it when the bill goes to the legislature. A Horseshoer's Lien Law bill has just been passed in the Indiana Legislature. It is simply a matter of getting such a bill introduced by the legislature and influencing the legislators to vote in favor of it.

This movement is being started and pushed by the American Association of Blacksmiths and Horseshoers, which has just been incorporated under New York State laws for the purpose of securing some much needed reforms and benefits of this nature for blacksmiths, horseshoers and wheelwrights. THE AMERICAN BLACKSMITH is the official organ of the Association, and is backing the movement. But we must have the support of the smiths—yours with the rest. The effort which we will ask you personally to put forth is slight, and certainly the advantages to be gained deserve that much support from you, as you will readily admit. The combined effort of the craft will, without doubt, have the greatest weight and influence, and secure what we want. The American Association will attend to the preparation and introduction of the necessary Lien Law Bill at the State Capitol. When the bill comes up for a vote, we will notify you, and your part will be to write a strong, personal letter to each of your particular county and district representatives in the State legislature, urging the passage of the bill. Ten thousand letters from the voters of your State asking for a good law to which there is no opposition, a direct appeal from every craftsman in the State, in other words, will undoubtedly have the desired effect, and the smith will get the protection he has needed so long and deserves so strongly. Fifty letters from the smiths of your county, who are voters, written to the particular legislators who represent your county, will have more influence than five thousand letters from men outside the district of those same representatives. In other words, you are to write to the assemblyman or State legislator who wants your vote.

Are you not in favor of this movement, and will you not support it to the extent which we ask?

A Movement for Securing Better Prices.

Are the prices which you are now getting for work high enough to afford you a good living from your daily labor? Do you think you are receiving sufficient compensation for your days of hard work? The price of stock and material has gone up greatly, as you know, and the cost of living has also been increasing. Have the prices which you have been getting for work day by day been advancing in the same proportion, or at all? Prices are not as high as they ought to be at the present time, and in many cases it is reported that the smith is unable to make a good living for himself and those dependent upon him.

This should never be at the present day when the whole country is so prosperous. No one will deny, not even the right-minded farmer, that the smith should have more money for his work to-day than he received for the same work a few years ago when general prices were lower. (All over the country wages are being advanced, and increases of salary granted to employees, either voluntarily or in response to demands). It is high time that there should be a general advance in prices on all blacksmithing, horseshoeing and wheelwrighting work.

The principal reason why the prices for shoeing and blacksmithing have not gone up is because the smiths in the various sections do not co-operate with each other as they should. One man is afraid to raise his prices for fear that his neighbor will not raise, and will therefore take his trade from him. If all the smiths of a given county can be brought together to adopt prices for work, they can then be sure of getting the amount of money they rightfully earn and richly deserve.

It is the intention of the Association to place in the hands of blacksmiths, horseshoers and wheelwrights, the means and opportunity to organize and secure higher prices. The time is ripe, and the opportunity does not come every day. Will you personally take advantage of it? Everyone can see the benefits which such a movement will

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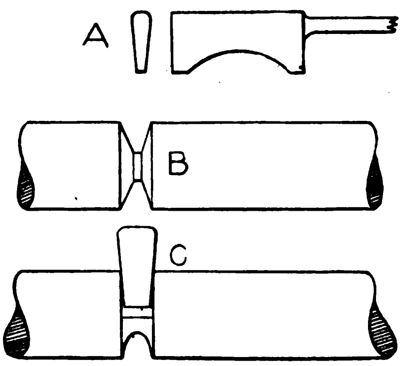
bring, and co-operation is all that is needed for success.

If you are in favor of such a movement, please lend your support. Let us hear from you to-day. We have already organized several counties and have raised their prices. Our representatives are doing active personal work in many other counties. Bear in mind that this thing cannot be done in a day, but will require united, persistent effort, and if you expect to share in the benefits, you must lend your own personal support. The American Association will do all in its power to help, and will lend the services of its representatives, but the smith's own support in every case should be given, and we feel that it freely will be. Keep in touch with the work as told month by month in THE AMERICAN BLACKSMITH. Throw aside all petty jealousies for your own good, and talk it up with your neighbor smiths. Be prepared to attend a meeting in your county of all the blacksmiths, horseshoers and wheelwrights, when one is called, for the purpose of organizing and adopting higher prices.

Let us get together and lend our efforts to make a success of this. We can do it in your county, for it has already been done in others. The support which any one craftsman can give is small compared with the benefits he obtains if we succeed, and succeed we can, if each one helps. The American Association of Blacksmiths and Horseshoers, being incorporated, has the power to organize the local county associations and grant charters to them. Will you join an Association in your county and stand by the prices adopted? Please refer to page X of this issue. Write to us and give us you opinions.



A GOOD METHOD OF CUTTING OFF ROUND BARS OF STEEL.

A Bar Cutting Kink.

S. H. HOOVER.

The following is a method which I employ for cutting off round bars of steel that my shears will not take, say from three up to eight inches. Any one can cut off a shaft hot and secure a good, clean end, but when I wish both ends clean without any chipping, I proceed as follows: Lay the shaft in a swage on the hammer die. Using a hack, or cutter, A, go entirely around. This will give a cut as shown at B, having cut the shaft all around in this way, and half way off. If we continue this, we will leave a knob sticking to each end. However, we have what we may call a parting tool. This is formed the same as a hack, although it is very heavy and has a square edge, as indicated at C. The ends must nearly fill up the space left by the former tool. Drive this tool about one-half way through, turn the bar over and drive the piece out which remains, by turning the same hack upside down as the space will be greater by this process, and will allow the piece to be driven out. By this process you will make as good an end on one piece as the other.

This may be an old kink, but I have hired no less than fifty smiths in the past year, and not one of them knew how to cut off a shaft properly without spending about an hour dressing up his cut, after butchering it.

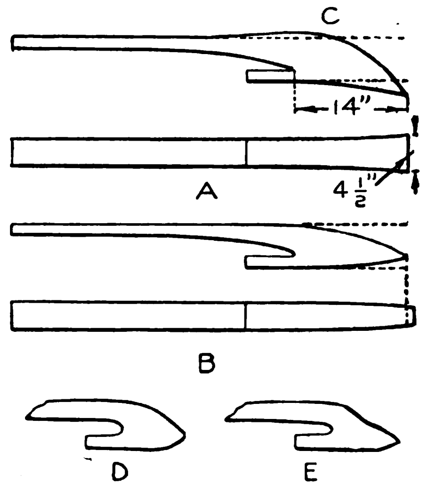


Fig. 27. CONTRAST OF PROPERLY AND IMPROPERLY SHAPED STEAM SHOVEL TEETH.

The Railroad Blacksmith Shop.—6.

W. B. REID.

Steam Shovel Repair.

The hard usage, to which the steam shovel is constantly subject renders the repair of this useful and indispensable machine a matter of frequent occurrence to the railway blacksmith, and also to many outside jobbers of the same calling. The teeth of the dipper are the parts requiring most frequent renewal and repair, and may, therefore, be profitably discussed at length.

The shape and condition of steam shovel teeth when brought in for repairs, compared with their condition when newly applied, should, naturally, suggest to the smith the proper shape and proportion and mode of repairing the same. Nevertheless, they are commonly made and repaired in a very imperfect manner—poorly adapted for the most efficient service, necessitating repair at much shorter intervals than should be necessary. It will be the object of this article to describe the methods of making new and repairing old steam shovel teeth in the most economical and efficient manner possible.

Fig. 27, A, shows the proper shape and proportion of the tooth, contrasted with one of poor shape and proportion, B. The curve at the point C, should be round and full, extending slightly beyond the dotted lines; not flat, tapering and deficient at the dotted lines, as at B. They should have liberal clearance at the point; the teeth will excavate the maximum of material with the minimum of resistance, while also remaining in service for a much longer period. A comparison of the shape of old teeth as sent to the shop for repair (Fig. 27, E), with proper proportions will bring this point into clearer view.

Another bad practice, lessening the working quality of the tooth, is the cutting of the point in chisel shape fashion (Fig. 27, D). The point should always be kept full, as shown by tooth A.

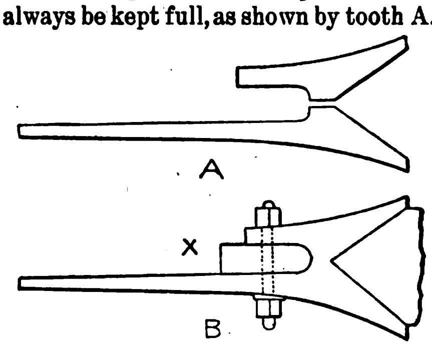


Fig. 28. METHOD OF FORGING NEW TEETH.

It will be ground away in service soon enough, and the proper curvature gives the tooth the digging or burrowing quality essential to the most efficient service.

In shops where much of this work is done, it is a good plan to have a template of proper shape and proportions for the use of the smith. This will maintain a uniform shape and size of tooth, thereby increasing the efficiency of the shovel by giving it a smoother, steadier movement.

To make a new tooth, forge two pieces, and weld in the relative position,

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shown in Fig. 28, A. This will leave a full well-formed cavity for the insertion of a steel wedge, Fig. 28, B. The wedge can be held firmly in place by a

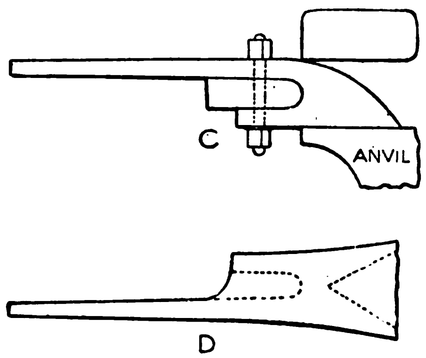

Fig. 29. METHOD OF FORGING A NEW SHOVEL TOOTH.

couple of chisel-hacks on one side, the other part being closed tightly over it while hot, as at B. Before welding, clamp a piece of flat iron of the right size in the opening at X, Fig. 28, B, to hold the parts firmly together while welding and drawing down the point. The welding of the steel properly in the point of the tooth is the most difficult and critical part of the job. Heated slowly, with borax or other welding flux, plentifully applied, the operation can be successfully completed under the steam hammer, the dies being adjusted in "safe edge" manner (Fig. 29, C). The finishing touches are to be done at the anvil with a flatter.

If preferred, this forging may also be made entirely from the solid (Fig. 29, D), and cut out at the dotted lines with a chisel. This method requires a heavier piece of iron, and is in no way superior or more expeditious than the first method described.

The proper quantity and quality of steel which should be put into the tooth is largely determined by the material at the disposal of the blacksmith. Cast steel is generally used. The greater the quantity the greater the endurance of the tooth. From ten to twenty pounds, according to the size of the tooth, may be used. When the steel is used in too small a quantity, an inferior job is the result. The iron is drawn down over the steel, as shown in Fig. 30, A, making it of little service in comparison with the large steel surface in Fig. 30, B. Considering the expensiveness of cast steel for such a purpose, and the probability of its quality being destroyed in process of welding, we believe the substitution of good soft steel to be a commendable practice. Every railroad shop has many old scrap-steel axles, driving-pins, guides, etc., in every way suitable for the purpose. It is comparatively easy to weld, and, treated with some hardening compound, gives a reasonable service.

(To be continued.)

Hints and Suggestions as to the Proper Use of Files.—1.*

Very few mechanical operations are more difficult than that of filing well. Unlike the tool fixed in the iron planer, whose movement is guided by unyielding ways, the file must be guided by the hand, and the accuracy with which this is done will depend largely upon the patience and perseverance given in practice, the "guiding principle," involved in many other tools and operations, being wanting in most applications of the file. While a perfect file is necessary to secure the best results in filing, knowledge as to the selection of the proper file for the work in hand, and skilfulness and practice in handling it, are equally essential.

A severe test in filing would consist in producing a true flat surface upon narrow work, or say that whose width does not exceed one-eighth the length or stroke of the file. To the uninitiated this would seem to require that the file should have a perfectly true and straight surface, but were it practicable to make the file absolutely flat and true, it would then be necessary to move it in absolutely straight lines across the work; even were this operation possible, the pressure, if applied to each end of the file, as is the usual custom, would give it sufficient spring to cause a slight

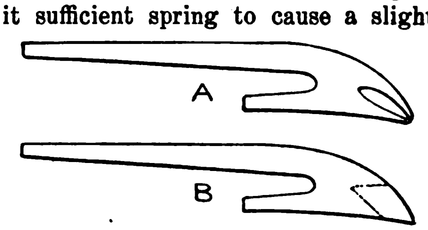

Fig. 30. POINTING THE TEETH WITH STEEL.

concavity to its cutting surface, and thus an inevitable rounding to the surface of the work must be produced.

Therefore to produce a flat surface under this severe test, or even under more favorable circumstances, the file should have a convexity given to its surface.

Convexity in Files.

Undoubtedly, few, even of the old filers, have given the subject of convexity as it bears upon broad surface filing the thought it is entitled to. It is known to many mechanics that a file which will bite and cling, with the accustomed downward pressure, upon wrought iron or soft steel will require a greater pressure to prevent it from glazing or slipping over the work, when applied to broad cast iron surfaces. This is owing to the glassy nature and the extremely granular formation of these surfaces; consequently the teeth should enter the surface deeper than in the more fibrous metals or they will soon glaze over and become dulled or shiny, thus giving to the file the appearance of being soft, while the contrary may be the fact.

Considerable convexity is, therefore, needed in such cases; for while it gives greater control of the file from point to heel, it also presents fewer cutting points to the work with a given pressure downward than the less convex file —*the bite being increased in proportion to the increase of the convexity.* The ability, therefore, to increase it more or less, at the will of the operator, is of considerable importance.

In finishing many kinds of work, the absence of a suitable convexity limits the usefulness of the file—as in the preparation of the valves of steam engines, tables of printing presses, stereotype plates, or other work requiring a true surface.

While an absolutely true surface is confessedly unattainable, it is evident that, as in the above cases, a degree of perfection is sometimes desirable beyond what the necessities of other work may require; and to be able to touch the exact spot indicated by the straight edge or surface plate with the file, is to utilize it in a manner which could not be done if the convexity did not exist.

Files Properly Handled.

Before using the file, it should first of all be properly handled; not, as is too often the case, by driving the handle half way down upon the tang and thereby doubling the chances of breaking it, but by forcing it well up to the shoulder. Some of the file handles found on the market will not stand this amount of driving without splitting; in such cases the tang of an old or worn out file of similar dimensions should be heated, taking care, of course, not to draw the temper, and the hole in the handle burned out to nearly the desired size and shape, before driving it upon the tang. It not infrequently happens that the tang hole is not drilled central or is badly out of line; this may also be corrected by using a heated tang.

Of the many file handles of special construction hitherto devised, there are

* From "File Filosophy," by courtesy of the Nicholson File Company, Providence, R. I.

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none which have, as yet, combined that simplicity, utility, and economy necessary to take the place of the ordinary wooden handle; nor do we think it possible to improve for most applications of the file, upon a wooden handle that is conveniently formed and properly ferruled, provided it be firmly affixed and carefully used. The Nicholson File Company now make two forms of handles, the straight ferruled and the spun ferruled, which, we are told, elicit the highest commendation from all users.

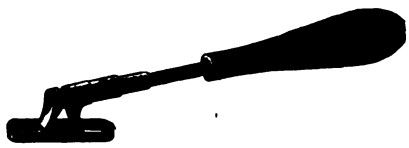

Fig. 1. STUB FILE HOLDER.

Devices for Holding Files.

The file, when used in the ordinary manner, considerably exceeds the length of the work; but when such is not the case, as in filing large table surfaces and shaping out recesses of considerable length, or when, from other causes, the ordinary handle will not answer, it then becomes necessary to grasp the file by holders of special construction. These special devices (many of which are quite rude) are numerous, and vary to suit the particular shape of the file and the work to be performed.

Short pieces of files of special construction are sometimes clamped to the slide rest, to be used upon work revolving in the engine lathe, and are soldered or screwed to bent handles when required to be used in finishing in and around the bottoms of shallow cavities.

The necessities, however, of this last and troublesome method of holding the file may be avoided by the use of the Stub File Holder.

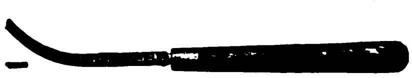

Fig. 2. A FORM OF BENT RIFFLER.

Wood workers not infrequently clamp one or more files to pieces of board, or fasten them by means of staples and wire pins, or by cutting in, in such a manner as will enable them to smooth out grooves, or true up the edges of their work, using the board or holder as a gauge.

Bent Rifflers are sometimes required in reaching certain irregularly shaped cavities.

In filing large table surfaces, the tang is frequently bent upward, as in Fig. 3, A, to admit of the hands clearing the work when the file passes over the surface; sometimes a crank-shaped holder is employed, having one end fitted to the tang of the file while the other is fitted to receive the handle, as in Fig 3, B. These devices, while facilitating somewhat the handling of the file, do not give that perfect control which enables the operator to manipulate it at will, nor do they aid in governing its convexity.

The Surface File Holder, which is herewith illustrated, is designed especially to meet these points, thus enabling the skillful operator to do much of the work with the file which has hitherto been done with the scraper.

To have the file truly and firmly handled or properly affixed to a suitable holder is the first step in point of economy as well as in the production of good work.

(To be continued.)

Diseases of the Foot and Their Treatment.—15.

E. MAYHEW MICHENER, V. M. D.

Inflammation of the Flexor Tendons.

The above condition is common in the region of the cannon of the front limbs of the horse, and occurs more rarely in the hind extremities. Injuries of these tendons vary in intensity from complete rupture in the most severe cases to that of simple straining or pulling apart of the fibres.

Causes.

These may be classed as either predisposing or exciting. Among the predisposing causes, most prominent is the conformation of the animal; those with large, heavy bodies and light limbs are frequent subjects to the injury. Animals with long, slanting fetlocks are more liable than those with upright pasterns, other conditions remaining the same. A condition very favorable to injury of these tendons is the existence of long toes and low heels. This may either be in the length of hoof alone, or the same result may be obtained by shoeing with thick toed and low heeled shoes. Given the condition known as low heeled, it is apparent at once, that shoeing may either further endanger the accident, or tend to prevent it to a great measure, according to whether it be improperly or correctly done. The kind of work done by the animal plays an important part in the causation of this trouble. For example, saddle horses or hunters which are obliged to carry much weight at a rapid gait and possibly over rough roads are very predisposed. In animals used for heavy pulling, the accident is more frequently with the hind limbs than is the case with animals used for driving or saddle purposes. When the injury does occur in the hind limbs, it is commonly the result of severe muscular exertion.

Symptoms.

The symptoms vary widely with the extent of the injury and the length of time that has elapsed. Lameness to greater or less extent is commonly present. The peculiarity of the form of lameness is that it is shown only at the time the weight is placed on the limb. Moving the leg at the fetlock joint when the foot is held in the hand is not painful to the animal. In standing, the heel is not as commonly held elevated as is the case in diseases within the hoof, but not rarely it will be noticed that the animal selects a resting place for the heel while standing, as, for example, he may prefer to stand on a slanting surface with the heel the highest. In the case of the hind limbs, the animal may place the heel of the shoe against the side of his stall. This position is taken to relieve tension upon the tendons. At the beginning of the trouble the local symptoms may be detected at the point of injury, pain on pressure, increased local temperature and swelling. The heat and pain may become much less after a few days, while the lameness of the animal may not improve. The swelling is at first soft and poorly defined, but later becomes harder and more clearly circumscribed. Long continued or repeated injury to the flexor tendons commonly results in a shortening of the length of the tendons; this causes the deformity known as knuckling at the fetlocks. In order to determine whether the knuckling is due to actual shortening of the tendons, or to a desire on the part of the animal to avoid placing weight upon the limb, it is necessary to raise the opposite foot, when, if the tendons be really contracted, the additional weight will not remove the

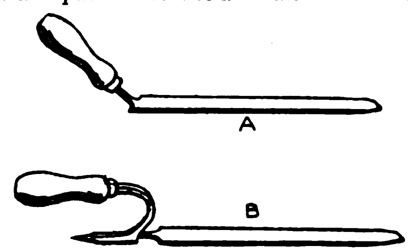

Fig. 3. TWO STYLES OF FILES FOR LARGE SURFACES.

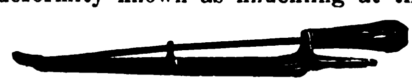

Fig. 4. SURFACE FILE HOLDER.

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knuckling. The prospects of recovery from injury to the flexor tendons varies with the severity of the injury; if both limbs are affected, the prospects are not so good. Repeated injuries tend to produce great thickening of the tendons and their sheaths, which, in severe cases, become bound together as one solid cord. The suspensory ligament may also be involved, which is an unfavorable complication. When the lameness is of long standing the prospects are unfavorable. If both legs are affected, the animal may suffer greatly and refuse to stand long at a time. In some cases the deformity continues to render the animal useless after all acute pain has subsided.

Treatment.

Rest is of the utmost importance early in the attack. The shoe should be removed, the animal should have a comfortable box stall if possible, which should be littered to a depth of four to six inches with fine shavings, or other short material. Cold applications should be made to the swollen and painful parts very frequently for the first two or three days. Spraying with a hose, having a spray nozzle, is an excellent way to apply cold water, or a small stream of cold water may be directed on the part from a small rubber tubing fastened to the leg by a broad bandage. Wrapping the leg with absorbent cotton, which has been immersed in ice water, is another good method. After the first two or three days, moist, warm applications give better results than cold. For this purpose the parts are inclosed in several layers of absorbent cotton, which has been wet with quite warm water, and over the whole is to be applied white flannel bandages evenly and firmly, but not too tightly. The application should be renewed at least four or five times daily. In most cases the moist applications are kept up with benefit for five or six days, after which time lameness may be almost gone. The animal should have three to four weeks rest, however, as a precaution against the return of the lameness. If lameness persists, or if the enlargement is considerable, massage of the thickened parts is often of great advantage. The application of blisters is also of use to reduce the enlargement. Firing, either in points or in lines is practiced with advantage in well selected cases. The toe of the hoof must be kept pared as short as will be borne without causing tenderness of the foot, and if shoes are applied, they should be wedge shaped, that is, with thick heels and thin toes.

If, after lameness has subsided, contraction of the tendons has produced marked deformity of the limb by knuckling of the fetlock, the only remedy consists in the surgical operation known as tenotomy. This consists in dividing the contracted tendon, or tendons, subcutaneously at the middle portion of the cannon. This operation requires a knowledge of the anatomy of the part and the practice of strict surgical cleanliness. The operation of tenotomy frequently gives surprisingly good results, but is somewhat costly on account of time required for rest. From six weeks to three months may be required. It is of the utmost importance that all, or nearly all, pain be gone from the seat of injury before the operation of tenotomy is attempted, for, should pain be sufficient to cause the animal to place little or no weight upon the limb, then the divided ends of the tendon will not be kept separated, but unite in about the same relative length as before the operation. If, however, a fair amount of weight is placed upon the limb, the cut ends of the tendon are separated, and the space between is filled in with new connective tissue, thus giving to the tendon its normal length and strength.

(To be continued.)

INTERIOR VIEW OF AN UP-TO-DATE SHOP IN TEXAS.

A Glimpse of a Texas Shop.

From the Lone Star State comes a photograph of a typical shop, sent us by the proprietors, Knight and Livingston, of Temple, Texas. The engraving shows the rear view of the interior of the shop.

They have a five-horsepower Fairbanks and Morse gasoline engine to pull a 36-inch band saw, a pony planer, a Universal woodworker, a rip saw, and a grindstone. On the deck in the corner will be seen a two-horsepower electric motor which pulls an emery stand, a drill press, a blower for four fires and two overhead fans. The pipe conveying the air to the fires may be seen along the wall to the right. They have a Henderson hand power tire setter; rubber tiring is also carried on in this shop. In front is a shoeing department with three shoers.

The building is 30 feet by 90 feet, one story high, veneered with brick, and a shed has lately been added, 28 feet by 60 feet. This latter is intended as a wagon repair department and for the carrying on of all bulky work. Thus the shop inside will be free of this inconvenience.

Knight and Livingston have been in business now for several years and have held their present location for two years.

The Scientific Principles of Horseshoeing.—18.

E. W. PERRIN.

Navicular Disease.

Navicular disease is a very serious malady affecting the under surface of the navicular bone, also the tendon flexor perforans, which passes over it. Fortunately, this disease is comparatively rare. It is commoner in horses that do fast work, but I have seen a few marked cases in draft horses. This disease is insidious in its approach. Many horses are affected with it for years before the lameness becomes acute. First, it attacks the smooth, glistening cartilage with which the articulatory surface of the bone is covered (see Fig. 91), and slowly the tendon and bone become implicated. Fig. 92 represents a specimen in which the hoof, skin, sensitive frog and a portion of the lateral cartilages is dissected off, and the tendon flexor perforans cut through at the back of the pastern and turned back so as to expose to view the seat of the disease.

In a veterinary school in England, I saw some twenty typical pathological specimens, showing the disease in its various stages of progress. In some cases —in the primary stage—the smooth surface of the bone had a few fine holes that would carry a pin's point; some were more deeply perforated,

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like a worm-eaten piece of wood; some had patches of the cartilage eaten away; a few were perfectly honey-combed, thus making the bone so weak that you could snap it in pieces with the fingers. Up to the present day this disease has—so far as I know—baffled every effort of the veterinary profession to effect a cure. I have heard all sorts of stories of blistering, firing, frog setons, etc., effecting a cure, but I have never known of a single case to be cured when the disease was once firmly established.

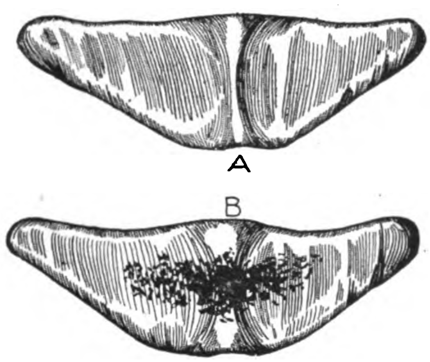

Fig. 91. A. THE NAVICULAR BONE IN HEALTH. B. THE DISEASED NAVICULAR BONE.

This disease is difficult to diagnose in the early stages, and I think some cases said to be navicular disease, may merely have been sprain of the navicular joint.

Symptoms.

In the early stages of the disease there is nothing to indicate its presence except a peculiar way of pointing the toe, and often the animal only does this when he stands still in his own stall. Generally, only one front foot is affected, but occasionally both feet are implicated. I have never seen it in a hind foot. This disease progresses slowly. Presently there will be a slight lameness, when starting out of the stable in the morning, which, however, works off in a few moments. As the disease advances it takes longer for the animal to "warm up" out of the lameness, until, finally, though going somewhat better with exercise, he is permanently lame, and he points the affected foot whenever he is standing still. He wears the shoe out rapidly at the toe, and is a chronic stumbler.

In its incipiency, there is nothing in the shape or form of foot to indicate the presence of the disease. I have seen perfectly formed feet affected with navicular disease, but as the disease advances there is more or less contraction of the hoof and often some wasting—atrophy—of the muscles of the shoulder in addition.

Causes.

Hereditary predisposition and severe work are the most potent factors in the production of navicular disease. I know of two cases in which navicular disease began to develop immediately following a runaway on a hard road. I saw several cavalry horses develop it in the British Army. I have seen two well developed cases in heavy draft horses, but it is more commonly met with in road stock that do fast work. I believe the pacing horse is less prone to the disease, although records—so far as I know—afford no information on this phase of the subject; I have never seen a pacer with navicular disease. If any readers know of a pacer being affected I should be glad to have an authenticated history of the case.

Treatment.

This disease being incurable, treatment can only be palliative. The seat of the disease is the under surface of the navicular bone, over which the tendon flexor perforans plays, like a rope or belt over a pulley (see Figs. 92 and 93). Depressing the heels or elevating the toe places increased tension on the tendon—more pressure on the affected part. Hence, to relieve the affected part of pain, the animal raises the heel and points the toe, which position relaxes the tendon and eases the pain. This accounts for the well known fact that the navicular horse goes much better with the toe short and rolled and the heel raised by means of a swelled heel shoe. If there be contraction, treat as recommended for that disease in the September issue of this paper, but do not apply frog pressure, which in navicular disease increases the pain and lameness.

In every case that has come under my notice, the disease has run its course, defying all efforts at treatment. The best course to pursue is to put the animal to walking work, for, under such conditions, he may do several years of useful work before the lameness becomes acute. We have one such case here. This horse has done six years of slow work, and although very lame at a trot, it is scarcely perceptible at a walk. Do not breed from a mare affected with navicular disease.

Neurotomy as a Remedy for Navicular Disease.

Neurotomy, commonly called "nerving," was a common practice many years ago, but it has long since fallen into disrepute as unscientific, as a remedy for navicular disease. The operation consists in making an incision in the skin of the leg just above the fetlock joint between the back tendons and the canon bone, dissecting out the plantar nerve, cutting about an inch out of it and stitching up the wound. The operation is performed on both sides of the leg, thus cutting off nervous sensation in the foot, and the foot being thus freed from pain, there is no lameness, unless there be some mechanical impediment to the proper movement of the articulations, tendons, etc.

But destroying the sensation of pain does not arrest the progress of the disease. On the contrary it accelerates it. The animal, feeling no pain, makes no attempt to save the affected part from wear and tear, and as a result it wears out—the disease runs its course much quicker.

To illustrate, I will give the history of one case. I performed neurotomy on a heavy draft horse, belonging to a Mr. Dyke of Bath, west of England. This horse had navicular in both front feet, lamer in one foot than the other. The horse was too lame to be of any service, and I advised the owner to have him killed, but he was anxious to try the experiment; so the operation was performed on both legs, a few days apart. The wounds healed rapidly. All the lameness was gone, and the owner was delighted, but I told him the probable consequences, viz.: That a breakdown was sure to follow sooner or later, and on that account, I advised him to work the horse on his farm a few miles from the city, which he did, making me a promise that he would let me know whenever anything happened the patient. It was about nine months from the date of the operation that one of

Fig. 92. DISSECTED SPECIMEN SHOWING SEAT OF NAVICULAR DISEASE.

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the farm hands came to my shop and said that while plowing, the horse got suddenly lame, and on investigation, he found that the foot was turned up in front and that the horse was walking

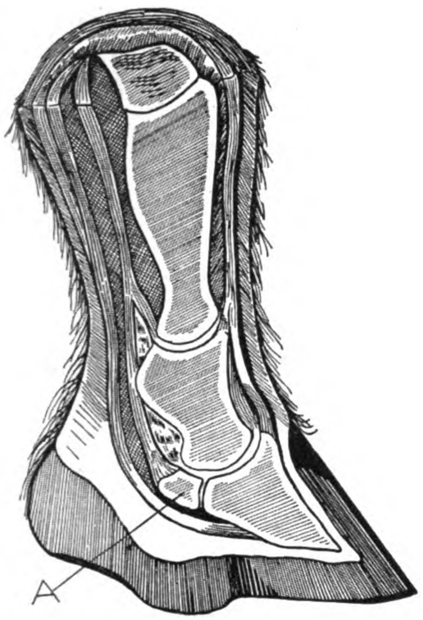


Fig. 98. SECTION OF FOOT AND PASTERN. A, INDICATES THE LOCATION OF NAVICULAR DISEASE.

on the end of his leg. I told the owner to have the horse killed at once, and to cut off the two front legs between the knee and fetlock and send them to me for dissecting purposes. On receipt of these specimens, I found that in the one in which the break-down had occurred I could bend the foot and pastern forward until it was at right angles with the canon bone—so that the foot and pastern were limp and useless, the end of the canon bone coming to the ground in walking.

I sawed both specimens through from top to bottom, cutting straight through the foot from toe to heel. In one, the tendon flexor perforans was severed where it passes over the navicular bone. Some four inches of the tendon at the seat of the disease was withered and discolored. The ruptured ends looked like the fibres of a rope worn through by friction. All the smooth cartilage was completely gone from the navicular bone, leaving a rough honey-combed surface. The same condition was in progress in the other foot, but not so bad. The tendon was worn some—it was only a question of time till it would have worn through, and when the last fibre gives way, the fetlock—losing the support of the flexor perforans—comes to the ground; there is a break-down, a collapse. The horse must then be killed. It is needless to say that if such a break-down happened to a buggy-horse while at a trot, it would probably cause a severe accident to the driver. Again, in the unnerved foot, there is nothing to indicate the presence of injuries or foreign bodies in the foot, until extensive suppuration breaks out at the coronet. You may prick an unnerved foot in shoeing, but if it does not attract your attention by bleeding, you will not know it, because the animal does not flinch. When you do find it, by matter breaking out at the coronet, some very serious complications may have set in. So that in the final summing up, although neurotomy removes the pain, it, at the same time, accelerates the progress of the disease, and when a horse is too lame to do walking work it ought to be killed. Hence, when viewed from a scientific standpoint, neurotomy is not a remedy for navicular disease.

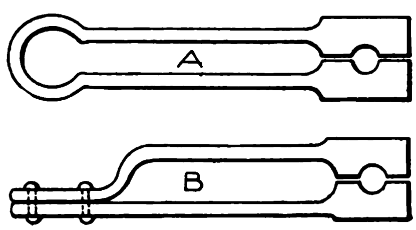
In conclusion, I would say that in shoeing for navicular disease, the shoes should be reset about every three or four weeks, because the abnormal growth of toe will cause increased pain. Elevate the heels and roll the toe to the degree indicated by the wear of the old shoe. If the frog is weak and thin, you can protect it from contact with the ground with a bar shoe. Arch up the bar so that it does not touch the frog. If thrush be present, treat as recommended for that disease. If the feet are hard and dry, moisten them with poultices or stop with wet clay. This is about all you can do; the disease will run its course, but the slower the work, the longer the horse will last.

(To be concluded.)

Two Different Forms of Hammer Swages.

S. H. HOOVER.

There is more than one way of making hammer swages, and, in the figure the form which I show at B is one which



TWO FORMS OF HAMMER SWAGES.

I consider much simpler and easier to make, and I also find it more serviceable, as the form shown at A will often break, whereas the other will not. Also it will be found much easier to forge the two-part swage, as only one-half of the stock needs to be handled at a time.

QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

Setting Axles.—Will some one tell me the most simple and convenient way of setting axles? JOHN MCCONNELL.

A Welding Inquiry—I should like to have some brother smith tell me the best way to weld cold rolled steel and how to scarf it. H. STROTTMANN.

Expanding of the Heels—I should like to have some brother smith tell me some plan for making a hoof expander for contraction of heels. ROBERT C. MENZIES.

A Toe Calk Question—I should like to have some one tell me of a way to put toe calks and heel calks on horseshoes, both steel and iron, so that they will wear sharp. ED. HAYDEN.

Softening and Tempering Brass—I should like to know how to soften brass, also how to temper it and copper, and about the hardening and mixing of various metals. What is the best book treating of work of this kind? W. C. GROHT.

Another Testimonial.—I would not do without THE AMERICAN BLACKSMITH. I obtained one recipe for a welding compound out of it, which is worth more to me than the price of two years' subscription. J. M. REED, Sundance, Wyoming.

One of Many.—Enclosed please find $1.00 for the renewal of my subscription for 1903. It would be almost impossible for one to get along without the paper, after once having taken it. One issue of the paper has been worth a year's subscription to me. H. M. FINGAR, Pleasant Plains, N. Y.

Tempering Small Springs—In answer to an inquiry of E. E. Knapp, would say that a very good way to temper small spiral springs is to heat them to a cherry red and to harden in oil. To draw the temper—this can be done by blazing off the oil three times in the usual way. B. B.

Cherry Red—One brother advises to heat tool steel to a "cherry red" to harden. We also have a "Cherry-Heat" welding compound. If good tool steel is heated to a heat so that it will weld with any kind of compound and then cooled off in water, it will be useless as a cutting tool. JOHN.

Welding a Buggy Spring Leaf—I should like some brother smith to tell me a good way to weld a buggy spring leaf, and also how they should be tempered, or treated after welding, as they sometimes set.

Also I should like to know how to harden and temper the jaws of a bolt clipper. H. H. WHITTEN.

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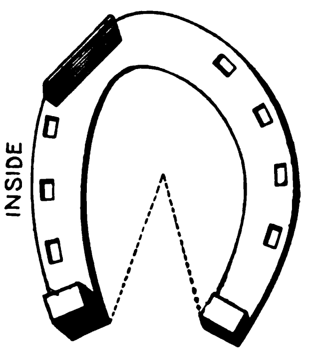
Tempering Copper Springs—With regard to the question by Mr. Fred Barney on copper springs, I would say that when it becomes necessary to use a copper spring I have the steel on the inside covered with sheet copper, which protects the steel from acids and sulphur water. The same will appear a solid copper spring, fairly tempered. A. J. COOPER.

Ship Smithing.–I should like to see some articles on ship smithing from brother craftsmen who have had experience in that line. For instance, how to make and adjust the iron work on a fore mast for a schooner or square-rigged sailing ship, for the main mast, the mizzen mast, lower yard, top gallant yard and other yards, or any work of this kind, which seems scarce. J. E. CLARK.

A Shoe for Interfering Behind—The accompanying figure shows a horseshoe, which I use in bad cases of interfering behind. In every case where I cannot straighten the ankles into plumb, I use this shoe. Nine-tenths of the interfering



A GOOD FORM OF SHOE FOR INTERFERING BEHIND.

behind is caused by the foot being too low on the inside, thus throwing the ankle in, which of course means that it gets struck.

The object of the shoe is to tip them out, and it is made with high inside and low outside heels, and with the toe calk inside, and nearly in line with the heel calk. I leave the inside straight, and turn the outside around close to the foot, and this, in my experience, will not fail to accomplish the purpose. O. P. TUCKER.

I Should Like to Ask How to Make a Weld—Where there is a great strain on a weld, a pick for example, after it is welded and finished and cold, is there any good done to the weld by reheating the pick at the weld to a dark red, then letting it cool? Does it make the steel any less liable to break off, just at the weld? Does it do iron welds any good to reheat them to a dark heat and then let them cool, for example, a chain on the rope to hoist a bucket out of a mine, when you want to make it as good as possible? W.F.

From the Editor: Several letters have recently been published in this department, mentioning benefits received by readers through THE AMERICAN BLACKSMITH. Letters of this nature form so large and representative a part of our correspondence that the Editor trusts our readers will not disapprove of a little display on that account. We are always glad to hear from subscribers, and especially to learn that they are deriving knowledge and benefit from the columns of THE AMERICAN BLACKSMITH. We are striving to make the paper of use and value to all readers. The three letters which follow are interesting in this connection, and we desire to reproduce them in full.

Editor American Blacksmith:

Enclosed please find one dollar. Please run my subscription for another year to your most valuable journal, the best of its kind that I have ever read. I have been taking your paper now for about a year and what I have learned in that time has been worth twenty-five dollars to me. If you ask three times the price for it, I should think it a cheap journal to such men and youths as mechanics, blacksmiths and horseshoers. H. A. CLINE, Tyrone, Ky.

Editor American Blacksmith:

I had no intention of letting my subscription to THE AMERICAN BLACKSMITH expire without a prompt renewal of the same, but my time has been so taken up outside of my regular work that I neglected to remit the amount of my subscription. I wish to thank you for sending the journal since my subscription expired and hope to receive every number in the future, for I am very much pleased with it. I have received several copies, any one of which I would give a dollar for and which I would not sell today for a dollar to any man. A. P. WETMORE, Clifton, N. B.

Editor American Blacksmith:

Your favor of January 23d received. I am not connected with the Yazoo & Mississippi Valley Railroad, though I use its letterheads sometimes. I used to be an engineer on this road, but on account of loss of hearing to a certain extent, I had to resign my position, so I opened a blacksmith, woodworking and general repair shop here. I have been around to the two other blacksmiths in our town and two in Jackson, La., but have so far failed to get a subscriber, but I have not given them up, for I cannot speak too highly of the merits of THE AMERICAN BLACKSMITH as a trade journal, for I am free to acknowledge that from it, I have profited more than I can say. Not being a blacksmith (I served my time as a machinist) when I started up in this business, I worked under many difficulties and ran up against jobs that nearly stumped me, until I got THE AMERICAN BLACKSMITH, and after taking it one year and reading its valuable articles bearing on the different phases of the trade, I am accredited with being the best horseshoer and general blacksmith in the community. This at a cost to me of $1.00 paid for your paper, and a little effort and commonsense on my part. I could write you a book of the trials and tribulations I experienced in trying to do jobs that I now do with ease and in a workman-like manner, and all due to the teachings of your valuable journal. R. D. ANDERSON, Wilson, La.

Removing Bolts from Engine Foundations—Referring to the problem asked by Mr. George Gardner, I will give an account of the same kind of one that I have had with an engine of the Great Northern Paper Company of Millinochet, Maine. I took a bar of iron, two by four inches and twelve feet long for a lever. Then using a number of pieces of iron two inches in diameter and about four to eight inches long, I began at the bottom and forced them up with the lever, thus forcing the broken bolt out. C. C. THOMAS.

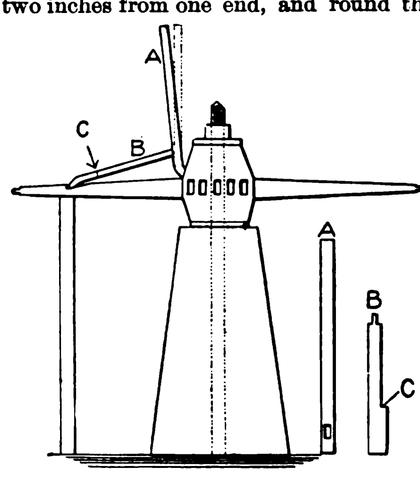
Heating after Forging.—I would say in reply to Mr. Furbush's inquiry that I think it is always a good plan to heat a forging after it has been finished to a good red heat, and then allow it to cool without being touched. This tends to relieve all heating strains and strains produced by hammering at a low heat while finishing. This is good practice.

The ordinary practice of finishing off a forging at a dark red in order to give a smooth surface to the outside has a tendency to set up strains in the metal, as only the surface metal is worked at this heat. This reheating and slow cooling has the effect of annealing and tends to relieve the metal of these very injurious strains. JOHN L. BACON.

How Prevent Home Horseshoeing?—Seeing many questions asked in THE AMERICAN BLACKSMITH, I thought I would ask the above one. What I mean by home shoeing is farmers doing their own shoeing work. They will pick up old shoes out of scrap piles, or anywhere they can find them, and when they have ruined their horses' feet by rasping them to fit the shoes, they will bring them to the shop. This practice is making havoc in the shops of Kentucky, and I should like to know how it can be stopped. My idea is that a license, or tax, of $5.00 be placed on every set of horseshoeing tools. I should like to hear from some brother smiths through THE AMERICAN BLACKSMITH on this question. J. B. M.

Fastening Spokes and Metal Wheels.—Answering the question on fastening spokes and metal wheels in the February issue, if Charles Sherman will hereafter try the Bush Metal Wheel, he will not need the information he seeks. However, we advise him to return broken-down wheels to the factory they came from, for he will have a picnic trying to remedy a fault, which the manufacturers of that wheel could not fix themselves. The wheel is of no account to repair, and can only be broken down and have the hub recast on. The trouble is that the construction strain was too great, caused by the shrinkage of the cast-iron hub, putting a great tension on the spokes, and in its efforts to release itself from the strain, the wheel went under. C. BUSH.

Removing Old Spokes—In answer to the question of Mr. Bruton as to removing broken spokes, I will give the way which I use and which I think is superior to putting the spoke in the vise and hitting the hub with a sledge. The accompanying drawing refers to my method. Take an old buggy axle about 1⅛ inches thick, and shape the piece A about thirty inches long. Cut a long square hole about two inches from one end, and round the



A CONVENIENT METHOD OF REMOVING SPOKES.

upper end of the piece for a handle. Take another piece twelve inches long, make a tenon on one end to fit loosely in the hole which has been cut in A, and also make a shoulder about two inches from the other end, bending the lower ends of both

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A and B so as to give a good purchase. Fasten A to B with a thin bolt and the device is ready.

Place the extractor on top of the spoke in the position shown by dotted line, mark the end of B with pencil, cut a notch, place a stick just under the notch and apply the extractor. Pull on the lever and strike a sharp blow against the notch with a nail hammer, and in nine cases out of ten the spoke will come out. H. JOFFER.

Making Over Old Wheels—I have been thinking for some time that I would give my brother smiths a little scheme that might be worth something to them. It refers to taking the dish out of wheels and making them as sound as new. Put the wheel on the block, and after you have removed the tire bolts and taken the tire off, cut out every rivet in the hub and take out every other spoke, turn them over with the rear side in front, using glue, and set them away to dry. When dry, put back the rivets with a good rivet set, and then put on the rim, which will pull the spokes straight. You may have to put a piece of leather in the rim, and then put on your tire, but you will have a stout wheel. S. O. LOVE.

Mill Picks—The following receipt for tempering picks is one which I have used for over twenty-five years with good success:

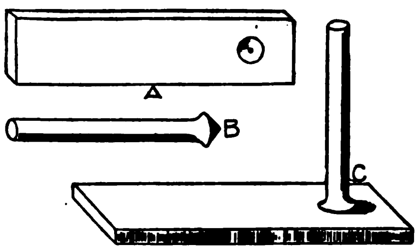
One ounce of salammoniac.
Half " " corrosive sublimate.
One " " alum.
One " " salt petre.
Half " " magnesia.
One " " borax.
One " " oil of vitriol.
One pound of salt.
Three gallons of soft water.

Care should be taken to work the steel in the way in which it is described by W. G. W. T. in the February issue. Heat to a cherry red, and cool. Draw no temper. This can be used for hardening stone hammers, drills, plow points, mouldboards, and in fact in every case where you need a tough, hard surface. I have used it with good success on edged tools by drawing the temper. R. R. TICHENOR.

Shoeing for Cross-Firing—In answer to W. L. P. on page 99 of the February issue, I would say that the horse referred to is a cross-firer, which defect is common in pacers, but never in trotting horses. To stop this, shoe very light in front, shorten the toe from the bottom all it will stand, and shoe behind with a side-weight shoe, having the weight on the outside. However, I prefer to make the shoe quite thin and light, punching the holes on the inside of the heavy side and letting the shoe project from ½ to ⅜ of an inch on the outside. This will always stop the cross-firing in my case. Be careful to lower the inside of both hind and front feet, and if there is a wing on the inside rasp it off before fitting the shoe. JESSE LEWIS.

Interfering—I have a little theory about interfering, and right here would say that it is very easy to stop a horse from interfering, when you know how. For instance, a horse that strikes his ankles behind, take and toe your horse in and set the toes on your shoe so that the horse's foot will look at the bottom as if he toes out. Be sure that you have the toe at an angle of about twenty-five degrees. Fit the inside close and leave the outside long enough to trail. Make your trail on the outside, and when you have it trailed turn your shoe over the horn of the anvil and throw the trail straight out from the shoe. Lower the foot on the outside, and, according to my experience, the horse will not strike at all. L. M. SARGENT.

Scarfing for Special Welding.—In the February number, Edward Adam asks a few questions. I shall answer one of them for him. He wishes to know how a piece of round iron should be scarfed which is to be jumped on to a piece of flat iron, so as to stand perpendicularly on the same. Take the round piece, B, and back it up, cone-shaped, leaving an edge all around and a point in the center. Take the flat piece, A, and with the small end



TO WELD A ROUND TO A FLAT PIECE OF IRON.

of the hammer hollow the same as the round piece, and then punch a very small hole in the center of the hollow on the flat piece to let the gas escape. Take a good welding on the two, jump the round on the flat, C, and turn it upside down. Put into a heading tool and give it a few strokes, or go around the edge of the lip with a small fuller. Hollow the flat piece about ⅜ or ½ inch deep, as seen in sketch. WM. H. KATHERMAN.

A Home-Made Blower—Having read THE AMERICAN BLACKSMITH with much interest and having learned from others, I will try to write a few lines to help my brother craftsmen. I have a blower in my shop, made from an old bicycle, which is hard to beat. The following is the way in which the same was made: Take the fan from an old blower and bolt it to a plank. Now with a piece of old tire, make two braces for the wheel. Taking a piece of wood, 3 by 2¼ inches for the post, bore a ¾-inch hole and cut out for the ball cups on each side, and welding a few in on one of the pedals for a crank. The post is bolted to the plan with two strap bolts and a brace with two nuts so as to tighten the chain. A piece of ¾-inch oval iron bolted on the wheel helps to steady the speed. My fan revolves fifty-four times to the crank once, and only takes eight pounds to turn. I hope this will help some brother smith to get a good and cheap blower. L. A. BRENNAR.

A Question on Melting Rubber.—Can some one tell me of a process of melting rubber, that is, melting the solid rubber so as to fill a casting or hole or groove in any other soft substance? R. E. B.

To Digest Old Rubber.—Place the material, cut in small shreds in a strong, (boiler-iron) air-tight vessel, provided with a safety valve, and introduce into it four or five parts of bisulphide of carbon for each part (by weight) of rubber. Close all the openings and place the vessel over a suitable water-bath, or, what is better, have a steam-coil inserted within the boiler. Heat for an hour at the boiling point of water. This will ensure the complete solution of the rubber. The vapor of the bisulphide is very inflammable and when mixed with air, it is explosive when ignited. For these reasons as well as for the offensive odor of the solvent, the operation is best conducted in the open air and with steam heat only. This swells into a pasty mass and may be moulded into any desired form, or passed through a die of a tubing machine. B.

Another Method of Spoke Pulling—In the January number of THE AMERICAN BLACKSMITH, Mr. Bruton asks about removing spokes from the hub. I should say get a spoke puller. In the meantime, one way to do it is to place the hub on the wheel bench, face down if it is a light wheel, taking hold of the end of spoke and working it up and down, and especially down. If the spoke is too brittle, or too heavy to bend, put a clamp on the spoke one foot from the hub and a prop under the clamp reaching to the floor, bracing out from the hub. Swing a light sledge over the hub and strike the clamp. The concussion and the bracing prop draw the spoke out. If there is no clamp at hand, cut a notch in the spoke, straight on the outside, and slanting down to the hub. Strike in notch instead of striking the clamp. Be sure to have the prop solid and in right position, so that the spoke will not be broken. The clamp can be made out of two pieces of iron ½ by 1½ by 3 inches curved in the middle along the spoke, and fastened together at the ends with bolts or thumb screws. This is my way. E. H. HOEL.

The Use of Toe Clips—Referring to the remarks of Wm. F. on page 100, I suppose he will agree that the toe of the hoof is the strongest part of the foot, and therefore should take the most strain, either shod or barefooted. It is a well-known fact that the toe clip when properly applied puts the strain on the toe instead of the quarters where the nails are driven. With the use of the toe clips you can use smaller nails and hold your shoe in better position. I admit that a man may hurt a horse with toe clips, but he is more apt to hurt him with big nails or a shoe that is not level, or one that is too narrow.

He also claims that the clip retards the desirous growth of the foot. This is hardly so, because the foot grows at the coronary band, and thus shoves the toe clip, nails, old horn and sole all down together. The only trouble that may arise is that the nails on the quarters will not allow the shell to spread as it is pushed down, and therefore if left too long will draw in the wall of the foot and cause contraction.

As to clapping a red hot shoe on the foot, I wish to say that any man who understands his business will fit a shoe hot. Great care must be taken, however, not to hold the shoe on long enough to burn the horse's foot. JESSE LEWIS.

Welding Toe Calks—I wonder if most horseshoers leave the old toe calks on when they become pretty well worn, and weld the new ones on top of them, or do they remove the old ones as I do. I shall endeavor to tell how this is done. Heat the old toe to nearly a welding heat and place it in a vise with the calk far enough from the vise to put an old rasp between the calk and the vise flatways. Then lift on the rasp, and with a little practice you will be able to do the trick and have no more trouble in welding than with a new shoe.

I saw in the December number that D. J. Lessel and B. B. Mallory tell about removing spokes from old wheels. The way I do it is to have two or three rings, or bands, according to the size of the spoke, and slip one on it which is a little larger than the spoke. I then take my shoe punch, or some other punch with a taper on it, and drive it from the hub side between the band and the hub. Then by driving against the punch, the same as they drive against the notch, the spoke may be removed. The punch never splits, as the notch sometimes does, and further, the rings and punch are always ready.

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I think Mr. T. J. Wallace's ideas about welding axles in the October issue are very good, and I also agree with Mr. W. L. G. in what he says about good-natured kicks. I read this article to a customer of mine and he was not at all slow to take the hint. R. W. SCUTT.

Another on Spoke Pulling — Referring to the plan of Mr. J. P. Wingard for pulling old buggy spokes, I think the ring and wedge plan is too much bother. If he will use the upright post and strike just over the inside line of the post, he will have the same result, using a hand ax or a sharp-faced hammer. I have tried both ways and like this the better of the two. The way I draw spokes is to strike the spoke on the front side, close to the hub. Do not strike hard enough to smash the spoke. Use light, quick blows, and you can start any spoke that can be drawn.

I see that W. L. P. names over a list of customers that are found in every community, but he has left one out, which I think is the worst of them all, and that is the man whose credit is good, who gets his work done, giving you to understand that the cash is ready when the work is finished, but when it is done he says, "I am a little short of money today; you will have to wait until I come again." It may be that you have used money to do his work which you wished to use for other purposes, and you have to wait his pleasure. If you ask him for it, he will get mad or say "I forgot it," when he is able to pay and you need the money.

I would like to see all of the brothers of the craft rub off the rust occasionally, and send items to THE AMERICAN BLACKSMITH which will be of benefit to someone else, if they are to us. We can extend each other a helping hand in this way. Pass along a good thing. R. R. TICHENOR.

A Word of Encouragement — Your paper gives an opportunity to all workers in iron, especially to horseshoers. Even our veterinary text-books, many of them serve only for exhibition in book or show cases. but this journal is practical and indispensable to the smith who wants to do shoeing properly. The question of scientific horseshoeing must appeal to any man with humanity, yet the majority of smiths and shoers stick to ancient and even barbaric methods. For instance, they treat corners and gravel bruises with the same knowledge that our ancestors started on three hundred years or so ago. And these same men post shop signs reading, "Scientific Horseshoeing."

Although a question may seem foolish, it is important to the questioner, and this journal has many subscribers who are willing to explain when necessary, thus educating and destroying prejudice in fellow craftsmen. A young man properly educated and trained in pathology of the horse is as competent a shoer as an octogenarian smith without such training. But reform in any line always meets with opposition. Such men as Michener, Perrin, Kenyon and others need not be discouraged in their efforts towards enlightening less experienced craftsmen. Opposition often has good results. It attracts hearers and spurs the mind to new thoughts. When opposition is offered it is met with due consideration, and the point under argument is satisfactorily explained to the benefit, not only of the questioner, but of thousands of others, widening our interests. ROBERT MOSER.

Brass and Copper—I find that a useful book to have on such subjects is The Metal Workers' Handy Book, by Brant, containing receipts for hardening and tempering copper and brass and for softening alloys; also the composition of all kinds of alloys for various uses, solders and metals for castings are given.

Copper, if heated to redness in contact with air, oxidizes and forms a red scale, but if heated to a lower red it may with care be worked like iron by the smith.

To harden or toughen copper, one to sixteen per cent. of manganese oxide may be mixed with the copper in a crucible. After melting and thorough stirring, the scum should be carefully removed and the copper is ready for casting. In case of brass this process is carried out just the same and the zinc added.

In mixing metals, the following points are useful and may be mentioned: The least fusible metal should be melted first, unless in such small quantities that they will readily dissolve in the more fusible. The metals requiring the greatest heat should be placed in the melting pot first, and no other metals added until those already in the pot are thoroughly fused. Do not apply the heat too quickly to an alloy, as the more fusible will melt and "sweat out" before the others are fused.

Copper and tin alloys have the property of becoming much softer and ductile when cooled. Heat to a dark red, or to the melting point of lead, and immerse in water. The alloy thus treated can be worked under the hammer and straightened without cracking. B. B.

Gold Striping on Vehicles — Reading the February number, I saw an article in regard to gold striping on vehicles, and as I am not a professional painter, but have a great deal to do in summer seasons and have seen a great many buggies with gold stripes, I tried to get it from jobbers that I deal with in Baltimore, but they say they can't find it, so please be kind enough to write me at once something about it and where I can get it, as I would like to have some at once. Also please explain in full through your valuable paper how it is used, and if it is put up in tubes like other striping, etc. We have one or two painters in the county, but they are as green as I am in regard to it, so that I appeal to you. J. H. TAPSCOTT.

The gold striping referred to by Mr. J. H. Tapscott is done with gold bronze powder, which may be bought in a dry state of Geo. E. Watson, 108 Lake Street, Chicago, Ill., whose advertisement may be found in THE AMERICAN BLACKSMITH.

Mix the bronze for striping purposes in two parts pale drying japan and one part elastic finishing varnish. To perfectly remove the verdigris solution, which is a characteristic of gold bronze, first mix up about the quantity of bronze desired for use with turpentine and stand aside. In a few hours a strong percentage of the verdigris will float to the top and may be poured off with the turpentine. Again pour on a fresh supply of turpentine, and when more verdigris appears empty the fluid.

This will give the bronze when mixed with the japan and varnish a cleaner, brighter lustre and increase its durability. Mix only as fast as needed, as when newly mixed it works better. In using, keep the pencil washed out in turpentine so that no gumming accumulations get into the "heel" of the pencil to injure its elasticity. Keep the palette clean, and if the gold is inclined to show laps where a fresh filling of the pencil lays onto the line previously drawn, add a trifle of flake white to the gold. A little practice will enable Mr. Tapscott to stripe with the bronze as nicely as with ordinary paint, and as easily. M. C. HILLICK.

Shoeing Special Cases—For contracted feet, the first thing to do is to get the feet soft and keep them so, to get rid of the fever which is in the feet, for I have never found a contracted foot but what there was more or less fever in it. Poultice the feet with hot bran, scalded with hot or boiling water. If you have nothing better, cut off an old pair of overalls at the knee, sew them up at the bottom and when the bran is cool enough, so that you can put it in the sack with your hand, put it in the sack, place the horse's foot in the same and tie on at the fetlock, or just above the foot. Leave it on until the foot begins to look white below the hair. After the foot is softened, fit the shoe close around the heel and pare the feet as low as possible at the heel as well as the toe. Then bevel the shoe at the heel, so the hoof will have a tendency to slip off the shoe at the heels. As perhaps the above is not plain I will try to make it a little plainer. Make the shoes a good deal thinner on the outside that comes in contact with the bottom of the hoof, and you will have excellent results if you will keep it up long enough. Shoe the horse in this way every time and if the feet begin to get hard, soften them up again.

Hitching or hopping behind with one leg is another puzzler. I have shod that kind of a horse in every possible way I have heard of, but without any good results. I was at Leland Stanford's farm in '87, and went into his blacksmith shop. He had his own shop, and always kept the best horseshoers he could find. While I was there they were shoeing some colts, and I noticed that they were shoeing one colt behind on one foot with a full shoe and on the other with a half shoe. The half was on the outside of the hind foot, and I asked the blacksmith why he did not put on a full shoe on that foot as he did on the other. He told me he was a hitcher or hopper, and that the method he used never fails, and that he placed the half-shoe on the foot with which he hopped. I felt more than repaid for going, and was in a great hurry to return home, as there were two horses which I was shoeing which were valuable before they commenced hopping. I had used all kinds of methods, but could not help them at all. As soon as I arrived I went to see my customers with the hopping horses, and told them to get them to the shop as soon as possible, for I had found the medicine for them at last. So I put on my half-shoe and I said to them, "you can't make them hop now," and I was sincere, for I got the remedy right at headquarters. So after I shod them, I went down the road to see them go level for the first time since they were four years old, and this was two years later, but to my sad disappointment they hopped as badly as ever, and I haven't been back to Stanford's farm since for pointers. Now when a customer tells me that his horse hops when he tries to speed him and asks me what to do for it, I tell him to trade him off and let the other fellow find the remedy, but if any brother smith can tell me a way to shoe him so he will not hop, I will be very glad to hear from him. I have a horse of my own that is a bad hopper. He can go at a three-minute gait, but could go much faster if it wasn't for that hitching. You might want to know his age before you could prescribe for him. He is eighteen years old, sixteen hands high and weighs 1225 pounds.

Wishing THE AMERICAN BLACKSMITH a prosperous year, and hoping for a speedy reply that will solve this troublesome problem and give my horse a normal gait, I remain, N. T. OUTWATERS.

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The Village Smithy.

The Village Smithy, mailed with our April issue, has excited any amount of favorable criticism and praise. We feel much gratified in having been able to reproduce this excellent painting for the benefit of our friends. Let us hear from you what you think about it. Copies of the picture will be sent free to all new subscribers while the edition remains unexhausted.

Foreign Subscriptions.

For the benefit of our subscribers in England, it is our desire to state that at the present time we have no subscription agent there. All subscriptions should be sent direct to us, Post Office Drawer 974, Buffalo, N. Y., U. S. A., by International Money Order. Price for English subscriptions, five shillings per year.

A New Series of Articles for the Carriage Painter.

We have been particularly fortunate in securing for our readers of the carriage painting craft a new series of articles by Mr. M. C. Hillick. Speaking of this writer, our esteemed contemporary, The Western Painter, says: "He is acknowledged to be the highest authority in America" upon all topics relating to the paint shop.

Mr. Hillick's peculiar ease and clearness of style, and his intimate knowledge of his craft and his delight in it, adds a charm to his contributions that cannot fail to awaken the interest of even the most casual readers. The present issue contains the second article of the series. The set when complete will constitute a text-book upon carriage painting that no painter can afford to be without.

A Year in Our New Quarters.

One year ago we changed our office location to the Holland Building, 451-453 Washington street, Buffalo. Our present quarters have proved extremely well adapted to our purposes, and with plenty of room and light, have facilitated the publication and distribution of the large edition of The American Blacksmith, of never less than 25,000 copies monthly. The growth of the paper, both along advertising and subscription lines, has been steady and uniform during this time. We have now to announce a great enlargement and improvement in our printing establishment, so that the printing of The American Blacksmith can now be done more quickly and to better advantage in every way. It will mean improved service for our readers. We should be pleased to have any of our friends call when in the city.

Our Blacksmith Directory.

The directory of blacksmiths in the United States and Canada, which is on file in our office, is the most complete of its kind in existence, but it is our desire to still further extend it, and we are going to ask the aid of our friends throughout the country to make our lists still fuller. We wish to secure the name and address of every blacksmith, wheelwright, horseshoer and wagon builder in this country, and to this end make the following offer as an inducement: To any one who will mail us the names and addresses of twenty-five live blacksmiths or carriage builders, doing business at the present time, we will send a copy of our "Village Smithy" picture, charges prepaid. This is an excellent opportunity to obtain a copy, or an extra copy, of this fine picture for a very slight effort. Write the names and addresses clearly, and forward to us as soon as possible.

Subscription Prize Award.

The contest for the prize offered the person sending us the largest number of subscribers closed May 1st, and the notice of the award will be made in the June issue. The contest was a very vigorous one. Like all others of the kind conducted by The American Blacksmith, everyone who competes receives a reward, even if failing to win the first prize.

A New and Interesting Serial.

With this May number is commenced a series of articles on mechanical drawing. Each succeeding issue will contain an illustrated article on this topic until the series is completed.

In days gone by the blacksmith was able to plod along without a knowledge of drawing, for the reason that he was seldom called upon to make a forging from a drawing himself. But all this is changed. The smith who desires to keep up with the times must be able to interpret drawings, to calculate stock and to make a forging from any drawing whatever, for he never knows at what moment such knowledge may be called for.

These articles are especially compiled from the very highest authorities on mechanical drawing both theoretical and practical, and have been especially adapted for the needs of the blacksmith. The aim of the author has been to set forth in a clear, simple style, the knowledge necessary to the blacksmith upon this subject. All unpractical or unnecessary information is carefully excluded. Just a plain, matter-of-fact treatise on the elementary principles of mechanical drawing, exactly the thing our people need to enable them to make and read mechanical sketches.

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While all fancy matter is left for the advanced student of drawing—the engineer, the mechanic and the professional draughtsman—this series will be found an excellent foundation upon which to start a subsequent course in mechanical drawing. Every prospective student, every engineer and mechanic, as well as the blacksmith himself, will be benefited by a close study of the present series.

A Striking Piece of Wrought Iron.

The American Eagle is a particularly obliging subject for adaptation to different decorative designs. The fact of the eagle's being our national emblem adds a dignity and an official air to a design embracing it, which strongly appeals to the patriotic American. Hence, for an ornamental piece destined to grace a public building, or a place of learning, no better subject could be chosen.

The accompanying engraving is taken from a photograph sent us by Mr. A. J. Jorss, Ornamental Iron Works, Washington, D. C., showing a very handsome wrought iron door grille, which was made by him for the Georgetown University, Georgetown, D. C. This grille is certainly a very striking and beautiful piece of ornamental iron work, and indicates some of the possibilities along such lines.

Blacksmithing at the Roycroft.

Of the Roycrofters and Mr. Elbert Hubbard so much has recently been said, that it is scarcely necessary to go into details of introduction.

The town of East Aurora, some eighteen miles southeast of Buffalo, is remarkable for nothing in itself, but it has become widely famed as the home of this unique institution. The Roycrofters take unto themselves the credit of having transformed the place from an unkempt, ne'er-do-well country town, where hoodlumism reigned supreme, to an orderly, up-to-date spot—quite a model town in its way.

In 1895, the Roycroft establishment was founded, when Mr. Hubbard, unable to persuade an editor to publish his written ideas, decided to set up a printing plant and print them himself. So the "Philistine" was started. The little periodical gained a following of admirers, and so many volumes were returned for binding that a bindery was opened up on the premises. In due time, publishing of books was undertaken. The shop was too small, so the enthusiastic workers built them a fine edifice from the cast-away "nigger-heads" of the surrounding farms. The shop, of course, needed furniture, so they set about making furniture, and the result was so good that the furniture-making department became permanent.

A peculiar code of rules has the Roycroft. In fact, the rules are scarcely rules at all, according to popular ideas of rules. Every worker is given the work he fancies and encouraged to cultivate his talent and skill in that particular line. At the same time he is encouraged to practice other

A STRIKING DESIGN FOR A WROUGHT IRON GRILLE.

branches, in order that he may find rest in change of employment. The shop is made as thoroughly attractive as possible. An artistic atmosphere pervades the place. Flowers, art and music are on hand at every turn. Concerts, lectures and dances are held for the employes weekly, and classes in singing, painting, sculpture, literature, history and bookkeeping are given. Whether the plan has been a successful one or not, can only be surmised. In order to utilize the services of the old people who have sought employment in the shop, new branches of work have been started, such as the weaving of artistic rag mats for sale.

To the casual observer, the buildings present the appearance of a church or charitable institution, but the Roycroft is nothing of the kind. It is a large and suc[illegible] money-making scheme, on the [illegible]e plan. The employes are helped and encouraged to yield their best—not forced, but attracted [illegible]and are given the best in return. [illegible]heir wages are good and their accomm odation very good.

To the outsider, the Roycroft sometimes seems like a new Utopia. But there is no place there for idlers. Earnest workers are always welcome, although home-talent is preferred and people from a distance are not encouraged to come.

A notable principle of the institution is that all the experts now employed in the shop came in untrained, receiving their training in experience, and by contact with examples of high-class work. There is just one exception to this rule, viz.: The master bookbinder, Louis Kinder, is a German of great skill in his art, and trained in the Old Country.

The name "Roycroft" is of double origin. First, it comes from the name of the Roycrofts, who were printers to the King of England, between the years 1650 and 1690, and who did very excellent work of the mediæval style, followed by their namesakes. Secondly, the name signifies kingly craft or kingly work—that is, work of the highest grade, fit for a king. And this latter meaning is carried into the work in every branch. "Not the cheapest but the best" is the Roycroft motto. Their furniture is hand-made, solid, substantial and homely. Their books are hand-made, and although a little volume of Shakespeare sometimes sells for one hundred dollars, the cost, considering the materials and workmanship of the book, is small to those who can afford it.

In a plant of the kind, where some three hundred workers are employed, there are necessarily a great many running repairs, which keep a carpenter-shop and a blacksmithing department fairly busy. However, in the latter, they find time to make for sale, such articles as andirons, lamps, tree-boxes, umbrella-holders, jardinieres, and other ornamental pieces. The work in this line, as in every other, savors of the antique. "Art," says Mr. Hubbard, "is the expression of the workman's pleasure in his work." Everything about the chandeliers, even to the chains, is made by hand. The finishing of the furniture is also wrought iron, as is everything made in the shop. Even the hinges on the book-cases, boxes and chests are all of different, original designs, carefully selected. The best materials are used in this, as in every department, and all but the best workmanship is discarded.

The blacksmith shop is a Gothic structure, forty feet long by twenty feet wide. The walls are two feet

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thick, veneered inside with brick. A wainscoting extends four feet from the floor, which is of earth, and the upper portion of the walls is plastered. There are two forges in the shop. The blast is furnished by a blower run by a 5-horsepower engine. The equipment is very complete. The swages, for instance, range from ¼ to 3¼ inches, top and bottom. A lathe, a drill-press, and an emery-wheel, all of modern design, are also in use.

The accompanying engraving is from a photograph of the blacksmith shop. The artistic element, fostered everywhere at the Roycroft, is dominant in this quaint, picturesque edifice The rough, uncut boulders lend a unique effect.

EXTERIOR VIEW OF THE BLACKSMITH SHOP AT THE ROYCROFT.

Some Qualifications of the Ship Smith.

W. L. PAUL.

Ship smithing is quite different from most other smith work, requiring a man of long experience and a good designer. I have not been able to find a machine that would be practical in a ship smith shop. Everything has to be made to order, and in doing hundreds of jobs of the same nature, no two of them will be the same size. For instance, take an anchor. One man will want his made of ⅝-inch round stock, another will want his of 6/8-inch, and so on until it reaches as high as 2½ or 3 inches in diameter. And so it is with all other work. The work must correspond with the boat, so that the range is from the small row boat to the large vessel.

Hints and Suggestions on the Proper Use of Files.—2.*

Height of Work.

Various ideas very naturally exist amongst mechanics as to the height at which the jaws of the vise should be set from the floor for use in filing. This arises largely, no doubt, from the varied nature of the work upon which the advocates of the different ideas have been accustomed to operate.

For filing general work the top of the vise jaws should be placed so as to be level with the elbow of the workman, which will be found to range from 40 to 44 inches from the floor—therefore, 42 inches may be considered as an average height, best suited for all heights of workmen, when the vise is to be permanently fixed. This position enables the workman to get the full, free swing of his arms from the shoulder; the separate movement of the wrist and elbow should be done away with as much as possible.

If the work to be filed is small and delicate, requiring simply a movement of the arms, or of one hand and arm alone, the vise should be higher, not only in order that the workman may more closely scrutinize the work, but that he may be able to stand more erect.

If the work to be filed is heavy and massive, requiring great muscular effort, its surface should be below the elbow joint, as the operator stands farther from his work with his feet separated from 10 to 30 inches, one in advance of the other, and his knees somewhat bent, thus lowering his stature; besides, in this class of work, it is desirable to throw the weight of the body upon the file to make it penetrate, and thus, with a comparative fixedness of the arms, to depend largely upon the momentum of the body to shove the file.

It will therefore be seen that in fixing the height of the vise the nature of the work and the stature of the operator should be considered, if it is deemed necessary to apply the principle correctly.

Grasping the File.

In using the larger files, intended to be operated by both hands, the handle should be grasped in such a manner that its end will fit into and bring up against the fleshy part of the palm below the joint of the little finger, with the thumb lying along the *top* of the handle in the direction of its length; the ends of the fingers pointing upwards or nearly in the direction of the operator's face.

The point of the file should be grasped by the thumb and first two

* From "File Filosophy" by courtesy of the Nicholson File Company, Providence, R. I.

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fingers, the hand being so held as to bring the thumb, as its ball presses upon the top of the file, in a line with the handle when heavy strokes are required. When a light stroke is wanted, and the pressure demanded becomes less, the thumb and fingers may change their direction until the thumb lies at a right angle, or nearly so, with the length of the file; the positions changing more or less, as may be needed to increase the downward pressure.

In holding the file with one hand, as is often necessary in filing light work, pins, etc., the handle should be grasped as already described, with the exception that the hand should be turned a quarter turn, bringing the forefinger on top and lying along the handle nearly in the direction of its length. In this position, the freest action of the hand and wrist may be had upon light work.

Amateurs will find that by following these directions, the movements of the file will be simplified and made somewhat easier than if grasped at random and without consideration.

Carrying the File.

The most natural movement of the hands and arms in filing is to carry the file in circular lines, the several joints of the limbs being the centres of motion; this movement of a convex file would apparently give a concavity to the work, but the real tendency, especially on narrow work, is the reverse, owing to the work acting as a fulcrum over which the file moves with more or less of a rocking motion, giving an actual convexity to its surface except when in the hands of a skillful operator. The real aim, therefore, should be to cause the file to depart only so much from a true right line as will be necessary to feel that each inch of its stroke is brought into exact contact with the desired portion of the work; and by

Fig. 5. THE PROPER USE OF FILES. A FILE CARD.

thus changing the course of the stroke slightly, thereby preventing "grooving," a more even surface results and the work is completed sooner.

The movements here referred to have reference to those in which both hands are used *upon flat work*, requiring nicety and trueness of finish, and the difficulties to be overcome in producing even a comparatively true flat surface with a file require much practice on the part of the operator.

In filing ovals and irregular forms, the movements, while not considered so difficult or trying, nevertheless require considerable experience and a good eye, so to blend the strokes of the file upon the round or curved surfaces as to give the best effect; the varied nature of the work upon this class of surfaces, though much might be said, prevents any detailed definition as to the movements of the file within the limit of this article.

In point of economy, the pressure on the file should be relieved during the back stroke; this will be apparent to anyone who will examine the formation of the points of the teeth very closely for direction, when it will be seen that the file can only *cut* during the ordinary or advancing stroke and that equal pressure during the back stroke must be very damaging to the points of the teeth.

Drawfiling.

Files are sometimes used by grasping at each end and moving them sidewise across the work, after the manner of using the spoke-shave. This operation is known as *drawfiling*, and is usually performed in laying the strokes of turned work lengthwise, instead of circular, as left from the lathe finish, as well as when giving a final fit to the shaft that is to receive a coupling: Cases, generally, in which no considerable amount of stock is to be removed, and thus any defects in the principle of construction or arrangement of the teeth of the file are not so readily apparent.

Files as they are ordinarily made are intended to cut when used with a *forward* stroke, and the same file cannot work smoothly or to the best advantage when moved sidewise, unless care is taken that the face of the teeth present themselves, during the forward movement of the file, at a sufficient angle to *cut*, instead of scratching the work. To accomplish this, the angle at which the file is held with respect to the line of its movement must vary with different files, depending upon the angle at which the *last* or *up cut* is made. The pressure should also be relieved during the back stroke, as in ordinary filing.

When properly used, work may be finished somewhat finer and the scratches more closely congregated than in the ordinary use of the same file, as in drawfiling, the teeth produce a shearing or shaving cut.

First Use of a File.

In economizing the wear of files intended for general purposes, consideration should be given to the kind of material to which they may be subjected in the different stages of their use.

In the ordinary use of the machine shop, the first wear of these files should be in finishing the large surfaces of cast iron, bronze or brass metals, all of which require a keen cutting tooth; they may then be made to do good execution upon the narrower surfaces of these metals, and also upon wrought iron and soft steel, as a file that has been used more or less upon this kind of work will not

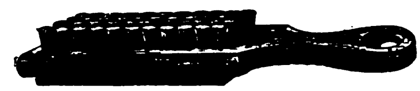

Fig. 6. THE PROPER USE OF FILES. A FILE BRUSH.

tear the surface of these metals and will consequently do more effective work. To obtain the best results, the file suited for general purposes is not so well adapted to filing brass or other similar soft metals as those whose teeth are arranged for this purpose.

New files, particularly double cuts, are severely worn down by use upon narrow surfaces, as the strain comes wholly upon a few teeth and frequently breaks them.

Preparing Work.

The corners or thin edges of iron castings are very likely to become chilled, and a thin scale or skin produced over the entire surface of the casting, caused by the hot metal coming in contact with the moist sand of the foundry moulds; this outer skin is usually much harder than the metal beneath it, and many times the thin edges or corners are chilled so as to be harder even than the file itself.

The necessity, therefore, of removing this scale and chilled surface becomes readily apparent, and all mechanics who give any consideration to the proper and economical use of the file will be careful to see that the scale and sand are first removed by pickling, and the surfaces which have become chilled by grinding, before applying the file.

If it is impossible or impracticable to remove the scale by pickling, a file that has been used until it is too dull for narrow steel work may be employed; the teeth will then not be broken by the hard scale.

Pickling the Work.

The pickle for gray iron castings is generally made by mixing sulphuric acid and water, in the proportion of two or more parts of water to one of acid, and is usually kept for this purpose in a trough lined with lead.

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The articles to be pickled are sometimes immersed in this bath, where they are allowed to remain for a short time; they are then removed and the acid is allowed to act upon their surfaces until the scale has loosened, when they are washed off with water. More often, however, the pickle is dipped from the trough and poured over the castings, which are placed on a sloping platform (thus allowing the acid to return to the trough), where, after remaining for a sufficient time, they are washed. When dry, the castings are either rattled or scraped and cleaned with old files and wire scratch-brushes until the surface is freed from scale and sand.

To pickle brass or gun-metal castings, a mixture of nitric acid and water may be used, in the proportion of, say, one part acid to five of water; the treatment being the same as that of the iron castings. While not in general use upon the coarser kinds of brass work, the pickle is desirable for smaller castings or those requiring to be protected with lacquer.

When Oil Should Not be Used.

All files, when they leave the manufactory, are covered with oil to prevent them from rusting. While this is not objectionable for many uses to which the file is put, there are cases where the oil should be thoroughly removed, as when the file is to be used in finishing the larger cast iron surfaces, which are of a glassy nature; the principal difficulty being to make the file "bite," or keep sufficiently under the surface to prevent glazing; otherwise the action not only hardens or burnishes the surface operated upon, but dulls the extreme points of the teeth, thus working against the desired end in both particulars.

When Oil May be Used.

Oil may, however, be used to good advantage on new files which are put immediately to work upon narrow, fibrous metals of a harder nature; in such cases it is not uncommon, with good workmen, to fill the teeth with oil and chalk.

Oil is also useful on fine files in the finishing of wrought iron or steel, as, by its use, the teeth will not penetrate to the same degree, and the disposition to "pin" and scratch the work is materially less than when used dry.

Cleaning the File.

The dust and small particles removed from the material operated upon are always more or less liable to clog and fill the teeth. This tendency is especially aggravated when the file is used upon wood, horn, and such other materials as, upon being mixed with the oil in the teeth, become baked when dry, and thus prevent the teeth from penetrating the work as well as give them the appearance of being worn and tend to injure them by rust.

It therefore becomes necessary that the file should be cleaned not only at intervals during its use, but carefully before being laid aside, if the best results are to be attained.

This cleaning is done in several ways: Sometimes, in the finer files, by rubbing the hand over them, or by drawing them across the apron of the workman; in others, by striking their edge upon the bench or vise; and again (which is a more common method with the large files), by the use of a strip of old or worn out card clothing, tacked to a piece of wood having a handle shape at one end—a device which is usually rudely constructed by the operator.

The file card and file brush, illustrated above, will be found excellent tools, and master mechanics should see that every file-user in their employ is furnished with one or the other of these, and insist that they be used, if they deem it desirable to economize in the wear of their files.

In removing oil from the teeth of a new file, a ready way is to rub chalk or charcoal across the teeth and brush thoroughly. By repeating the operation a few times, the oil will be entirely absorbed and the file will be in the best possible condition for use upon cast iron.

When the teeth of files are clogged with wood, or other soft substance which has become baked into them, if the file is held in boiling hot water for a few moments, the imbedded substance becomes so loosened that it may easily be carded out of the teeth. If the operation be quickly performed, any moisture remaining will be readily evaporated by the heat retained in the file and so avoid harm to the files.

To yield the best results, any file must be kept clean. To this end the practised operator will find no trouble in carrying out the foregoing instructions.

Care in Putting Away.

One of the most destructive customs among a large number of mechanics of the present day is that of loosely throwing their files, fine and coarse, small and large, into a drawer filled with cold chisels, hammers, turning tools, etc., and then throwing the chisels, hammers and other tools on to the files.

Now when we consider how small a portion of the points of the teeth is worn off by extreme wear when the file is properly used, but that to effectually dull them for some kinds of work requires but slight knocking upon a hard substance, it will be easily seen that the evils of this habit should be more carefully considered by the master mechanic, and suitable provision made to avoid its destructive tendencies.

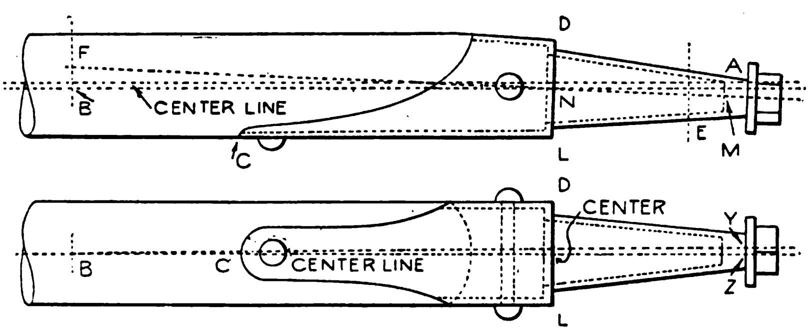
(The end.)

How to Set Wagon Skeins.

GEO. W. HOPKINS.

A wheel, to run with the least friction, should stand on a plumb spoke, that is, the face side of spoke from the hub to the ground should be perpendicular to the axle, and to have it so each skein must be set according to the dish of the wheel.

Referring to the upper figure to get the length of the axle, find the length of the skein from C to A, or length



A SUCCESSFUL MODE OF SETTING WAGON SKEINS.

from inside of front end to back end, in this case twenty-two inches. Next the length from C to D, or from the back end to the shoulder, say twelve inches, and then from the back end of hub or shoulder of skein to face of spoke, as D to E, six inches. Now for a track of four feet eight inches, which means four feet eight inches from face of one wheel to face of other, we have eighteen inches from face of spoke to back end of skein on one side, or thirty-six on both sides, which leaves one foot and eight inches between the skeins.

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To get the pitch of the arm, first make the axle stick straight and square on the bottom and front sides, and get the diameter of inside of skein at the shoulder. Draw A H parallel to bottom of axle, and $\frac{1}{2}$-inch below the center line. From N, measure back on line A H one-half the diameter of wheel, giving point B, and then from point B measure the dish of wheel up to F.

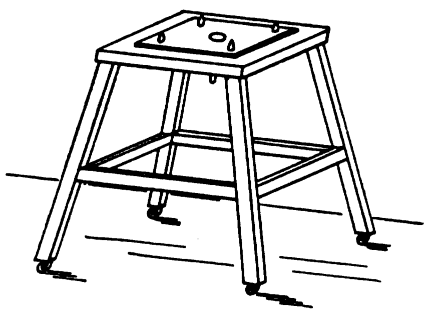

Fig. 5. BODY TRESTLE FOR THE CARRIAGE PAINT SHOP.

From F, draw the line FNM, M being the center from which to lay off size of inside diameter of skein. The inside skein diameter at the shoulder is laid off at N.

To get dish of a wheel, lay a straight edge across the face of the wheel, close to hub, and the distance from straight edge to face of spoke at the hub will be the dish, when the face of the spoke is flush with the rim. When the rim projects beyond the spoke, measure from straight edge to face of spoke at the rim, also at the hub, and the difference between them will be the dish of the wheel.

Referring to the lower figure, to get the gather draw a line through the

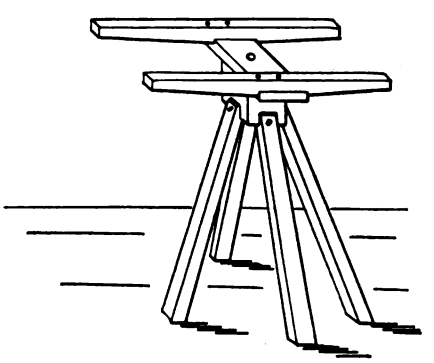

Fig. 6. COMBINATION BODY AND GEAR TRESTLE.

center of bottom as HY, and at Y measure one-fourth of an inch in front of line to get the center point of the arm, which gives the point Z. Now where BZ crosses DL is the center of the back end, from which center lay off the proper skein diameter.

A knowledge of the general construction and parts of a wheel is indispensable to every carriage repair man, as is likewise a knowledge of how to set wagon skeins. The above is a very convenient method and with a little practice will be found quite simple.

Talks to the Jobbing Shop Painter—2.

M. C. HILLICK.

Probably the most indispensable labor-saving device about the paint shop is the revolving body trestle, as shown in Fig. 5.

This trestle, while similar to those published in various magazines, is different in that the standards are fitted flush with the outer edge of the top frame, thus making it a stronger trestle. Height of trestle is a matter of individual preference, as are also the other dimensions. The lighter the material, without sacrificing requisite strength, the better. Fig. 6 shows a combination body and gear trestle. It is another device which the jobbing shop painter cannot afford to do without. It is made on heavier lines than that shown in Fig. 5, as it is supposed to carry the heaviest running parts, if

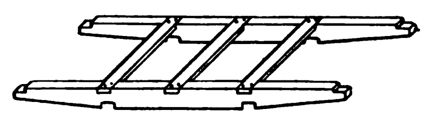

Fig. 7. GEAR FRAME TO BE USED UPON REVOLVING TRESTLE.

necessary. Make the trestle of hardwood and bolt all parts together, revolving frame pieces and standards 2 by 2 inches. Make the revolving frame 28 inches long. The bed piece supporting the frame, and to which the standards are bolted, is 5 by 5 inches and 10 inches long. As shown, the trestle is ready to handle bodies upon.

In Fig. 7 is the gear frame which fits onto the trestle, making it a revolving frame for holding carriage running parts during the process of painting, striping and varnishing. Make the frame 4 feet, 6 inches long and 14 inches wide. The illustration quite clearly explains how the frame is made. Fig. 8 shows a seat-frame made of light, 1-inch material. Make it 2 feet long, 9 inches high at rear, 2 inches at front and $13\frac{1}{2}$ inches wide, to fit the revolving trestle seen in Fig. 6.

The chief advantage to be gained from the use of these revolving trestles, is that the workman is always able to command the best light the shop contains. By choosing the window affording the best and easiest light to work by, and operating the revolving trestle, the carriage may be painted, striped, varnished, in fact, finished throughout, with no extra strain upon the nerves or eyesight.

(To be continued.)

The Elementary Principles of Mechanical Drawing.—1.

General Hints.—Instruments and Their Use.

Even the most unpretentious mechanic has, at times, occasion to make a sketch of a tool or device in his shop, or to refer to the sketches made by

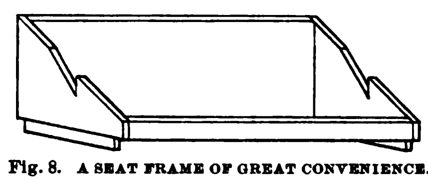

Fig. 8. A SEAT FRAME OF GREAT CONVENIENCE.

other mechanics. It is, therefore, of the utmost importance that he should know at least something of the principles of mechanical drawing. To represent a tool in such a way that he will understand it perfectly himself is very easy, although no workman-like mechanic should be satisfied with turning out crude drawings that a school-boy would scorn to own. But it is another matter to represent things in such a way that his brother mechanics may understand them as clearly as he himself does. To do this, some knowledge of the way in which it is usual to represent objects and the technical devices employed by draughtsmen is indispensable. Thus, the surfaces, intersections, elevations and depressions may be accurately represented. Each view shows something—means something. Again, in a tool composed of wood and two or three kinds of metals, the different materials may be indicated in the drawing by differently arranged lines. Colors, textures and other qualities not capable of being rendered in outline and shading may be represented in like manner. Also, cer-

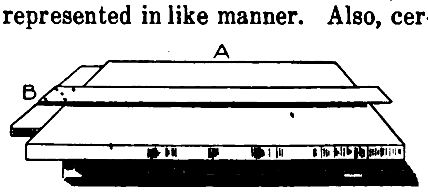

Fig. 1. A USEFUL FORM OF BOARD FOR MECHANICAL DRAWING.

tain fixed rules have been established relating to shading, perspective and other points, all of which, though seemingly trivial, serve their ends in making the drawing more intelligible.

The instruments for ordinary mechanical drawing are few and simple. The first requisite is a board of pine, or other wood, soft enough to admit of

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pressing tacks into it with the fingers, and it must be of a size to accommodate the largest piece of paper which will be used. In making a drawing-board, the best way to secure the proper shape (which must be a true rectangle), is to make the two longer sides parallel, and then to mark off the ends at right angles by means of a square. The surface must be absolutely smooth and level. Pieces may be fastened to the bottom of the board parallel with the ends to rest it upon. They should be made short enough to insure against their protruding, should the board shrink. Fig. 1, A, shows a convenient style of drawing-board. Boards are often made with narrow side pieces at the right and left-hand sides, with their grain running at right angles to that of the board. The tacks for holding the paper in place should be small and flat, to avoid getting in the way. The paper is most conveniently placed at the left side of the board. Again it must be impressed that the board should be absolutely level, in order that the paper may lie flat.

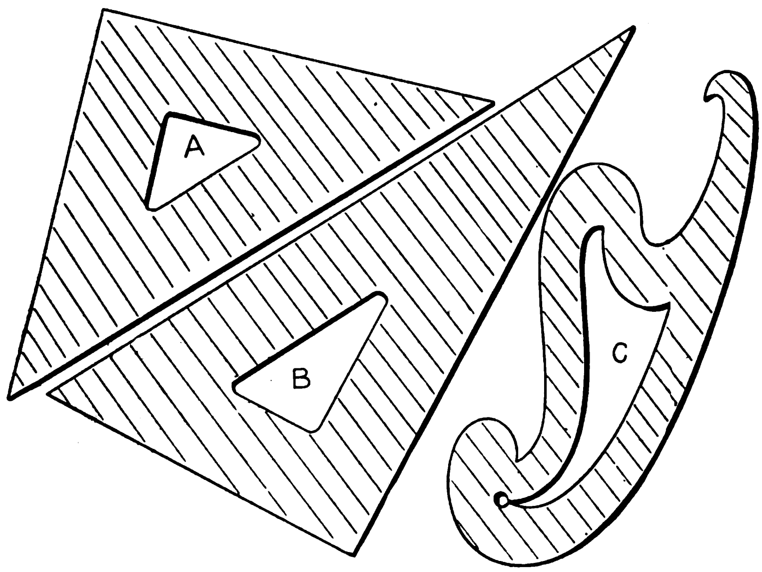

Fig. 2. TRIANGLES AND VARIABLE CURVE USED IN ELEMENTARY DRAWING.

The next thing required is a T-square (Fig. 1, B). consisting of a cross-piece with a "blade" fastened at right angles to it. The cross-piece of the T-square fits down over the edge of the board, so that the blade rests upon it at right angles without possibility of slipping or inaccuracy. Thus, parallel lines may be secured. A good scale is the next thing. There are many kinds; the triangular, which brings the numbered edge nearest to the paper to be measured, is perhaps the best. Next, a couple of triangles are needed. These may be either of wood or hard rubber. Both these should be right-angled triangles, one with two angles of 45 degrees each; the other with one angle of 30 degrees and one of 60 degrees. In Fig. 2, A and B, are shown the necessary forms of triangles. These two will answer ordinary purposes. A variable curve comes next on the list, (See Fig. 2, C). This, too, may be of wood or of hard rubber. It is used to secure free, regular lines in curves which are neither circles nor arcs of circles and hence cannot be made with compasses. A pair of compasses, like those shown in Fig. 3, B, a soft rubber and a good, hard pencil are necessary. The compasses are made so that either a pencil or pen piece may be attached on one arm. Make the lines light and use the soft rubber in case of error, so that the surface of the paper may not be roughened in erasing, for whenever the surface is disturbed the paper is liable to become soiled. When ink is used it will run on these spots, unless the roughness be first packed down by rubbing with a clean ivory knife or pen-handle. The pencil may be sharpened either to a chisel point or a round point—the latter offers the advantage that the draughtsman can keep the point in view as the line advances and see where it is going.

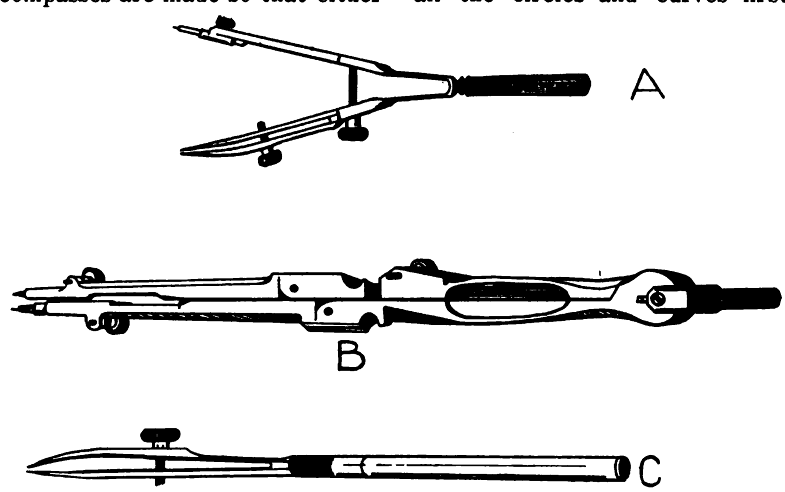

Fig. 3. ORDINARY INSTRUMENTS FOR USE IN MECHANICAL DRAWING.

For ordinary shop work, pencil drawings are the simplest and most convenient to make, but where a higher class of work is required, they must be done in ink. India ink, which does not corrode the instruments—Higgins' is good—should be used. Two special pens will be needed—a right line pen (see Fig. 3, C), and a small bow-pen (Fig. 3, A). The latter is intended for circles smaller than the compasses can well make, and is not absolutely essential. When the spring has been regulated to produce the width of line required, the pen is filled from the "filler" and held almost vertically. The lines should be drawn from left to right, or from bottom to top (away from the operator). In using the variable curve, have the line on the side of the curve farthest from the eye wherever possible, and keep the pen vertical as for straight lines.

It is an essential of ink-drawings to have the lines clean and sharp and the corners sharply defined. The whole drawing should be made first lightly in pencil complete. When the pencil draft is finished in its final form, it may be inked in. In doing this, put in all the circles and curves first, the straight lines afterwards. The horizontal lines can be put in proceeding from the top of the drawing to the bottom; then the vertical lines, working from left to right. Do as little erasing as possible, and that with a sharp, hard ink eraser that will take off only the line required to be removed,

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for every erased spot tends to diminish the strength and clearness of the whole. Finally, when the lines have been inked in, clean the drawing with a very soft rubber, or, better still, with a piece of fresh bread. The latter does not affect

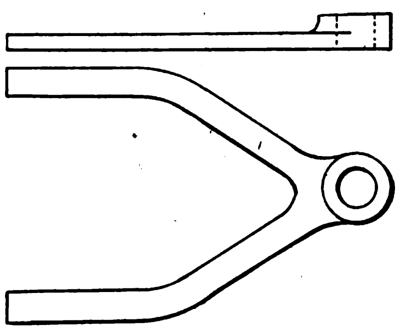

Fig. 1. A SOUND FORM OF V-HANGER.

the ink lines in the slightest degree, where even the softest rubber blurs them a little, and the bread does not soil the paper.

In selecting drawing instruments, this should always be borne in mind: Unless the instruments are really first class, they are no good at all; and it is far better to have one or two good tools than a whole outfit of worthless ones.

(To be continued.)

To Forge V-Hangers.

J. BRINDLEY.

The following example of die forging may be of some service to a portion of the craft. Particularly those interested in the cheap and quick production of a sound, but intricate article. It is the practice in most shops, when making these and similar articles, to first bend a ring or collar, weld and scarf it, then weld the legs in their respective positions; but where a steam hammer is available, and the quantity of articles to be made will pay for preparing the necessary tools, the following illustrated method will be found a decided advantage:

I first cut off my stock for the legs, allowing about two inches for upsetting in the following manner (a method, by the way, capable of wide application, but by no means in general use). Place a quantity of the ends in the fire, or furnace, to get hot, five inches; when a bright orange heat, I take two out and cool two inches in water. I then bend them into the shape, as seen by Fig. 3, A. Place them on the steel tool, Fig. 3, A, while the bar is in its proper position. A few very light blows under the hammer, or one stroke under the hydraulic press, will cause the extra stock to form a swell, some three or four inches from the end, a point very important in the subsequent operation. A few blows with a hand-hammer on the end of the bar will force it out of position and liberate the compressed stock. I find this a much easier and quicker way than holding my stock endways and jumping with sledges.

I next place the hammer dies (see Fig. 3, B), in the 10-cwt. hammer, the top block being an exact counterpart, and the two semi-circles forming one complete circle. In the plain part of the block, I draw a small bloom down to about 4 inches by 1½ inches, by any length. Then hold it edgeways over the horn-like projections. A rough piece, 4 inches diameter by 1½ inches thick, is quickly shaped. When I have made enough of these, I again change the blocks, or dies, for those seen by Figs. 3, C and D, and the recess seen in the center of Fig. 3, C, forms the boss of the V-hanger, while the general body of the

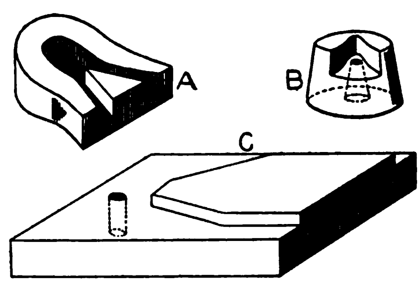

Fig. 2. TOOLS FOR FINAL SHAPING OF V-HANGERS.

article is shaped in the tool shown in Fig. 3, D (care must be taken in setting the dies, or the parts will be badly shaped). I next get the ends of two legs hot in the fire, to the upset portion, and one washer-piece, placing the former one in each recess of Fig. 3, D, the ends overlapping each other, and the washer on top of these directly under the recess in the top block. A few sharp blows will weld all together. It is necessary to have a little taper in the sides of the recess in the top block to prevent the hammer from lifting the forging with each blow. There will be a thin fin all round the center. This is readily removed by placing the loose block (Fig. 2, A), on the dies, and putting the V-hanger in the opposite way up. One light blow will cut it all clean off.

I then punch the hole through the center of the boss. To do this, I place the latter in a loose tool (Fig. 2, B,) and a small ring the same diameter as the outside of the boss on top, as a guide for the punch. A few sharp blows will cut a hole through. I next drive a barrel drift through, which both cleans and opens the hole as required. The welding, fraying, and punching, I complete at one heat.

To bend the legs on the block (Fig. 2, C,) is very simple. I place one leg on either side of the guide plate, and a suitable pin through the hole in the V-hanger and into the hole of the plate. When the legs are hammered home to the plate the article is complete.

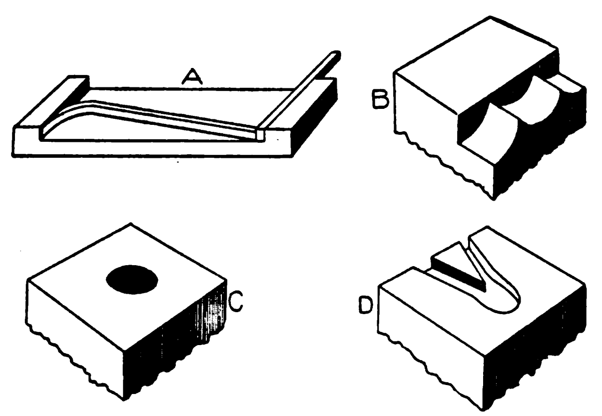

Fig. 3. A, UPSETTING STOCK FOR V-HANGERS. B, C AND D, HAMMER DIES USED IN THE OPERATION.

Welding Steel Axles.

BY G. W. R.

In welding steel axles, I heat and scarf them as I would any ordinary piece of iron, being careful to have the ends oval, so that the center of the lap will be the highest and will touch first when put together. Then heat till they look as if grease were running over them (what looks like grease is melted steel). Now they are ready to weld, and here comes the part of the weld where I believe some of my brother smiths make their failure. They strike straight down towards the anvil. Don't do that, for it breaks the iron apart that adhered when you placed the two melted ends together. Strike over the center of the scarf, holding your hammer so that the face will be parallel with the slant of the scarf, and work to the end of the scarf on the upper piece (which should extend a half-inch over the heel of the under scarf); turn and do the other side the same, still holding your hammer parallel with the scarf, only strike towards you instead of from you as at first. I use "Cherry Heat" for a flux.

The whole secret of the greater success ensured by following this method

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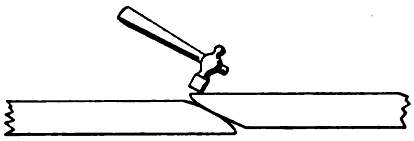
lies in the way of striking the scarf at the central point and having the face of the hammer parallel with the slant. You will be surprised at the difference this small point makes.



THE BEST METHOD OF WELDING STEEL AXLES.

Regarding a flux, almost every smith has his own ideas, and there are many good welding compounds; but I have found "Cherry Heat" very satisfactory myself. A little care at first in wielding the hammer, and practice will enable you to apply this principle with entire satisfaction.

A Useful Bolster Plate.

A. J. YEAGER.

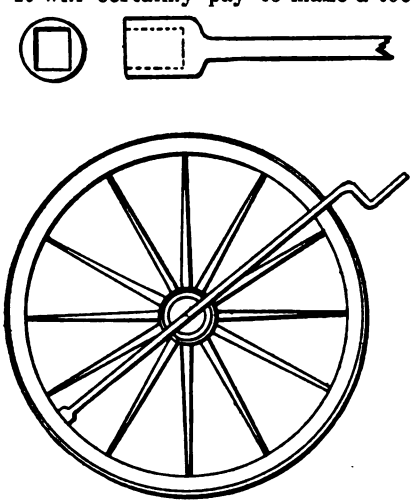
The following is a description of a bolster plate that can be used on nearly any kind of vehicle. What I mean is any ordinary buggy or light wagon, such as is the lot of most smiths to repair in small towns and cities. Take two pieces of, say 1½ by $\frac{5}{16}$-inch iron or tire steel, of any length you want the bearing. Drill a ⅝-inch hole through the center, and counter-sink the holes on one side quite deeply. Then put the smooth sides of the plates together, take a piece of good iron for a rivet that will fill the hole drilled through the center; heat it hot enough, rivet the plates together, so that the counter-sunks are full and smooth. Now put in the fire and heat hot enough to work loose, the same as you would a pair of tongs. Now drill your king bolt hole and your end holes and you will find that you have a bolster plate with a socket in the center that will hold. There is no wear on the king bolt and you cannot get it apart even if the king bolt does break. I find that this plate helps me repair a great many jobs that come to me all broken up and which are malleable iron fifth wheels, and to make the customer wait until you could find out where to get a duplicate fifth wheel for his buggy would surely lose you the job. I have served an apprenticeship of twenty-eight years behind the anvil and am just getting so that I can do some jobs right. I run a general jobbing shop and push the rubber tire business very strongly.

A Tool for Removing Tire Bolts.

A. BRUTON.

The following is a description of a very useful tool for removing tire bolt nuts, as well as for screwing them on, and it may be of use to someone having much of this kind of work to do: Take a rod of ⅝-inch iron, long enough to reach across the hind wheel of the buggy with eight or ten inches to spare. Upset one end and drill a hole endways into it large enough to admit a tire bolt and deep enough for the same purpose. After heating the end of the rod, screw it into a vise, and by means of a square punch square up the hole so as to form a socket wrench for the nut. Next make a crank on the other end to turn it with, and the result will be a tool such as shown in the illustration. I find it far more useful than an ordinary wrench, and with it can take off and put on three nuts to one with a wrench. Of course, if the bolt turns, you must use a holder to hold it tight, but often this tool is far more useful than a wrench.

It will certainly pay to make a tool



A USEFUL TIRE BOLT WRENCH.

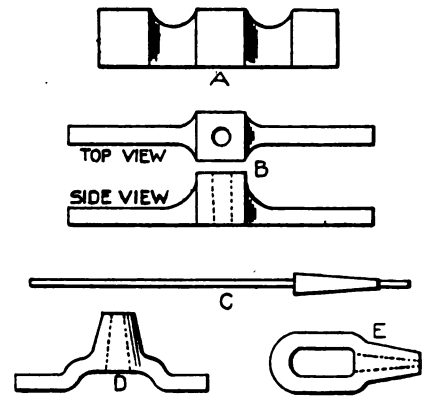
like this and you will be surprised how useful it really is after you have used it for a while.

Making Wire Rope Sockets With One Weld.

SUBSCRIBER.

The following way of making sockets for wire ropes is, to my mind, a quicker and easier way of forming such articles than any I have seen described before, and when completed it gives a more substantial socket:

Take a piece of square stock to begin with, and by means of a fuller, shape it as shown in the figure at A. Then draw each end down to the size wanted. B shows top and side views of the socket at this stage. I next punch a hole through the body, shown by dotted lines to admit a mandrel, C, which I think is best made with a key way. I next bend the rounded ends, taking care not to form any cold shut under the shanks. This can be avoided by making a goose-neck with the fuller over the horn of the anvil, as indicated at D. Next, place the mandrel in the hole and



METHOD OF FORGING A WIRE ROPE SOCKET.

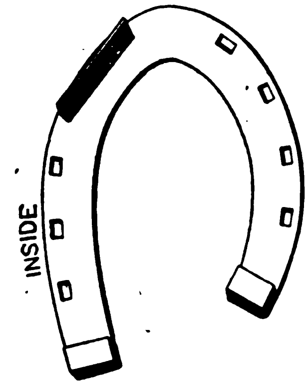
shape up the socket, which is best done in a tapered swage under a steam-hammer, or on a taper plate. When the body is finished, cut the rounded ends the proper size, bend and weld.

When the job is completed, you have a socket which will stand any strain which the wire will, and with but one weld in it.

A Hint on Interfering.

G. J. HUGHES.

With regard to shoeing interfering horses on the hind feet, I have used a certain shoe on the most chronic cases, with the result of stopping the trouble at the first shoeing. I first lower the hoof on the outside as much as it will reasonably stand, from the center of the toe to the back of the heel. Should the heel or outside of the hoof be too thin to stand paring, leather should be used on the inside. Let the inside of the heel of the shoe extend back ½ inch longer than on the outside on a straight



A VERY SATISFACTORY SHOE FOR INTERFERING.

line with the inside of the hoof (see sketch). The outside of the shoe is formed on a curve with the heel. Weld the toe calk of the shoe to the inside. This prevents the ankle from tipping in.

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Feci.*

EDNA MANNERS.

At his forge, grim and black, toiled the
smith all the day,
Where the setting sun found him still
working away.
All unheeded the hour though the daylight
waned fast
'Till the model he fashioned was finished
at last.
Then sang the proud spirit within the
smith's breast,
As he gathered his tools ere he lay down
to rest:
" It is mine! I have made it, and mine
was the thought;
From the dull, shapeless iron its form
I have wrought."

Alone at his easel the painter stood long
From the chimes of the matins till near
evensong,
And when twilight defied him his glances
he cast
Where the vision of years lay translated
at last.
As he fondled his tools in the deepening
night
He cried out in his heart with a wond'ring
delight:
" For the joy of mankind, out of chaos of
naught,
From the dull senseless palette this work
I have wrought."

The Creator looked down o'er a great
living world,
As through space on and onward the Uni-
verse hurled—
All mingling and changing and ever the
same
The races and ages they went and they
came,—
A million strands woven in one mighty
scheme —
A Universe finished, a work and a dream.
Then over the world passed the glad, silent
Thought:
"From the void, without tools, this great
work I have wrought."

*Written expressly for the May issue of THE AMERICAN BLACKSMITH.

HEATS SPARKS WELDS

A bright new summer season is at hand.

Ready for a busy season of wagon work?

Do you believe in craft organization and co-operation?

What has been your experience with rubber tire work? Profitable?

About time some of those backward customers were paying up.

Have the longer days brought a proportionate increase of work?

Before Investing in a new engine or tool of any kind it is wise to thoroughly sift and weigh the merits of the various makes. Remember also that first cost is not the only thing to be considered.

Now is the time to clean up the shop, make room for improvements, put in new tools.

The Editor of a paper having its readers' interests at heart always welcomes suggestions for improvement.

A favor to your brother smith—tell him the advantages of reading an up-to-date journal on blacksmithing.

Looking for new business chances and openings always, or are you letting your competitor get ahead of you?

Experience is the best teacher, said the unskilled horseshoer, after he had lamed a customer's horse. The owner did not agree.

Keep things in order. Do not waste your own and your customers' time in looking for tools that you could, with a little system, put your hands on directly.

Have you sent in a photograph of your shop? We are receiving pictures of every kind and description of establishment. Do not be left out of the contest.

The ten-cent customer of today may be the ten-dollar one of tomorrow. It pays to be attentive and painstaking on even the smallest job.

Additional blacksmith fires may shortly be installed by the International Harvester Company, Geo. L Rice, Deering Division, Hamilton, Ontario.

The slow and steady man has been aptly compared with the short arm of the lever—goes slowly, possesses more force, accomplishes greater things.

Have you done any special piece of work or come across any new kink lately that would interest brother craftsmen? Send it in. We can use it.

Never despise a bit of information because it comes from a humble source. Remember that the first idea of the mighty steam engine came from the lid of a tea-kettle. Keep on the alert.

Think not that the boy of great bulk and weight will make the best blacksmith's apprentice. Something besides brute force is necessary to ensure a successful mechanic—brains and energy.

Now is your time to obtain a working knowledge of mechanical drawing. Our series on this subject is specially prepared from the highest authorities, to fill the requirements of the practical blacksmith.

Knowledge of the first thing to be done in case of ordinary shop accidents will sometimes save a smith, or his helpers, suffering, money and even life. Some of our large manufactories, equipped with modern machinery, provide hospital facilities and train employees for emergencies.

The practical application of cast iron began when water-power superseded manual labor for blowing the bellows. Cannon balls were first cast from molds made of gypsum. In 1705 the first cast iron pipes were used for the water service of Versailles, followed by screwed and flanged pipes.

The outside appearance of the shop is of great importance. This it is which first impresses the customer. In building a new shop this should be borne in mind, and the design made as neat and pleasing as possible. If not building a new one, at least the old one may be kept in repair and neatly painted.

Everyday wheelwrights would probably shrink appalled from the task of constructing a coach like that built for Napoleon I. Its weight is about four tons. From the rims of the wheels to the roof of the body it is a mass of carving and gilding, and its embroidery and embossing outshines any circus chariot ever dreamed of, for gorgeousness.

The International Brotherhood of Blacksmiths have lately drawn up an "agreement" to hold between smiths and employees. One clause relates to apprentices, and states that every apprentice shall serve four years, after which he shall be rated a competent blacksmith and shall be given a letter of service from his employer. A very good system.

Odd customs prevail in different countries. A curious little horseshoe, a flat plate with raised rims, is used by the Turks. In Japan horses are backed into their stalls, the feed box being attached to the door. In China the men ride with their heels in the stirrups. In several uncivilized countries the horses are shod with leather shoes strapped on. In Naples none of the horses in public service are supplied with bits, but are guided by means of a brass band passing over the bridge of the nose. These are a few instances.

"The time is ripe for securing higher prices. I am located ten miles from the County seat in a thickly settled and well-to-do farming country with no shop nearer than seven miles, but the bad feature is that neighboring smiths will cut prices to get work, which I am willing they should have at the price they do work for. Four years ago I bought the place which was my father's stand when I was but a boy, and found the prices cut to pieces so one could not make a living. I at once raised them at the cost of half my trade but I soon got it all back. I am willing to raise again if I could get the best smiths of our County. Hence I am in favor of organization to secure better prices." So writes a good Iowa smith.

There's a reason for everything. Tom Tardy did not get his name for nothing. It suits him to a "T."

Yesterday morning, passing his shop at about a quarter to eight, we thought to drop in and exchange a few social words. A couple of horses were tied to the door, and when we came up the owner declared that Tom was not at home. He growled a bit and was just about to depart when there was a shuffling inside, the door opened a little way and Tom's head appeared in the aperature. "Wait a bit," he cried, but his would-be customer did not come back. Tom explained that the spring fever made him want to sleep late these mornings. He said he simply couldn't get up. "Well," he added, "I suppose that fellow's gone over to get Smith to shoe his horses. He must be in an awful hurry. I ain't no use fer them chaps as can't wait a minute fer nothin'."

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American Association of Blacksmiths, Horseshoers and Wheelwrights.

The work of the Association is now well under way, and encouraging reports of substantial progress are many, both from counties where organizations have been perfected and from those where the work is still proceeding. The reforms thus undertaken for the craft make the movement an ambitious one, requiring time to perfect, but already scores of smiths have received much benefit from that which the Association has done.

Let it be here remarked that this Association is an independent company, incorporated under New York State Laws, empowering it to undertake certain reforms for the good of the blacksmiths and wheelrights of this country, and also, among other things, to grant charters to local county associations. THE AMERICAN BLACKSMITH has, upon request, become the official organ of the movement, feeling in duty bound to uphold and advance any movement which will benefit the craft. Any statement that such local county associations cannot accomplish what they aim to, is absolutely disproved by the entirely successful associations, whose members are already organized under the plans of the American Association and enjoying the benefits obtained by standing together for their own interests. Organization is the order of the day, and the blacksmith feels the need of it as well as any other trade.

The Association will be glad to furnish full details of various successful county branches to interested smiths, who would like to see their own counties organized. Refer to the blank on page VI. A capable, energetic man in every county of the land will be needed to organize associations under our plans and guidance. The smiths of any county can thus form themselves into an association. Any who are interested in securing higher prices in their county and a Lien Law in their State should write to The American Association of Blacksmiths, Horseshoers and Wheelwrights, P.O. Drawer 974, Buffalo, N. Y., for plans and further details. Send us the name and address of every craftsman in your county that you know. The Association wishes to reach every live blacksmith, horseshoer and wheelwright in the country so as to awaken their interests and convince them if necessary of the need existing for co-operation among themselves.

The following complete schedule of prices just adopted and posted by the Orleans County (N. Y.) branch of the American Association may be of interest to readers. It is a minimum schedule, of course, and prices higher than listed may be charged:

HORSESHOEING.

Resetting shoes	$0.15
New shoes—No. 6 and under	.30
" " " 7 and over	.35
Bar shoes—No. 6 and under	.50
" " " 7 and over	.55

CARRIAGE REPAIRING.

Resetting tires, 1¼ in. and under per set	2.00
Resetting tires, 1¼-2½ in., per set,	2.00
" " one wheel,	.75
" " 3 in., per set,	3.00
" " one wheel,	1.00
" " 4 in., per set,	4.00
New steel tires, ¾-⅞x$\frac{3}{16}$ in., per set	4.00
" " " one tire,	1.25
" " " ¾-⅞x¼ in., per set	4.50
" " " one tire,	1.25
" " " 1-1⅛x¼ in.,	5.00
" " " one tire,	1.25
" " " 1-1⅛x$\frac{5}{16}$ in.,	5.50
" " " one tire,	1.50
" " " 1¼x$\frac{5}{16}$ in.,	6.50
Iron wagon tires, 1½-2x½ in.,	7.00
" " " 3x⅜ in.,	8.50
" " " 3x½ in.,	10.00
" " " 3½x⅜ in.,	10.00
" " " 4x⅜ in.,	11.00
Resetting light axles,	1.00
Resetting channel, tire and rubber, per wheel,	1.50
New axle stubs, ¾ to 1 in.,*	6.00
" " " 1 to 1⅛ in.,*	6.50
" " " 1¼ in.,*	7.50
Cutter shoes, ¾, ⅞, 1 in.,	2.50
Heavy bob sleigh shoes,	5.00
Heavy creased shoes,	7.00
Welding shaft iron,	.25
Shaft eyes (new), per pair,	.75
Draw clips (new), per pair,	.75
King bolts (light)	.75
Fifth wheels,	$1.50 and up
Neck yoke, full ironed, 3-3½ ft.,	1.00
" " " 4 ft.,	1.25
Double trees, complete, per set,	2.00
Single tree, full ironed,	.50
Reach bolt with tail nut,	.25
Wagon box rods,	.20

*Including setting boxes in wheels.

WOOD WORK.

New rims, 1-1⅛ in. and under, per wheel,	1.00
One-half rim,	.65
New rim, 3 in., per set,	6.50
New rim, 3½ in., per set,	7.00
New rim, 4 in., per set,	7.50
Buggy spring bar,	.75
Axle bed piece,	1.00
Head block,	.75
Reach straight,	.50
Reach drop,	1.00
Shaft, light,	1.25
Cross-bar,	.75
Whiffle-tree,	.50
Wagon pole (lumber)	2.00
Brace for pole (lumber)	.65
Half crotch to lumber wagon,	.75
1 crotch to lumber wagon,	1.25
Reach to lumber wagon,	1.00
Front hounds, lumber wagon,	1.00
Front hounds, sway bar wagon,	2.00
Sand board, 2 x 4 inches,	.75
Sand board, 2-½x 3 in.,	1.00
Front bolster,	1.25
Hind bolster,	1.50
Bed piece to lumber axle,	1.00
Buggy spokes,	.20
Buggy spokes, two,	$0.35
Buggy spokes, three or more,	.15
Spokes, heavy, 2-½ and under,	.25
Spokes, heavy, 4 or more,	.20
Spokes, heavy, 3 in ,	.30
Spokes, heavy, 3 in., 2 or more,	.25
Side bar to surrey,	1.25
Double heel shafts, 1½ x 2¼ in.,	1.50
Lumber axle,	2.50
Resetting light axle boxes, per set,	1.00
Resetting lumber axle boxes,	2.00
Lumber evener,	.50
Carriage pole,	2.00
Lumber wagon pole and braces,	2.50
Lumber whiffle-trees,	.35
Cutter knees,	$1.00 and up
Bob runners,	1.50
Bob rave,	.75
Bob beam,	1.00
Bob knees,	.50
Bob roll,	.75

REPAIR WORK.

Resharpening bean knives, long,	1.00
" " " short,	.75
Resharpening harrow teeth,	.02
" spring teeth, out of harrow,	.05

Some Prices From Indian Territory.

R. A. DALE.

Horseshoeing, plain, with heel calks,	$1.00
Horseshoeing, plain, with toe calks,	1.25
Resetting shoes, straight,	.15
Plow shares, 16-inch,	3.00
Plow shares, 14-inch,	2.75
Plow shares, 12-inch,	2.50
Sharpening,	.20
Pointing,	.65 to .75
Setting wagon tires, each,	.50
Buggy tires, per set,	3.00

The Railroad Blacksmith Shop.—7.

W. B. REID.

Steam Shovel Repair.—*Continued.*

The foregoing chapter applied very largely to the repair of old steam shovel teeth. Fig. 31, A, shows a worn tooth driven back to form a lap scarf, to which a small piece of flat iron is to

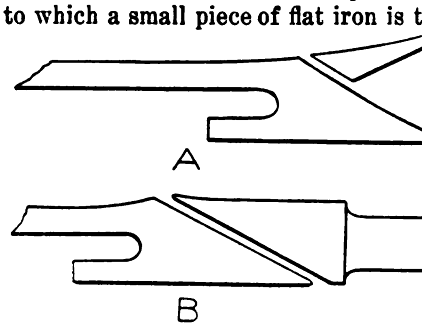

Fig. 31. REPAIR OF WORN TEETH.

be welded to form a cavity for reception of steel, similar to that shown in Fig. 28. If soft steel is to be used, the repair might with advantage be made as suggested in Fig. 31, B, in which a liberal piece of the steel is welded directly on the old part, and then drawn down to the proper shape.

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The strengthening ring around the top of the dipper occasionally becomes so worn as to require renewal. Made of heavy bar iron 6″ or 7″ x 1¼″, this ring is, at best, an awkward, difficult job to handle. We have seen fairly good smiths at times sorely puzzled how to go about it, doubling the labor for themselves and helpers by failing to apply the right methods.

This ring, it will be seen (Fig. 32), is fitted at the same angle, or bevel, as the top of the dipper. This complicates operations somewhat, and is a frequent cause of much unnecessary trouble to many blacksmiths who make the mistake of bending the ring and then attempting its adjustment to necessary angles afterwards.

This can be done in a much superior and easier manner by first setting the iron to proper angles, edgewise (Fig. 33), before bending it around to the square (M, Fig. 32). The proper inclination of these angles can easily be determined by holding a straight edge

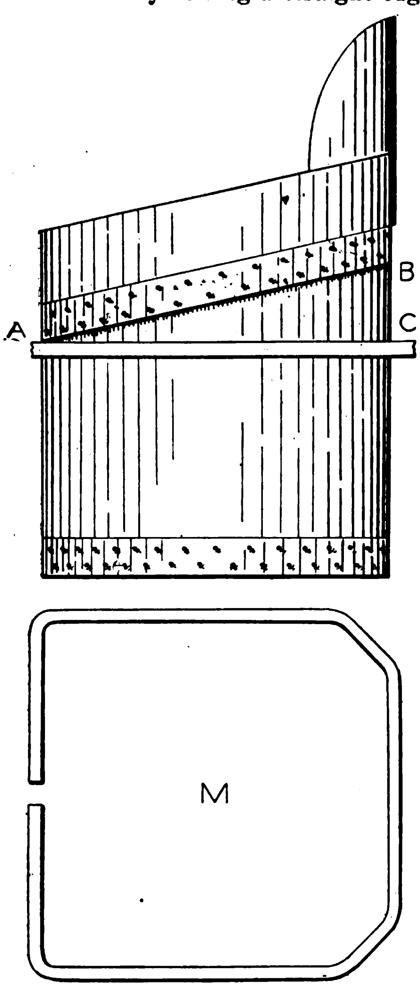

Fig. 32. FORMING AND BENDING THE RING.

along the side of the dipper (C, Fig. 32), then, adjusting a "bevel set" (E, Fig. 33), to the angle C, A, B, (Fig. 32.) Set the iron of the ring to this angle, as shown in Fig. 33, at points A, B, C, D, corresponding to the corners of the dipper.

When first set in this way, the ring adjusts itself accurately to the shape

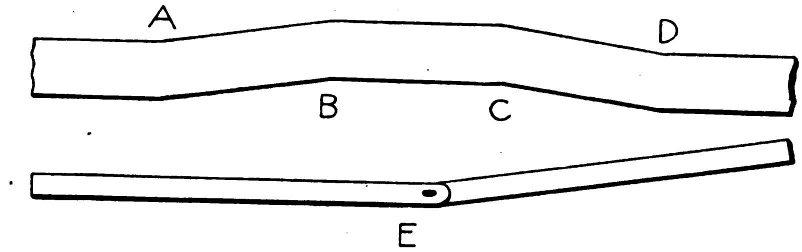

Fig. 33. METHOD FOR SETTING RING OF DIPPER AT PROPER ANGLE.

of the dipper when bent around its circumference. This latter operation can be greatly simplified by using the dipper itself as a former. For this purpose, cut eight or more pieces of 3″ x 1″ iron with a bolt hole in one end, as in A, Fig. 34. Bolt these clamps to the dipper in the rivet holes of the ring with a washer, the thickness of the ring between, which will hold the ring tightly to the dipper while bending the corners. Bend each corner separately with a heat just long enough for the purpose. When making the two first bends allow the clamps on the sides of the dipper to hang loosely downwards, until the ring is bent around into place. Then turn the clamps up and screw the ring and the dipper closely together, as in B, Fig. 34. Repeat the same operation as each corner is bent, and a perfectly fitting ring is the result.

(To be continued.)

A Few Facts About Shoeing.

W. L. POTTER.

I believe that the shoe should correspond in heaviness to the weight of the animal, and the nature of the work which he is expected to perform. Heavy shoes not only burden the animal which is condemned to wear them, but there is truth in the old adage, "An ounce at the toe means a pound at the withers." The legitimate mission of the shoe is to prevent undue wear of the walls, and a light shoe will do this quite as well as a heavy one; it is moreover entirely erroneous to suppose that a heavy shoe wears longer than a light one, as experience has proven the contrary to be the case in many instances, even among our mammoth draft horses, whose shoes must of course be made with reference to the weight they have to bear and the strain which they are subjected to when the animal is at work. I am not prepared to admit that it is by any means necessary to add to the concussion to which the feet are unavoidably subjected by several pounds of unyielding iron on each foot, when shoes weighing half as much would serve the purpose equally well.

The subject of winter shoeing presents in many sections of the country fresh difficulties, for now the shoe is required in the case of all classes of horses to discharge a double duty; to afford a foot-hold as well as guard against undue wear. There has been a various number of shoes invented to meet this double requirement, but the most common of them all is the old-fashioned three calked shoe, which though faulty, is probably one of the best, all things considered, to suit the various requirements. In no case should high calks be used, for a short and sharp calk will hold just as well. The horse with high calks is like a boy walking on stilts; he is uncertain of his footing, and they will rock around and are liable to strain the horse's limbs and bring untold torture to him. I believe that too many of us use too large nails and drive too many. I think a No. 6 nail will hold a shoe, No. 3, 4, or 5, as long as they ought to remain on. For No. 6 and 7, I use No. 7 nails and drive them as near the toe as possible. I have no trouble to make them stay on as long as it is advisable to let them remain. I use

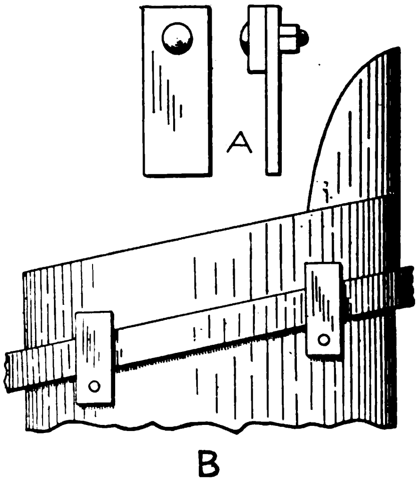

Fig. 34. FITTING THE RING TO THE DIPPER.

the Capewell nail, made by the Capewell Horse Nail Company, as I believe them to be the best and cheapest in the

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end, although they cost a trifle more than some brands.

In every case the scientific principles are the same. The employment of different kinks is a matter of individual opinion.

Another Type of "The Village Smithy."

It cannot be denied that the picturesqueness of the old-fashioned shop is sacrificed to the scientific convenience of the modern one. This fact is borne out in the accompanying engraving, entitled "At The Forge." Imperfection is individuality, for, were all shops perfect, all would be alike. The primitive equipment, the patched window, the broken bricks and the smoke, all give character to the spot peculiarly in keeping with the picturesque figure of the old country smith at the forge.

This is a corner in Jeddo, N. Y., and the blacksmith is Mr. Patrick Scullion, a son of the Emerald Isle. Looking at the picture one can almost fancy the easy-going, poetic Celt has been caught off his guard, wrapt in dreams of the land of his birth, so unconscious and natural is his pose, and so full of unpremeditated action. This is quite unusual in a photograph,—the rule being stiff, half-scared figures, staring out of the picture, with fixed gaze—and places it at once in the realm of art, where few photographs are worthy a position. The photographer, Mr. Eaton, of Jeddo, deserves credit.

AT THE FORGE.

Mention was made, in a recent issue, of the wide variety of blacksmith shops extant. In this connection, be it noted that this also might share with Mr. Beck's picture, the title "The Village Smithy," and it is interesting to compare the two.

The Scientific Principles of Horseshoeing.—19.

B. W. PERRIN.

Closing Remarks.

In closing this series of articles on the principles of scientific horseshoeing, my first desire is to thank the Editor and management, and especially the numerous readers of THE AMERICAN BLACKSMITH for the many words of praise and encouragement I have received.

In a final summing up of the work accomplished, it would be well to briefly review the subject dealt with in these articles. In the month of October, 1901, the first article of the series appeared in these columns, and each issue from that date, with one exception, has contained an article on some phase of the subject, including elementary anatomy, and pathology of the foot; preparation of the hoof for the shoe; fitting the shoe to the hoof, versus the hoof to the shoe; care of the colt's feet and its relation to deformed limbs; frog and sole pressure; interfering front; interfering hind; cross-firing; stumbling; forging or clicking; balancing roadsters; hot and cold fitting; the use of rubber pads; pathological shoeing for corns; fracture of the hoof, toe or quarter-crack; laminitis, drop sole or pumiced foot; contraction of the hoof; thrush; ossified cartilages, or side bone, and navicular disease. But while the foregoing articles comprise the various phases, or headings, we have by no means exhausted the subject, for horseshoeing is a science that is never mastered. Some of the oldest craftsmen are frequently discovering something that they never knew before, therefore the closest observation and study is always in order. Don't let egotism persuade you that you have learned it all. I have been a practical shoer for twenty-five years. It is over fifteen years ago that I began to write articles on shoeing, but every-day experience in my shop ever reminds me that I have not learnt it all, for I frequently discover something which I never knew before. Especially is this true in the diagnosis of foot lameness, or of balancing, interfering, etc. Hence the successful shoer must be a keen and accurate observer of the horse. He must be a close student of the anatomy of the locomotary apparatus, and of conformation, gait and action; otherwise he will not be able to discern the varying differences in the conformation of limbs—that powerful factor in the production of interfering.

The perplexing problems in interfering, balancing, etc., which present themselves to the horseshoer, are rendered the more difficult of solution because the horse does not speak, and in this particular the medical practitioner has an advantage over the veterinary surgeon or horseshoer. A sick person can tell the doctor how he feels—can often give a history of his case,—can explain some of the symptoms, but in this particular, the veterinary surgeon and horseshoer are in the dark. They can only watch those mute signs—which it takes years of patient study to understand. They can at best treat symptoms and watch results, and by carefully noting the result of the application of certain scientific principles

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to certain defects of conformation or action, or to the treatment of disease, they hand down to the future generation of horseshoers that legacy of horse knowledge, the accumulation of research, the concretion of centuries of practical experience as a guide for the embryo horseshoer to start with. Now I would say to those who desire to make a success of horseshoeing, that the first essential is the study of the anatomy of the foot and leg. It is as necessary for the horseshoer to understand the nature of the organ he handles in his every-day practice as it is for the pharmacist to understand the nature of drugs. It is not enough that the shoer read anatomy, he must practice also. Hand and brain must work in unison. There is nothing so instructive as dissecting a dead foot and leg. Every shoer should dissect the foot and leg until he becomes intimately acquainted with every part of it, for a knowledge of anatomy is the basic principle of horseshoeing, without which the horseshoer is in the position of the quack medicine man — an imposition on the general public. There never was a period in the world's history when books and papers were so cheap as to-day, in fact, there is but little excuse for ignorance in the forge when so bright a paper as THE AMERICAN BLACKSMITH is within the reach of every man who works on an anvil.

This is a utilitarian age, an age of human advancement, wherein men and things are judged upon their merits. In the march of human progress there is no room for the obsolete and useless, there is no room for the shiftless drone. He who will not diligently toil to keep pace with the onward march of Twentieth Century civilization will be relegated to the background—a human derelict.

I know of no trade that has made such rapid progress during the last few years as horseshoeing. The number of journals published in the interest of the horse has fostered a very lively interest among the horse-owning public, and as a result, the horse owner is demanding a better class of workmanship than formerly, and I predict that the time is not far distant when the horseshoer, at least of cities, will be registered—licensed practitioners—in much the same way as veterinary surgeons are to-day, and I say with all my heart—"God speed the day when the horse and its owner shall be protected from the impositions of the botch shoer."

Now in concluding this series, I believe I should miss the main point, were I to omit a few words on my pet theme—the apprentice. I have devoted much labor to the elevation of the brothers of the craft. I have watched with keen satisfaction their progress, but there is yet a great deal to accomplish. At the present time I don't believe there are fifteen per cent. of the horseshoers of America who have passed an examination in the science of horseshoeing. I do not mean that a greater percentage could not pass such an examination if they were to try, but the facilities for proper courses of instruction are poor, except in a few of the large cities, and even where the opportunity is good, the percentage of horseshoers who have taken advantage of scientific instruction and obtained certificates is small. Another much-needed reform is a registration law that would protect the first class, the qualified horseshoer, the horse and its owner from the impositions of inferior workmen who are not qualified to shoe horses. But the large percentage of horseshoers who are conscious of their inability to qualify before a board of examiners makes the introduction and passage of such a law very difficult, however, I am glad to say that organization has accomplished something along this line. But since education must precede organization, the work has been slow, and after an exhaustive study of the situation, I have long since arrived at the conclusion that the hope of the trade lies in the apprentice. There has been too little attention paid to the selection of suitable material for the embryo horseshoer. The master has looked upon the apprentice as he would upon a mule. If the boy was big and strong that was sufficient; whether he was in possession of a common school education was of secondary importance. They demanded much brawn and too little brain. This was a grave error, for it must be borne in mind that the apprentice of to-day will be the master horseshoer of the future, and the boy who has only brains enough to shovel dirt will never understand the intricate science of horseshoeing. I believe that the proper method is to compel every apprentice to go to a school of horseshoeing for a thorough course of instruction, and with this object in view, I have labored long and earnestly for the establishment of a school of scientific instruction for the proper education of the apprentice and others who may desire to attend. But although I have accomplished something along educational lines, I have achieved nothing of a practical nature, owing to the lack of interest manifested by the master horseshoers. However, I have not abandoned the work, and I hope the near future may develop a practical plan for the proper education of the apprentice, for in him lies the future hope of our craft. Now in conclusion, I desire to say that I have an abiding hope in the future of the horseshoer, for there is a most earnest desire among the leading lights of the craft for a higher education. I have observed with keen satisfaction the high standard of intelligence possessed by the men who attend the national conventions as delegates from local bodies of horseshoers, and that local bodies send their best to represent them in national conventions is evidence of their appreciation of merit. This shows that deep down in the hearts of our craftsmen there is a self-respect, a conscious rectitude, a lofty ideal, a striving for a higher civilization. History proves that the trend of human events is ever in the direction of the goal of progress; then let us so shape our course that our craft may be ever in the vanguard.

(The end.)

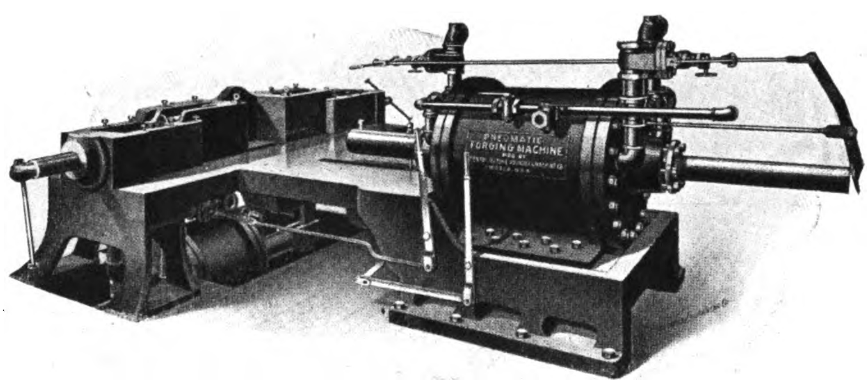

Fig. 1. THE "MECHANICAL BLACKSMITH."

A New Mechanical Contrivance.

The "Mechanical Blacksmith" is a new contrivance that is attracting considerable attention. It has been in use for some time in the shops of the Illinois

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Central R. R., and was designed and perfected by Mr. Martin Kennedy, foreman blacksmith, and built by authority of Mr. Wm. Renshaw, superintendent of machinery.

This forging machine will be of interest to every blacksmith. It is practical, economical, and its range of usefulness is very wide. It consists of a T-shaped frame, or bed-plate, and is operated by two cylinders, one plunger and one adjustable die. On the longer arm of the bed-plate is mounted the 24 by 31-inch air cylinder, the piston of which furnishes the power movement to the bulldozing plunger. On top, at either side of the shorter arms, are the die-holding forms, which can be set to open and close at any desired distance between them, and one side of which is operated by a lever connecting with the plunger of a 24 by 31-inch air cylinder below. This machine is designed for a working air pressure of 125 pounds, and some idea of its power will be gained when it is seen that it exerts a stated pressure of 57,000 pounds. The rapidity with which the blows can be struck is limited only by the speed with which a man can operate an angle-cock, as the return of the plunger is effected by means of compressed air instead of the usual spring present in other machines, while the capacity of the mechanism for turning out work is restricted only by the amount of iron that can be heated and handled for it.

It is claimed that 85 per cent. of locomotive forgings and nearly every job on a car can be turned out with the aid of this blacksmith's hammer, while the terrific blow it strikes has an advantage over a squeeze of the power machine, making a more perfect job.

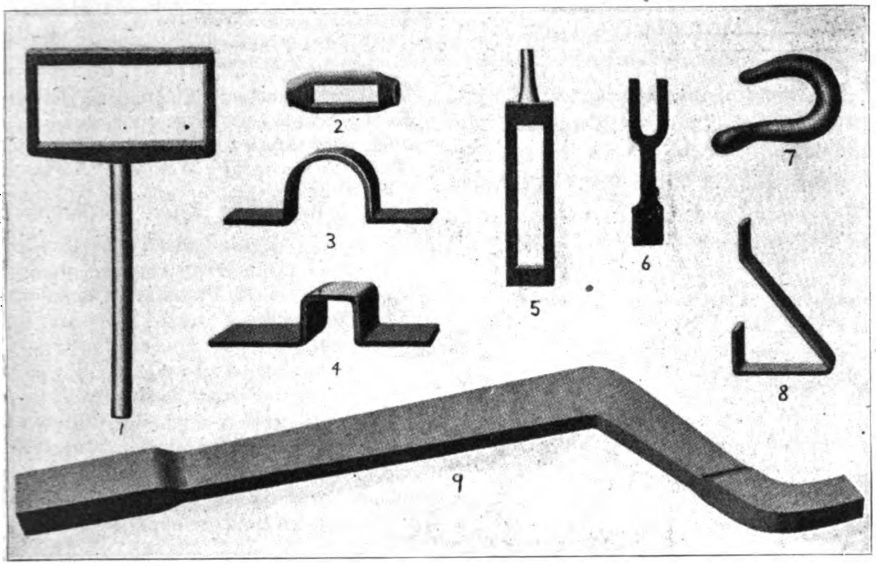

Fig. 2. ARTICLES FORGED BY THE NEW MACHINE.

1. Valve Yoke.
2. Turnbuckle.
3. Pipe Clamp.
4. Frame Buckle.
5. Driver Brake Adjusting Rod End.
6. Passenger Car Truck Hanger.
7. Wrecking Chain Hook.
8. Driver Brake Rod Safety Hanger.
9. Passenger Car Equalizer.

Straps, draw-bars, pockets, frame buckles, pipe clamps, valve yokes, and the like, of any dimensions, may be made from the same dies by merely applying plates to the faces of the dies of such thickness as will furnish the desired sizes. By placing liners over the face of the die in forming pipe clamps it is possible to forge 30 to 40 different sizes of clamps in one minute, while a locomotive main-rod strap weighing 236 pounds has been forged in 47 seconds, and a valve yoke forged complete in five minutes. Turn-buckles are forged and welded in two operations, smoke arch braces in one blow, while thimble eyelet for rope hoists is bent and grooved in a single operation. From one to three minutes only is required to change the dies necessary in the most complicated jobs, and in every case this can be effected before the metal in the furnace can be brought to the proper heat for working. The machine has the unique capacity of making its own tools.

Mr. Kennedy has spent much time and thought upon this machine, but the result is well worth it, for he has contrived a blacksmithing tool unequaled in simplicity, rapidity, range of application and general efficiency. It is interesting to know that the device has already been patented in the United States, Canada, England, Germany, France, Belgium, Russia and Austria. The Featherstone Foundry and Machine Company, of 348 North Halsted Street, Chicago, have arranged to manufacture and sell it.

The accompanying illustrations explain themselves. Fig. 1 shows the pneumatic forging machine complete. In Fig. 2 are seen an interesting collection of articles forged by the machine. The wide range of application, both in point of size and nature of forging, is here apparent. The dies illustrated in Fig. 3 are also very

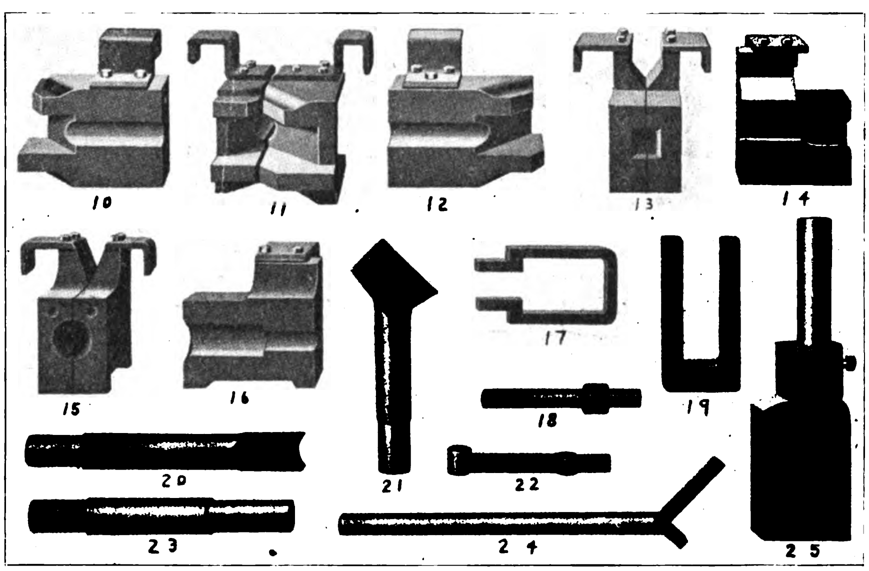

Fig. 3. SOME OF THE DIES USED IN FORGING.

10. Die to Forge Boiler Brace.
11. " " " "
12. " " " "
13. Die to Forge Driver Brake Adjusting Rod End.
14. " " " " " " "
15. Brake Hanger Fulcrum Die.
16. " " " "
17. Draw Bar Pocket.
18. Brake Hanger Fulcrum.
19. Connecting Rod Strap.
20. Piston Rod Die for Passenger Car Truck Hanger.
21. Piston Rod Die to Forge Heel on Boiler Brace.
22. Driver Brake Hanger.
23. Piston Rod Die for Brake Hanger Fulcum.
24. Boiler Brace.
25. Piston Rod Die for Connecting Rod Strap.

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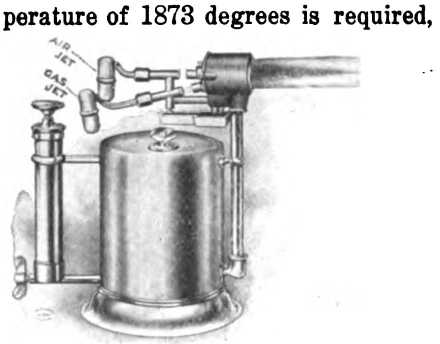
interesting. Of course in engravings of the kind the number of parts illustrated must necessarily be limited; but those shown are typical and serve to give a general idea of the work this new machine is capable of accomplishing.

A New Double Jet Brazing Torch.

In view of the increasing use of rubber tired wheels and the consequent need for improved facilities for making and repairing them, automobile manufacturers and rubber tire workers will be interested in the Turner Double Jet Gasoline Torch herewith illustrated, in special connection with the brazing of retaining wires for solid rubber tires and work of a similar character.

The torch, but recently placed upon the market, is claimed to produce the maximum heat obtainable by a device of this kind. The intense heat is secured by a double jet burner. The air and gas are under absolute control of the operator and enter the combustion chamber separately. The independent control of the jets enables the user to mix the air and gas in exactly the right proportions to produce absolutely perfect combustion. Maximum temperatures result from perfect combustion. A temperature of 3,500 degrees Fahrenheit is claimed for this torch. To illustrate just what this means, the makers state that to flow brass a temperature of 1873 degrees is required,



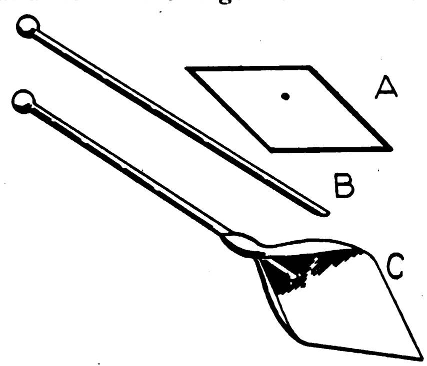
A NEW DOUBLE JET BRAZING TORCH.

and that this cannot be successfully secured with a single jet torch. This torch produces an intensely hot and concentrated flame, and is stated to give splendid service for brazing retaining wires in rubber tires, for the use of carriage makers and for all work where intense heat is required. Mechanics and artisans have also found this torch useful for brazing, tempering and annealing, or for processes requiring a temperature higher than usual devices of this nature afford. The torch here illustrated is manufactured by The Turner Brass Works, 63 N. Franklin Street, Chicago, Ill., to whom we are indebted for the above information.

A Blacksmith's Lily.

J. P. MULRONY.

The accompanying engraving illustrates the "Blacksmith's lily," designed and used by me for a long time as a tool for the forge fire. It is indis-



THE BLACKSMITH'S LILY.

pensable for packing or poking the fire, for putting flux on heated iron or steel, for removing slag and also for many other uses about the forge. I highly recommend its use to the craft.

To make the tool, first cut out a piece of iron plate with bevel edges as at A. An old diamond-shaped cultivator shovel will do. Make the handle of ½-inch round iron, as shown at B, and weld the end of the diamond and the handle together, doubling the former around the end of the handle, as shown, which would shape it like the cup of a lily. The end of the handle should project one inch into the center of the cup. At C is shown the tool when complete.

The International Railway Master Boiler Makers' Association.

The above is a new Association, having been organized in St. Louis, November 12th, 1902. They will hold their First Annual Convention at the Great Southern Hotel, Columbus, Ohio, on May 19th, 20th and 21st. The following is a list of the officers for 1902-1903:

President, F. J. Graves, Huntington, W. Va.

1st Vice-President, J. A. Doarnberger, Roanoke, Va.

2nd Vice-President, Wm. H. Laughridge, Columbus, Ohio.

Chairman Executive Committee, Wm. P. Kelly, Dennison, Ohio.

Secretary and Treasurer, P. Sullivan, St. Louis, Mo.

Assistant Secretary and Treasurer, F. C. Cook, St. Louis, Mo.

List of subjects to come before the Association at this Convention is as follows:

1. Causes of fireboxes cracking; why do they crack vertically instead of horizontally? Prevention of same. M W. McCoy, *Chairman.*
2. Best method of setting locomotive flues; best tools for setting same; best method of caring for same while in service. C. F. Wilde, *Chairman.*
3. Best method of staying boilers and detecting defective stays. John Corbett, *Chairman.*
4. Best method of riveting seams in fireboxes. H. Denzler, *Chairman.*
5. Best style of draft sheets and spark arrester. W. M. Evans, *Chairman.*
6. Best method of welding flues; best fuel for same. Frank Rahrle, *Chairman.*
7. Construction of boiler; kind, size and tools to use. W. A. Timms, *Chairman.*
8. Maintenance of boilers and round house work. R C. Young *Chairman.*
9. Best method of applying patches on fireboxes. J. J. Meyer, *Chairman.*
10. Best method of washing boilers Floyd Harris, *Chairman.*
11. Cause of mud rings leaking and the best method of preventing same. P Sullivan, *Chairman.*
12. Best method of taking out fireboxes. J. A Doarnberger, *Chairman.*

Tool for Removing Spokes.

J. VASTAL.

A good tool for use in taking out old spokes which are broken off at the hub is formed by welding a ⅝-inch lag screw to a piece of 15-inch iron. Then turn up the end at right angles to form a shoulder to give the hammer something to strike against in driving the spoke out. Bore a ½-inch hole in the tennon, screw in the tool and knock out with the hammer.

QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

Tempering Rock Drills—Will some one kindly inform me how to temper rock drills? Wm. Curry.

Plow Work—I should like to hear from some of my brother craftsmen on how to make a new plow share, so that it will run all right. J. B. Stearns.

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A Tempering Question—I should like some good receipt for tempering thread cutting taps and dies. I lost my shop by fire last October, and my dies will be all right if they are tempered again. They were in the fire. G. W. McCord.

Tempering Gun Springs—I find the following a very successful way of tempering gun springs. Heat to a cherry red and immerse in lard oil. Then draw the temper by dropping in lead just barely melted. Tea lead is preferred for this purpose. Ira B. Harvey.

Steam Hammer—I work a steam hammer that is causing me a great deal of trouble. Every now and then the piston head jars loose. I hope some brother blacksmith will tell me how to overcome this trouble. Carl A. Gillen.

A Question on Tempering Springs—How is oil prepared for tempering springs, say carriage springs, so that there is no need of drawing the temper, and what are the ingredients used in the preparation? Will somebody please state? R. F. De Pane.

A solution which is often recommended for springs of this kind is composed of equal parts of sperm oil and neats-foot oil to which an ounce of rosin has been added. This will be found satisfactory. B. B.

Remedy for a Horse's Foot.—Will some brother smith tell me the best remedy for curing a horse's foot that is decayed and brittle, and which peels off? It is hard to get a solid nail-hold, and therefore difficult to shoe. S. Shindledecker.

To Shoe a Kicking Mule—If Brother C. E. McKee will hobble his mule's hind feet, he won't kick like a cow. I have shod them in most all shapes and know they can almost stand and kick a man in front of their nose if not more than fifty feet away. J. R. Boggs.

Tempering Mill Picks—I should like a good receipt for tempering mill picks for dressing bur mill stones, as I cannot make the picks hard enough with fire and water to stand, as they want to be thoroughly hard, and yet not break. J. F. Tramor.

Drawing Out Spokes—I suppose Mr. Bruton knows how to draw out spokes, but when in a hurry I think the following is excellent: Turn the wheel inside up, tap the spoke with a light hammer about four inches from the hub, and nine times out of ten it will drop out. Scotie.

Sharpening Horse Rasps — I see that Brother J. H. L. asks about sharpening horse rasps. I grind them, starting in the middle, holding flat on the stone and turning the stone from me. It is not well to grind them too much. I grind them three or four times and then use them for plow points. C. E. Beck.

Hardening Calks—In answer to the question of Mr. S Anderson about hardening calks, I would say the easiest way is to take a pail of water and put five pounds of salt in the water. Then heat the shoe red hot, cool off in the salt water, and you cannot touch it with a file, as I have found. Claud Bailey.

Building Automobiles—I should like to hear from some brother who has had experience as to building an automobile which will take a load of 4000 pounds with its own weight over any kind of road. I have my own design for the carriage. I should like to know which is preferable, gas or steam? H. E. Walker.

A Shoeing Question—I should like to hear from some of my brother craftsmen about a saddle horse that I have to shoe, which is affected in both front feet with two very bad corns. There is a core through the frog about the size of a common lead pencil that unites the corns, or what has the appearance of corns. The feet are also contracted, but not badly. How shall I shoe her to obtain the best result, and what is the cause of the core? I am anxious to find out. W. H. Doty.

How Make a Horse Pace—I have a fine road mare five years old that is double-gaited, that is, she trots and paces. She will pace for a month at a time, and then break off and start trotting, and no matter how I shoe her, I am unable to stop her. Will some brother smith tell me how to shoe this horse so as to make her pace all the time? J. W. Erven.

Another Question on Shoeing—I should like to ask through these columns if there is anything in the line of shoeing that would change a colt's gait, which will be three years old this spring. He is a racker. None of the stock on either side were rackers, and I should like to get him to move on a trot while driving. I shall be much obliged for information on this subject. R. A. Kelso.

Measuring Iron for Tires—Mr. W. H. Berge wishes to know the exact amount of stock it takes for a tire. To three times the diameter add one-seventh of the diameter, and then allow the thickness of iron for weld. This will give the correct amount of stock every time. I have been at the trade for twenty years. I put on a large number of new tires every year, and I have always found this rule reliable in all my practice. S. J. Blanchard.

Liniment for Horse's Hoof—I should like to have some brother smith tell me which is the best liniment to apply to the hoof when it is brittle and when it crumbles away in order to preserve it in a sound condition. I shoe the mare in question with a broad web shoe with plenty of frog and sole pressure, and I think a good liniment would completely fix matters. Thomas Roberts.

Tempering Gun Springs—In answer to several inquiries about tempering gun springs, the following is my method, which is simple and sure. Heat to a cherry red and harden in water. Then wipe dry and smoke with birch bark. After which heat over a clear fire until the soot burns off, and cool by swinging in the air. The spring should be forged from a good piece of cast steel, and if carefully tempered by this method, will be sure to stand any ordinary test. Charles J. Wolfe.

Shoeing Special Cases—For stumbling there is only one remedy, that is, cutting off the horse's hoof at the bottom of the toe. Don't put on a toe calk. If you have to put one on, put it clear on the inside of the shoe at toe and make it very low. Turn the toe up over the shoe to fit the place you have cut off of the foot, and when the foot comes in contact with the ground it will have a tendency to slip over the ground instead of stopping at once and making the horse stumble. Try it. If there is any help for him, this is the remedy.

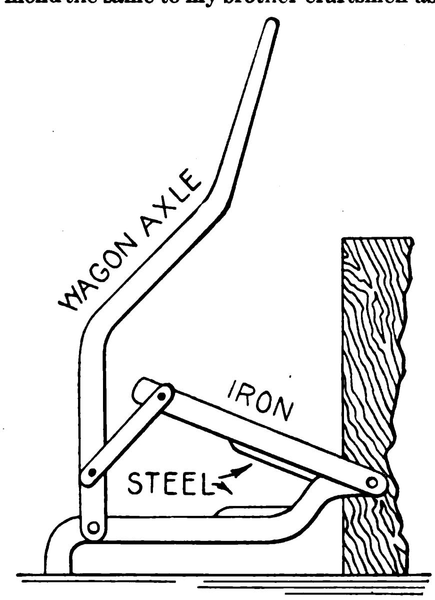
For clicking or forging. Where a horse is continually hitting his front shoes with his hind ones, I know of only one remedy, and that is to tell the driver to drive him at a gait at which he dosen't click. A horse always clicks when he is going at a slow or moderate gait. Now tell the driver to drive a little faster or a little slower. Teach him a different gait, or drive him at a gait at which he doesn't click. N. T. Outwaters.

Sharpening Lawn Mowers—I should like to hear from some of the boys as to the best way to sharpen lawn mowers. My method is to take off the knife, dress it on the emery wheel, then replace and adjust the mower, and then reverse and grind in emery and oil. This makes a good job, but takes some time to do it. I should like to have a way of grinding the wheel, so as to do away with the emery and oil part of it. Chas. Ozias.

Removing Old Spokes—The following is my method of removing old spokes out of the hub when they are broken off at the hub. Take a ½-inch lag-screw eight inches long and a 12-inch piece of ½-inch iron. Then weld an 8-inch piece across the end of the 12-inch piece, which makes a T or handle. Bore a ⅜ or $\frac{7}{16}$-inch hole in the spoke, screw in your lag-screw, and use a hammer on the T. Try it and you will find it good. Major B.

Shoeing Bad Horses—In noticing C. E. Gould's method of handling vicious horses, will say I would about as soon do the shoeing as to put his ropes on. I have shod broncoes and mustangs as soon as they were shipped from the West, and I have never shod one with a rope on, more than a halter. I find that kindness and carefulness will go farther and be better than harness, for colts will always remember their first lesson and experience in the shop. W. L. Potter.

A Pair of Shears—The figure accompanying this represents a pair of iron cutters which I have made. It took me about a half a day to make them, and I can recommend the same to my brother craftsmen as



A CONVENIENT PAIR OF SHEARS.

doing fine work. They only cost me about fifty cents to make. The upper movable jaw is of iron, 1 x 2 x 18 inches. The cutters are made of ½ x 1-inch tool steel, six inches long. The link connecting the handle with the upper jaw is nine inches long, made of 1 x ⅜ stock. C. E. Beck.

Shoeing an Interfering Horse—A retired horseshoer once told me that there were but two ways of shoeing an interfering horse. To pare the foot low on the ouside and vice versa. The former method with a shoe straightened on the inside has been the most successful in my experience.

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In case that failed, I found the other would nearly always have the desired result. In about seven cases out of ten, it is the driver's fault when his horse interferes or stumbles, but as our brother in Canada says, "The blacksmith is to correct all faulty actions, stop interfering, forging, crossfiring and a host of other defects in that line" no matter how carelessly or hard the poor beast is driven. This is all very true. IRA B. HARVEY.

An Interesting Letter—Your letter is at hand and in reply will say that I have received two copies of THE AMERICAN BLACKSMITH. The first copy was worth the price you ask for one year, and the second copy showing the different ways of welding rocker arms was the finest explanation I have ever seen. I have seen my best days now, but if I were a young man I would not be without THE AMERICAN BLACKSMITH. I have worked now thirty-five years at the business. I have ironed lumber wagons when we had to make every iron on the wagon except the cast bolster plates. I worked on the linch pin wagon, which make is a thing of the past now-a-days. The hardest work I have ever done was shoeing, and for no money at that. PATRICK BARRY, Omaha, Neb.

Making a Printer's Chase—In the January paper, Mr. Hewitt tells how to make a chase for a job press. I shall give my way of doing it. The first thing is to have good material. Then cut a bar from five to six inches longer than wanted when done, so as to be sure to have enough to get it straight and true. Cut one end at nearly the angle of the corner when done. Suppose you want a chase 12 by 18 inches. Cut out a V-shape for the corner, then heat and it will bend round very easily. Next weld it square and do the same with the others, thus making your chase with practically only one weld. On the inside measurement allow about half an inch on each arm, so that when welded and the corners squared-up, you will have the chase of the right dimensions This is quickly done and makes a job that you will not be ashamed of. I. GAUB.

Tiring a Wheel—Mr. H. W. Berge in the March issue inquired how to find the exact amount of iron to tire a wheel. The following is my method:

Take the wheel or wheels that are to be tired, and make a mark with a piece of crayon at one of the joints, and start with the mark at the end of the tire, laying the tire flat on the floor. Then rolling the wheel carefully on the tire until the starting point is reached, mark the tire and from that point add one and a half times the thickness of the tire that is going to be used. For example, if the tire is $\frac{1}{4}$ inch thick add $\frac{3}{8}$ of an inch, or if it is $\frac{3}{8}$ of an inch thick add $\frac{9}{16}$ of an inch Always make your measurement good and long because some iron and steel tucks more than other kinds in bending. Use each wheel for its own measurement because wheels vary somewhat. J. E. MARTIN.

Tiring a Wheel—In answer to Mr. H. W. Berge in the March number asking how to find the exact amount of tire to tire a wheel, would say that the way in which I do it is as follows: Lay the new tire down on the floor and mark the felloe joint on wheel Put the wheel on tire with mark at one end and roll the wheel over tire until the mark comes down to tire again. Then mark the tire $\frac{1}{2}$ or $\frac{3}{4}$ of an inch larger and cut off.

The next step is to bend it. If you haven't a tire bender, lay tire on floor again, put a clevis under one end and set the wheel in the clevis with pin over the felloe. Proceed to roll the wheel and the tire, keeping the wheel from slipping as much as possible. If it be a buggy tire, one man can easily bend it, but if it is a wagon tire, it takes two.

I have a staple about four or five inches wide driven down in the sill through the floor to finish bending the ends. Of course you must run the wheel then the tire again before you weld it, so as to be sure you have it right. WILLIAM BALDWIN.

Knife Making—I should be very much obliged to hear from a brother craftsman with regard to making butcher knives, and knife blades of any kind; how to prevent warping them when hardening, and also a good way of tempering them. Will somebody answer? J. B. CURREN.

Tempering Knife Blades—To simply temper a knife blade, take a piece of rosin soap, heat the blade just to a red, and put it in the bar of soap, edge down. Do not melt the soap; simply cut the hot piece into it. When it is cool it will be hard enough for a razor.

Another way is to take your knife, after you have it forged and ready to temper, heat it to a cherry red all over, chalk the knife well on both sides, all over, plunge it evenly in water, cutting edge first, and hold it there until it is the same temperature as the water. Be sure to have the water lukewarm. Have a bar of iron hot. A piece of $2\frac{1}{4}$-inch wagon tire will do. Wipe the chalk off and draw the knife slowly across the hot bar. Hold the back of the knife on the bar, and let it lean over a little, as you see the blue coming in it, and be sure to keep it moving. Draw to a medium blue, chalk again on both sides and plunge into the water. Another way is to have some damp clay. Heat the knife to a cherry red and put in the clay, but you cannot always get the right temperature with certainty. M. M.

A Couple of Questions—There are a number of questions which I should like answered by some of my brother smiths, who have more experience than I:

About Axles—Is it proper to make the front axle longer (between collars) than the hind one, say about $\frac{1}{8}$ inch or less? Will a vehicle with axles welded that way run true, providing the axles are properly set, or should the two axles be the same length? Is it right and proper to give the front and hind axle the same pitch and gather in setting so that the vehicle will run true when loaded, providing the wheels are all right?

Horseshoes—I see that some smiths turn the heel calks square with the shoe while others allow them to slant back $\frac{1}{4}$ inch or more. Is it for the horse's comfort, or is it mere fancy whether the calk is turned square under the shoe or whether it slants back? I like the looks of the square turned calk the best myself, but I should like to hear some one else's opinion about it. I am willing to learn. D. PEKHAT.

Removing Broken Bolt from Engine Bed—I have not seen in the paper how the gentleman was to get the broken bolts out of the engine bed. I have thought of two ways that the work could be done. First, the nut or key must be removed. If a nut, wedge the bolt so as not to turn, then remove the nut; or, if a key, they can generally be slipped out. I should think my first plan would work. Then take a short jack screw and a number of short pieces of iron that would not quite fill the hole and force the broken bolt out with them. Screw one up as far as it could be driven, then add another, until the bolt could be reached. Hitch on chain falls and pull it out. This is one way.

Another way would be to take a piece of small link chain and make three half hitches around a bar a little larger than the bolt to be drawn. Next tack them lightly with solder, drop it over the bolt, and give it a sharp pull, which would break the solder. Now draw with tackle. Perhaps neither plan would work, but when in a fix like the one in question everything must be tried to accomplish the desired purpose H. N. POPE.

A Few Notes on Diseases of the Horse's Foot—Some brother smiths seem to think that all shoers should be veterinarians. It may be all right, but I don't think that all the blame for so many lame and crippled horses should be laid to the shoer. I think if the owner of the horse does not take care of the horse, then the shoer can not do much with a bad foot. The whole secret in having the foot in good condition is in the care of the same from colthood up, and the horse raiser should know all about taking care of the same while the colt is growing and developing, and keep the foot pared and level so that the joints will have their equal bearing. This will make the horse carry his feet in line, and not strike each other, and also help to keep the foot sound and healthy.

Of course I must say that a great many horses' feet are ruined by poor shoeing, although there are as many ruined by the owner allowing the shoe to remain on the foot too long. Therefore, the owner and the horseshoer have to work together in order to keep the foot in a good condition.

A Foundered Horse—I have been treating a horse that was very badly foundered, for six months. This horse was taken out of the pasture, fed all the corn and oats he would eat, and then driven ten miles in the heat of the day to a heavy load. On his return he was given all the water he could drink, and then turned loose to eat all the sheaf oats he could. It was seven months after this that I got him. He could hardly walk, the soles of his front feet around the point of the frog being broken through, and the sensitive sole coming through was exposed to the ground. I shod him according to William Russell and he has improved slowly ever since. His heels are in good shape; the frog has a spongy appearance, but the proper shape and size; the sole has the right cup shape nearly to the toe, just about the natural size of the foot, whereas before it was deranged. From the quarters, is the line or portion of the old dead hoof which remains turned out and flat What I desire is to grow the hoof in shape again and get the old dead hoof off. Will some of my brother smiths tell me how to do this? G. CLARK.

Corns and Quarter-cracks.—I should like to give my ideas on contracted feet, quarter cracks and what are wrongly called corns. With regard to the latter, I firmly believe that they are not corns, but what shall we call them? In the first place, these so-called corns are sores or ulcers, which are ordinarily caused by contraction. You rarely see one of them in a foot that is not contracted. When the foot narrows up to such an extent that the hoof crowds the wings or sides of the pedal bone in the foot, a sore follows, although they are not always visible. The horse shows a narrowing of the foot. Next the animal stubs his toe, then steadily gets worse all the time. After a time those red spots are seen which you call corns, but you have no more right to call them corns than you have a right to call an orange a pumpkin, and further you cannot cure by burning or cutting them out. First you must remove the cause.

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In regard to quarter-cracks. After a horse has had a gathering or pus in the foot and the opening takes place, and the opening is perpendicular, you have what is called a quarter-crack. You can never cure this until the cause is removed, and to do this the anatomy of the foot must be thoroughly understood. It is possible that some of the toe cracks and quarter-cracks do come from a cut or a calk. In order to remove the cause of all this trouble, you must shoe with either toe clips or thin flat shoes or else with bar shoes, so that the frog can do the work that nature intended it to do. Many horses can do a lot of hard work on the farm and on the road with no shoes at all. Mr. T. J. Lemsford is right when he says: "If you know how to shoe in one place, you know how in another," but I say if you do not know the anatomy of the foot, you do not know how to shoe the foot in any place. G. W. Kenyon.

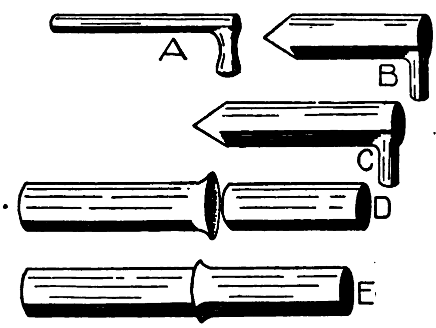
Rubber Tiring—Referring to the request of Mr. J. H. Jensen for information about applying rubber tires, it seems to me to enter upon this subject fully would require considerable space. Briefly, get the circumference of the wheel first. There must be six or eight inches allowed for compression, so that it will be necessary to get a strip of rubber about that much longer than the wheel measure. Trim the ends so that it is a trifle shorter on the bottom, which will cause the top of the ends to be closed first, makes a better joint and prevents an opening at the top. The most important part is getting the tires on tight. The best method for doing this is the screw power, which most machines for the purpose are supplied with. Each machine has all the parts required for the process and differ with every make. Some compress the rubber on both sides for closing the joint. I prefer one side. I use a No. 13 soft wire, taking four pieces about ten inches long, bending them in the middle and placing them on or around the tire where the compression is to be put. For closing the joint I use a screw attached to these wires.

There are several methods for brazing—electricity, gas and gasoline, the latter being the best for small shops. I recommend the Turner torch, made by the Turner Brass Works, 63 North Franklin Street, Chicago, Ill. In brazing, some men use sleeves or collars, and place them so as not to come directly opposite each other, as to do so will cause a bunch and wear at that place. A lap braze is also often used. Scarf the end of the wire with a file. Care must be taken to get a neat fit, but not to get the wires too tight. If you get them too close there will not be sufficient brass between the wires to get them to hold.

I have used the West Cold Tire Setter. Not knowing what kind of machine Mr. Jensen has I cannot advise, but give the ideas as above mentioned. S. E. Thomas.

Removing Bolts from an Engine Foundation.—Referring to the problem which I gave in the December issue of The American Blacksmith for my brother smiths to think about, I will now tell how I solved it and removed the broken 2¼-inch bolts from the foundation of the engine. The figure is printed herewith to show the foundation bolts which were broken, and which had to be removed. It was easy to remove the nut at the top part, as it had broken where it was welded by tightening the bolts on the bed-plate. The first thing that I did was to take a ¾-inch hexagonal bar of steel and make a chisel-bar of it. With this I cut some of the cement from around the bolts for a couple of inches. I then took a piece of 2½-inch pipe and flared it on the end, so that I could drive it over the bolts. After doing this I cut the pipe off level with the hole at the top of the foundation. I then took a twist drill, welded a piece to it and made the other end to fit the ratchet, as it would be impossible to drill it the way it was broken. I will tell you how I made the drill stay in the center. First I made a collar the size of the pipe inside and then drilled a hole in the collar the same size as the one that I drilled the bolts. Putting the collar on the bottom of the drill, and making one for the top so as to hold it steady, I then drilled it five or six inches deep and tapped it out to 1⅜-inches the same way as it was drilled. Next I took a 1⅜-inch thread end and made a big eye-bolt out of it, screwing the eye-bolts in the bolts which were tapped out, and fastening a 10-ton electric crane on the eye bolts, pulled them out. It took all the crane could do for they were tight, as the thread was pulled flat. Geo. Gardner.

Welding Flues—In the January number, A. G. Ottoson asks for information regarding the welding of flues. I shall try to tell him how I have welded them successfully. He probably wants to weld a short piece to the one end. He should first make a few tools, one for scarfing,



WELDING FLUES, AND THE TOOLS USED IN THE OPERATION.

one for welding on, and a tool to use as a hammer, as he must do the welding in the fire. Having a small fire, take a short piece of 2½ or 3-inch round iron or wood, set it upright in the fire and pack wet coal all around it tight. Then lifting the piece of iron out, he will have a small hole for his fire. After the pieces are scarfed, put them together and place in the fire. It is necessary to have good coke to feed the fire. He must keep turning his flue in the fire all the time to keep it from burning full of pin holes, using a little white sand. When it comes up to a welding heat he should take his long light hammer and tap it lightly in the fire all around the lip, going around it a couple of times. Taking it out quickly, he should slip it over the little mandrel he has on the anvil and go over with a top swage and hammer. He should have help on this, as it must be done very quickly. After he has them welded, he can put a wooden plug in the end nearest the weld and fill the flue with cold water, and if the water does not sweat through at the weld, he has got a good one that will stand 140 pounds of cold water test. I welded forty 2-inch flues a few months ago in this way for a traction engine boiler, and they all stood the test after they were put in. I shall now describe the tools.

A is a hammer made out of ¾-inch round iron with the end bent over and the face rounded a little. It should be about thirty inches long. B is a tool to put in the anvil hole for scarfing the flues. C is a mandrel to put in the anvil hole to slip the flue over to swage it. When bringing it out of the fire it should be small enough to allow the flue to go over it easily, as it has to be done quickly. D and E show the flue in position for welding. The rest is very simple. Wm. H. Katherman.

Making Plow Shares.—Seeing so many different methods of how to make a new plow-share in the columns of The American Blacksmith, we shall give you our way, and let us say right here to all who will try it, they will wonder why they were so long in not making them that way before. We do not wish to criticise any one or his method, for a good mechanic can make one any of the ways enumerated, but after using nearly all these methods, we think the following the easiest and quickest:

First get an Ideal plow clamp. It is cast in a triangular shape to slip over the point of blank and landside point. It has a set screw that screws down on to the blank, likewise one from the bottom that screws up against the landside. There is a tongue cast on the inside that goes between the blank and landside point just a little ahead of the set screws, that, when tightened up, will press them together harder at the heel than elsewhere. You will find them advertised and listed in almost any catalogue.

Now supposing you have your clamp, which will not cost more than 75 cents, fit your landside point to the plow and fit it right, leaving about ⅜ of an inch below the bottom of the frog and corresponding nicely with the curve of the frog on the top. You should be very careful to have the bevel on the top side, so that the blank will touch alike inside and out, or in welding it will be apt to turn over toward the side which they do not touch. Of course you must fit the back end so it will, when back against the landside plate, throw the point in exact line with the bottom of the landside proper.

Now that it is all fitted, we will clamp it to the plow by means of a clamp or pair of tongs, and proceed to fit the blank so that it lines up with the landside nicely and down on the top in good shape from the point of the heel. We always dress up the point of blank in good shape to be turned back on the underside of the point, but leaving it straight until welded to the bar. Now put your Ideal clamp on as near the point as you can and tighten up set screws, letting about 1/16 or ⅛-inch of the blank project over the landside point all the way down the side. By all means have a good fire, for this is highly essential to make a weld on this class of work. We use borax and plenty of it. Plow steel will stand a high heat, provided you have plenty of borax on it. Heat slowly at back end or heel as far as your heat will reach from the corner, and we want to emphasize corner, for this is where they always break loose first. Therefore get a good clean heat on that part. Then weld with a light hammer, having a long handle, and don't strike too heavily. Be quick and hammer down along the top as far as the heat reaches. Then while it is yet hot turn the back of the share up and upset the edge (which we left out over the landside point) until it is nice and even with the landside. This upsetting raises the corner and leaves it in much better shape than when rounding, as it is so common in most lays made in country shops. Remove your clamp and continue the process until the point is reached, making sure your weld is solid as you go down, for you will be sure to get the bar out of shape if you attempt a heat back

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of where you welded, on account of its expanding from hammering in the middle when both ends are solid. When welding down the top, hold the share so that it rests hardest on the edge of the anvil next to you. This will prevent the point from turning up. Turn the point back under and weld, and let it cool. Mark and drill with a little draw. If you have an emery do your grinding first. After grinding and polishing you will have a job to be proud of. H. J. DUBBS & SON.

An Interesting Letter from Canada—I am one of the oldest blacksmiths in Southern Manitoba. I commenced to work at the trade in 1855 and am still able to shoe horses, and have shod many oxen in my early days. I have had to make the shoes and the nails also, and became so expert that I could make a horseshoe in one heat ready for calking, and I could make five horse nails in one heat. You can imagine how hard we blacksmiths had to work in those days. I was healthy and strong, or else I could not have stood it. I am still working every day. I wish to give my experience on center and quarter-cracks in horses' feet. I tried clipped shoes and a bolt across to draw the foot together, but it did not prove successful. I then tried a plate fitted over the crack, fastened with fine screws, and it proved a failure also. I then tried another plan, the only one which I could make a success. This was on a center crack. Cut a groove on each side of the crack deep enough, so that you could spring the quick with the point of your knife, leaving a bar of hoof on both sides of the crack, sufficient to bear one or two stitches with soft tough wire well twisted to draw the crack together. Then cut crack across between hair and hoof with a flat bar made sharp and hot and there will be no bleeding. Weakening the wall of the foot in this way stops the spring or working of the crack and it starts at once to grow down solid. I always use an ointment of tar and grease to heal and take away the soreness. I have never failed with this treatment, and will guarantee it. I have read your journal carefully for the last year and a half, and I thought I would give you my experience on split feet, as an old timer, though I am still willing to learn. WM. J. JOHNSTON.

A Letter from Maine—I read with much interest the different opinions of men regarding smith work. Some of the kinds of work are out of my line and do not interest me much, others I criticise, and many of them I profit by.

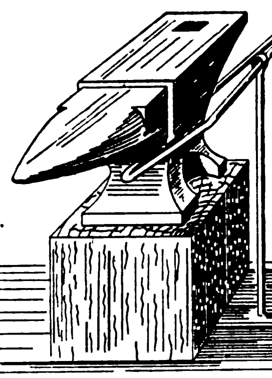
The article in the December number by W. L. G., with regard to cranky customers, was really good. I suppose most smiths have such. I think Mr. B. B. Mallory is making himself too much work, according to his writing in the February issue as to the welding of axles. I simply scarf them, take a good clean heat and put them together, using Climax Welding Compound on the scarf. A welding compound is good for nothing unless it is put between the parts to be welded (except for the borax that may be in it). I weld sleigh-shoes and carriage-springs in the same way. If any corner or lip should fail to weld, I take another heat with a little borax.

I regard toe-clips as of no use whatever, and do not use them unless urged to by customers. Side-clips are also bad, as they hold the foot too tight.

I wish to thank Mr. C. S. Simmons for his hint on tools. I have the bolt-holder and have used it for years, but did not know what to name it. I called it my "grabber," but shall adopt this new name of "LaGrippe," which is better.

Noticing the account of the folding cart body, I thought I would give my plan. I make a flat body with four stake irons on each side. I then fit my stakes to the irons, leaving them as high as I want the box. I fasten the side-board to the stakes. Putting on a rail of hardwood about two inches wide, I place cleats on the forward end, so that the end board will slip in, and have the back board held by two iron rods running through the top rail, and the sill without nuts. My wagon-body can easily be taken apart. The sills are fastened to the rocker with two bolts, and behind I have an eye bolt in the sill and a pin in the back side of the axle stock, so that to remove this box you have only to take out two bolts in the rocker, slip out the ends and sides, slide the floor back a little and it is all apart ready to pack away. I use no stakes in bolster or rocker.

Mr. A. Bruton's device for a post drill is all right. I fixed my drill that way years ago and find it very convenient. We benefit each other by mentioning these things in THE AMERICAN BLACKSMITH. I invented a helper by putting an iron, as



AN INGENIOUS FORM OF HELPER.

shown in the illustration, on the side of the anvil. The middle piece is a brace to hold it up. Spring the ends into the holes in each end of the anvil and you will find it handy to hold up irons which are to be welded. It is easily removed and put away when not in use. WM. P. DAVIS.

Power in the Shop — A Kentucky Smith's Experience—Father was a blacksmith, and at his death had been a smith and woodworkman for about fifty years. He had four sons, of whom I was the second, and we boys had to work in the shop from the time we were big enough to stand upon a horseshoe nail box to strike. My oldest brother was very apt, and when he was seven years of age he could make a good wrought nail, and would forge the rod to make it out of by taking two half horseshoes and welding them up. He could also make a good hook and staples. At the age of eighteen he could do anything that came into our shop.

After alternating between the farm and the blacksmith shop, I settled in Christiansburg, Ky. The shops are tolerably close around here, and the shape that you can buy your material in is so nearly just what you want, that it is expensive to have an extra man. But there is some work that a man cannot do very well by himself. I had a good run of work, more on my father's reputation than my own, and I could not do it all. I could not afford to have a regular hand and could not get a good smith when I needed one, so I decided that an engine was what I needed.

I first endeavored to find out something about gasoline engines. Now, I had never run an engine of any sort, but soon found out that machine shops would throw out gas engines and go back to steam for first one cause and then another, so I concluded to get a small steam engine. I talked the matter over with a friend who had a small engine which he let me have on trial, but the boiler had been torn to pieces. I got his engine, two by three-inch cylinder, and ordered a boiler. After getting the boiler, I found that my engine would not pull my grindstone, but would pull my blower all right. If it had been good for nothing else, and I could not have done any better, I would have fired up every day just for that much. I had an engineer come and look at it and he said the piston head had worn until it wasted more steam than it used, and it was so made that it had no cylinder ring and there could be none put on it.

Another friend then came to my rescue and told me of a second-hand engine that he thought would pull anything that I would need. This was a 2¾ x 4-inch cylinder. When I put it in and fired up, I tried it on my rough machines that were home-made, and with sixty pounds pressure I could run my grindstone, drill, fire and wood lathe at one and the same time. Now I could get up steam and run all day with never more than one bushel of coal and often half a bushel—the lighter the work the less fuel. I put in a Thompson tuyere iron, so I could have as large or as small a fire as I wanted. I also put in a small emery stand, two 6-inch wheels and rigged up a band saw. At first I had some trouble, owing to my inexperience, but today I don't think there is another shop in our county with such a thing in it, and I have never had a man see it, but said it is undoubtedly the best thing he has ever seen.

Some will ask how about horses that come to be shod. I never had a horse mind the engine as much as they do the rattle or popping sound of the valves of an old bellows. I would not be without it for a good helper, if he would agree to do what it does for his board, because in the first place he could not do the work and he would cost so much more that in two years you could save and put in a new engine. If I want a light fire, I can get it and no matter how hard a blast I desire I am able to obtain the same, and can keep it up as long as desired. If a wheel comes in, I have twenty-three different patterns for different heights and you can see the stock it saves to be able to cut your rims from timber as quickly as you can lay it off. I can rip a plow beam in five minutes or a pair of wagon hounds as quickly as a man can make up his mind to start on them. I have ground enough plow points in the last three years to pay for my coal to say nothing about what it has saved my patrons, and to say they do not appreciate this advantage would be doing them an injustice.

If you have never had an engine in your shop, it is just because you don't know the good of one and the small expense necessary to keep it up. I have only had to buy one thing and that was an emery stand. I have fitted up the rest myself, and you could do the same. No man can have an engine and not learn to use it. I could write one hundred pages and still not tell half the possibilities of power in a shop in the hands of a good blacksmith. I will say nothing about a gas or gasoline engine, for I know nothing except as stated in the first part of this letter, and you can't help but be pleased with steam. I know that it is cheaper than hand and a great deal more satisfactory. If what I have said will help any one, I am glad to be of service to my trade. N. M. SCOFIELD.

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A New Series of Contributions on the Treatment of Steel.

Having in mind the request of many readers for a clear, comprehensive series of articles upon tool steel and the proper methods of treating it, hardening, tempering, forging and annealing, we have arranged with Mr. Joseph V. Woodworth for a complete treatise upon this most interesting and important subject. As the author points out in the first chapter published in this issue, the position of the tool smith is becoming more responsible, and the demand for competent men greater. Further than this, no smith of any class should be without knowledge of the properties of steel and how to treat it, such knowledge as will be afforded by this series as mentioned, and we are most fortunate in having secured the services of such a practical writer and authority as Mr. Woodworth.

Demand for Shop Pictures.

A picture—there is nothing like it to bring an idea into reality. Pictures of a shop, which present in detail the outside design and the inside arrangement of tools and furniture, are the best object lessons a blacksmith can have on these points. If the arrangement be faulty, he can criticise it to his satisfaction; if good, he can adopt it. Exchange of ideas leads to competition and is the greatest stimulus to advancement.

We want photographs of well-equipped, up-to-date shops, as examples to be followed, and photographs of tumble-down establishments, illustrating a state of affairs to be avoided. To make it worth while, from a money standpoint, we offer a prize of $5.00 for the best shop picture and a suitable reward in recognition of the worst in existence. It may not always be easy or convenient to a smith to obtain photographs of his shop, but it is worth a little trouble, if only for future reference, to say nothing of helping along the craft. If you can get an interior or exterior picture of your shop, send it to us this month.

The Competent Boss.

To be a good boss means more than the average man supposes. It is not necessarily the man who knows the most that is chosen for this position, nor is it the domineering man with the loud voice. Not uncommonly one sees a man of great ability who has been at his trade, and even in the same concern, for a score or more of years and is still trudging along near the bottom, while younger, newer men have passed right over his head. Again the man who requires watching really pays for the overseeing himself, and will never come to a position of command.

Promotions are usually given to the men who show a capacity for taking hold and assuming responsibility of their own accord; and from these, "bosses" of departments arise. A boss must be able to handle the men under him, to tactfully lead them to do their best and yield the most for the concern.

A bright, cordial manner and a sense of humor will save many a critical situation. The man who can control himself, and do justice as to his own interests, may be trusted to control others and to mete out justice in cases of others. The man who aspires to lead and rule, even in a blacksmith shop, should cultivate the virtues of cheerfulness, justice and quiet decision.

A Piece of Good Fortune.

The winning of a prize of any kind is always regarded as "a piece of luck," and the winner as a lucky person. It makes one feel good to know that he, among hundreds, has been first and most successful, no matter how small the prize in view.

We congratulate Mr. John A. Piller, 245 Texas Street, San Francisco, California, as the winner of our $10.00 subscription prize, competition for which closed May 1st, 1903. Mr. Piller was fortunate in securing twenty-one subscribers to THE AMERICAN BLACKSMITH,—the largest club among those sent in. The contest was a very vigorous one, and all of the many sending smaller clubs received a recompense for their effort.

In a competition of this kind, the winning is not due to luck so much as to determined energy, and hence we take special pleasure in awarding this prize for subscription effort.

An Important Branch of the Craft.

One of the leading factors in the present-day development of the United States is the extension of its shipping. All along our coast line and lake shores new shipping yards are springing into existence, while new lines of steamers are opening up traffic with every remote corner of the globe.

In ship building, as in nearly every other industry, the blacksmith plays a very important part. The ship smith, of course, requires special training and special skill to meet the requirements peculiar to his craft. A really competent ship smith is necessarily a very skilled mechanic, for most of the jobs that present themselves to him require originality as well as mechanical ability. This fact is due to the widely different styles of vessels and the individual opinions of the various ship-owners.

We have secured a few excellent

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articles upon this branch of the craft, and we invite other ship smiths to write regarding their work, or to ask questions upon any point of difficulty. Remember that THE AMERICAN BLACKSMITH is for smiths of every class. Also that the demand for good ship smiths is on the increase.

Notes on Covering a Dash.

BY J. F. M.

To cover a dash, lay the dash frame on the leather. Mark and cut ½ inch larger than the frame all around. Lay the frame on again and mark with an awl by punching a hole ⅛ inch from each corner outside. Punch holes $\frac{3}{16}$ inch from the corners on the inside. Take the frame off and draw lines with a marker or sharp piece of pumice-stone from hole to hole where you are to stitch. Now cut the other side the same size, give one of the pieces a light coat of paste on the flesh side. Lay the two flesh sides together and rub out perfectly smooth. Lay between two smooth boards, say for three hours or until nearly dry. Draw the thread from your sewing machine needle and then perforate the marks all around inside and out. Then pull the two pieces of leather apart, put your frame in as it was when marked. Baste each corner on the outside and sew with two needles all around on the outside first, then finish on the inside.

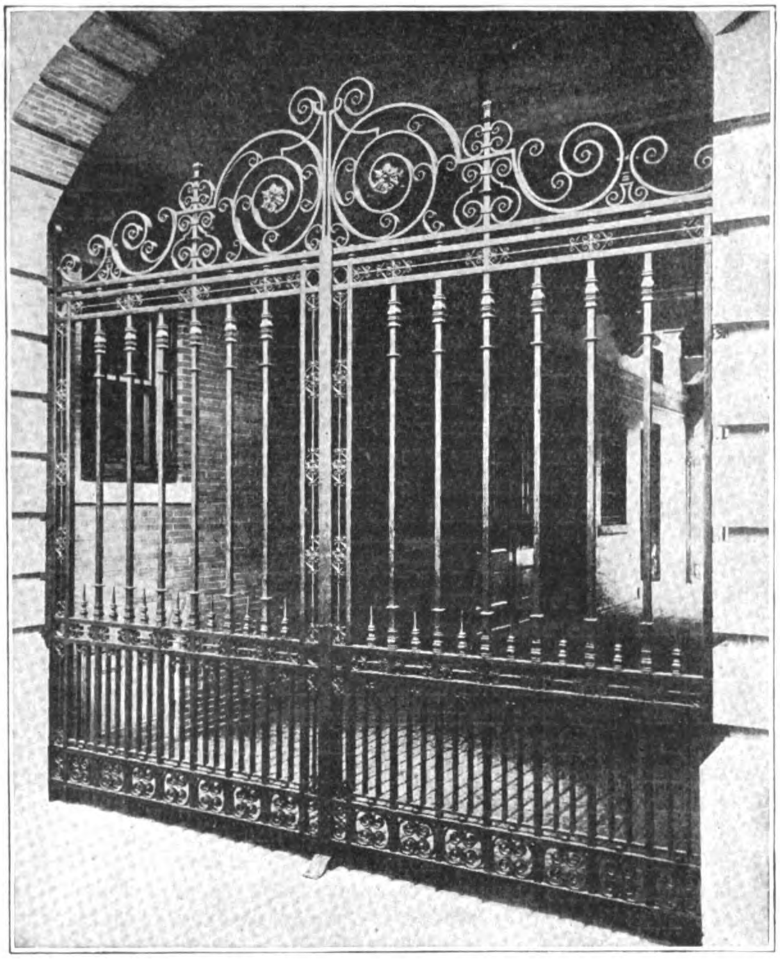
If you are careful to start in the holes as they were made you will have a dash without a wrinkle or draw. If you start wrong you may spoil the job. For a phaeton or curved dash, lay the frame on the leather, full side up and raise the leather up to the frame while marking.

Ornamental Iron Work.

Gate and railing work forms a goodly part of the house smith's work, and gives scope for creative qualities of a high order. There is something particularly gratifying about a well designed and skillfully forged gate for instance, due to the combination of solid strength and graceful, pleasing lines.

Photographs and half-tones of good examples of such work are always gladly received for illustration here. The accompanying engraving shows a particularly handsome gate executed at the forge of A. J. Jorss, Washington, D. C., whose iron work is well known to the readers of these pages.

In connection with the above specimen it may be noted how much judgment is required to adapt a design to its special use and surroundings. This gate is massive and somewhat severe in keeping with the stone-work of the archway in which it is hung. The same design would not be suitable for an ordinary residence gate.



SPECIMEN OF ORNAMENTAL GATE WORK.

How I made a Gasoline Engine out of an Old Steam Engine.

W. L. PAUL.

I took an old steam engine with a cylinder 4½ inches in diameter by 12 inches long, and cut off the steam chest and all other projections except the flanges around the ends. I then made a foundation by bending a piece of flat iron ½ by 2 inches edgeways to form a support for the engine. My next step was to take two pieces of flat iron, ⅜ by 6 inches by 10 inches long, and bend it to fit the outside of the cylinder. Feet were now made to one end, and the other end dovetailed into the flange of the bottom of the cylinder. I bolted the feet to the bed plate or foundation, spreading them far enough apart to allow room for the throw of crank. Turning the engine upside down, I bored four holes through the bed plate and through the bottom flange of the cylinder, put in bolts and screwed them up tight. This gave me a good strong support for my engine cylinder.

The bearings for the crank shaft should be bolted to the bed plate. After forging out my crank shaft of 1½-inch stock, I put it in place and fitted caps to the journals. I next rebored the cylinder. This I did by turning a piece of hard wood to fit the cylinder and twenty inches long, fitting a cutter or bit about four inches from one end, and turning it through the cylinder, taking a fine cut, just enough to smooth up the worn places. Taking the old piston which was two inches thick, I bolted it to a piece of gaspipe five inches long and 4½ inches in diameter. This gave me a piston six inches long. I worked the whole down to fit the inside of the cylinder. I cut four grooves for packing rings, bored a one-inch hole through the piston for cross head pin, made connecting rod and connected all together. The connecting rod should be just long enough so that when all is connected and the piston is at top stroke it will have one-third of the cylinder volume for what is called the combustion chamber.

Taking a piece of galvanized sheet iron, I made a jacket to fit water tight around the flanges of the cylinder. Taking the two heads of the steam engine, I placed them one on top of the other, leaving space enough between the two to allow the water to circulate between, and fitting pieces around the valves and edges to make it water tight. I then bored holes through the bottom,

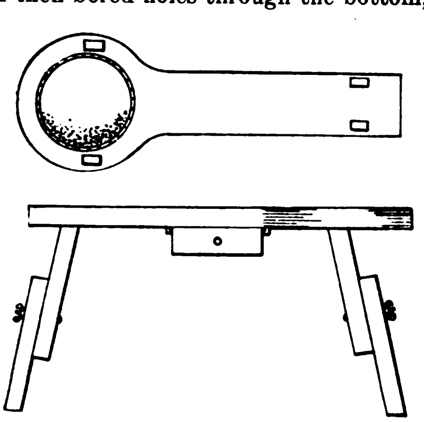


Fig. 9. A VERY CONVENIENT STRIPING BENCH.

1½ inches in diameter, for intake and exhaust valves and through the top opposite the intake and exhaust valves for the stem guides. I also bored a hole through the flange of the cylinder, one through the bottom of the cylinder head to match for water circulation, one through the bottom of jacket and another through the top of cylinder head, thus forming a complete water circulation.

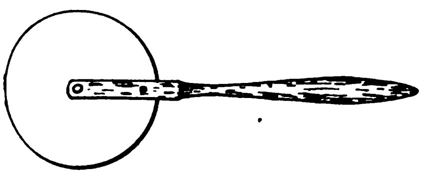


Fig. 10. A GOOD STRIPING PALETTE.

The above will give an idea of how I changed a steam to a gasoline engine. The valves and fittings can be arranged to suit the taste and convenience of the builder. I built the above engine with nothing but a post drill as a helping machine.

Talks to the Jobbing Shop Painter—3.

Striping Bench, Palette, Striping Pencils. How to Make and Care for Them. Striping Designs, Etc.

M. C. HILLICK.

The painter located in the country or village paint shop and who necessarily must have a practical knowledge of carriage painting from A to Z, should early learn how to stripe and ornament a vehicle, and particularly how to do rapid and fine line striping. At the present time this accomplishment is indispensable, and the jobbing shop painter unable to do such work is badly handicapped, to say the least. An artistically striped carriage is not only a good advertisement, but it draws trade directly. Nice, easy striping, moreover, aids to conceal defects in the finish which otherwise might arouse injurious criticism. In the country, carriage users like plenty of striping of an effective sort, and as a matter of business the painter should endeavor to satisfy the demand.

Not long since, the writer heard of a painter doing carriage painting in the country, who, in order to meet the wishes of his patrons, and not being a striper, hired a city painter to cut him stencils and actually stencilled the stripes on. Of course, this does not reflect favorably upon the critical and artistic judgment of the vehicle users of the community, but it certifies to their patience and their capacity for swallowing a bare-faced imposition. The art of striping is an easily acquired one, requiring only study and practice. To assist the painter in the work, a bench or seat will be needed, and as a suggestion for the same we illustrate in Fig. 9 a bench that can be raised and lowered to various heights as the workman may desire. Use 1⅝-inch poplar for top, shaping it with a swell and cutting out centre for leather seat. Make legs of 1½x1-inch pine, and mortise into the seat securely. Make legs in two sections with a sliding slot and thumb screw adjustment. Underneath attach a box for holding palette, pencils, color cups, tubes, etc. The cut shows plainly the constructive plan of the bench which will be found a handy labor saving device. The device shown in Fig. 10 is a striper's palette, to be made of ash, cedar or box wood. Attach handle, and with good care the device will last for years.

The pencil equipment is most important of all.

In art stores and paint supply houses one may usually buy sword and dagger pencils, but rarely, if at all, can one get a pencil that will do the work of the shop-made one, if it be skillfully put up. The beginner had best make his pencils in lots of six or more. Then out of this lot he should be able to get at least two high class pencils. It will be impossible to get all good ones. Even the expert pencil maker does not average more than four out of six pencils that may be accounted first class. Buy some swan quill, camel's hair pencils of exceptional quality and from these make the sword pencils. First remove from the quill the desired quantity of hair. Take the end that is to be tied between the thumb and forefinger of the left hand, and pull the long hairs over to the right, with the thumb and forefinger of the right hand thus exposing the short and objectionable hairs, which should be removed. This removal of the short hairs develops the pencil of one length of stock, not counting, of course, the taper of the

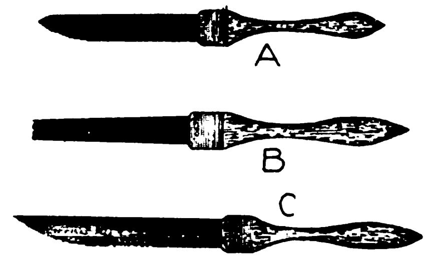


Fig. 11. THREE PENCILS USED IN STRIPING. A, FINE LINER; B, MEDIUM FINE LINER; C, HEAVY OR MEDIUM LINER.

pencil. This selection of stock yields a pencil of greater elasticity, finer poise and hang, and of better durability. The short hair having been weeded out, draw the hair to the proper bevel from one side of the pencil, for fine and heavy lines, as seen in Figs. 11, A, B and C. Then with the thumb and forefinger of the right hand work a little trimmer's paste into the hair inserted into the handle. Cut narrow strips of paper the length of the hair and apply a glaze of paste. Then on each strip of paper lay the hair for a pencil and fold up until the day following, or later. Make the handles from cedar or straight grained white pine. Split in center of handle end, and then from the hair trim the paper and insert the hair carefully in the split. Wind with strong linen thread and tie securely. The

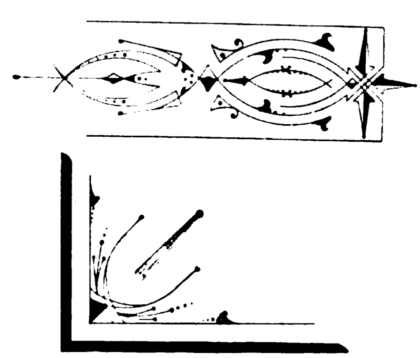


Fig. 12. TWO ORNAMENTAL DESIGNS EXECUTED WITH A SWORD PENCIL.

illustrations will afford the reader an idea of the shape of the pencil handles, winding, insertion of hair and general design. Practice and experiment in making will do the rest.

While a single pencil can be made to

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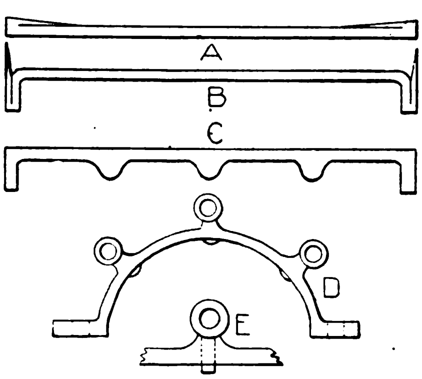
draw lines of various widths from the hair line to the heavy line, it is advisable to make a pencil for a certain line, and no other. A larger assortment of pencils will be needed, but the work can be done more easily and with more uniform excellence. The accompanying illustrations (Fig. 12) of ornamental striping serve as examples of what may be accomplished with the sword pencil. Always keep the pencils in a dust-proof compartment. Flatten the hair out straight on a piece of glass. After using the pencil, wash out thoroughly in turpentine, getting all accumulations from the heel of the pencil. Wipe dry in soft woolen cloths and grease with a mixture composed of three parts mutton tallow and one part sweet oil.

(To be continued.)

A Brief Talk on Ship-smithing Work.

BY EXETER.

In making a belaying-pin band, 4 by 1½ inches, first draw down the stock and turn over as shown at A. Next, bend the ends as shown at B, and weld down as seen in the figure at C. This welding gives a stubb and square corners with the grain of the iron all in your favor (which is an important item in ship work where strength is required). The next step is to bend to a curve as shown at D. After bending, punch the holes in the cones. Now put in your eye-bolt, as at E, with the end white hot, and rivet up. You can then heat up, pene the scarfs close, take a last heat and clean up the work. You will notice that no jump heats are used in ship work—they should be avoided as much as possible. Shipsmiths do a



A CONVENIENT METHOD OF WELDING EYES ON BELAYING PIN BANDS.

large piece of forging with one ordinary fire because they try to keep their work together.

Eye bolts are sometimes made solid and sometimes welded up to form. A great many are used in ship building when blocks and tackle have to be made fast at many places on the deck and spars of a ship. A full-rigged ship has a large amount of forged work aloft.

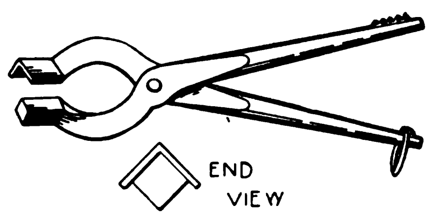
It takes an exceedingly clever iron worker to be a good shipsmith. He must be able to iron off a yacht, or to make all the forgings of a full-rigged trading ship, or even to make any piece of iron work for a first-class man-of-war. Hence a good shipsmith stands in the front rank of metal workers.

A Useful Pair of Tongs for Holding Slip-shares.

S. T. GREIMANN.

The accompanying sketch is to illustrate my device for tongs to hold slip-shares. I have used them for three years, and have proved their utility.

While sharpening a plow slip-share, the ordinary straight tongs will slip and jar loose from the hammering. Some smiths use a kind of handle and brace to bolt on with two ⅜ by 1 inch plow bolts, but it takes too much time this



AN INGENIOUS FORM OF SLIP-SHARE TONGS.

way. The bolts will heat and work loose, so that it takes a wrench to keep them tight, especially when an old slip-share is worn at the top of the landside. Sometimes it comes unwelded. My slip-share tongs will hold a bar of lay-steel together so that it cannot jar loose. They will fit any kind, right or left, any size or any make of share and hold it firmly. They are never in the way over the anvil while sharpening or pointing a slip-share, and have the same angle as if a solid bar were bolted on. They never will work loose.

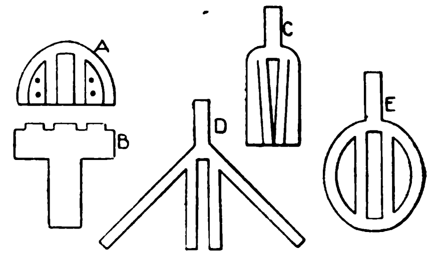
I have seen seven other different devices, made for this purpose, fail, but mine never does. During my apprenticeship of ten years, I studied on a new device for this purpose and I caught the idea of the tongs illustrated. In the sketch the first figure shows the tongs in elevation, the second, an enlarged cross-section at the end of the lips.

How to Make a Gridiron Step.

JOHN A. SCHULTE.

I have been making gridiron steps in hundreds of different styles for the past thirty years. I occasionally have an order for an odd step to replace one that is lost or broken, not of my own make. Consequently I am often without a tool to get the proper shape and size. I thought it might interest some of the younger men of the craft to know how one old fogy does it.

I recently had a small oval step to make to replace one lost off a French



PROCESS OF MAKING A GRIDIRON STEP, AND TOOLS USED.

make of cart. The step was 3 by 4 inches inside. The bars were ¾ by $\frac{3}{16}$ inch. I started off by getting up a tool to make it in. I welded a shank for the anvil on a block 3½ inches wide, 1¼ inches thick, shaped it half oval, then lightly welded a piece ⅞ inch wide, ¾ inch thick, exactly in the center, keeping it back ¼ inch from the front edge as shown at A. Then I shaped two pieces for the sides and riveted them on, leaving full $\frac{3}{16}$ inch between as shown. B shows a side view of the tool.

To make the step, I took 1¾ by ¾-inch Norway iron, formed a shank, punched a ⅝-inch square hole and split the stock as shown at C. Then I opened the strips out, drew out the iron for the frame and bars, set with a small set hammer, between the bars, until they were ⅞ of an inch apart, cut off bars to 4½ inches, formed a two-lipped scarf on the end bars, bent around as at E, in the tool, welded the bars and lap of the frame in the tool and the step was done.

Power and Machinery in the Shop.

J. H. SKEELS.

I should like to say a few words on power and machines, as I have been in the blacksmithing business for twenty-one years and have used all kinds of power from a tread power to a gasoline engine. I run an all-round blacksmith shop, doing work all the way from track shoeing to difficult forging. I use gasoline power at present, as I find it to be the most convenient, for it can be started or stopped at any time, thus saving time and expense. Last spring I put in a No. 2 Hawkeye Power Hammer, made by the Hawkeye Manufacturing

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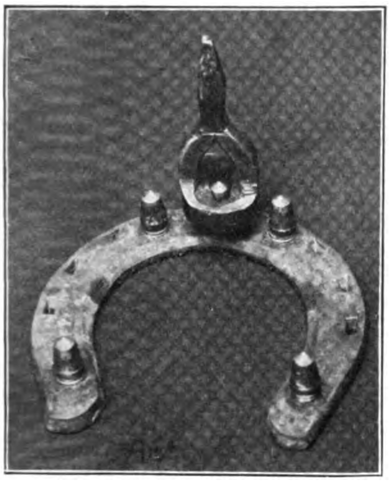
Company, Tama, Iowa, which has proved to be the most valuable and useful machine in my shop. It is light running, easy to operate and strikes a hard blow. Last spring I welded one hundred and forty-nine sets of plow shovels, which more than paid for the hammer. It makes plow work a pleasure instead of a worry, and I cheerfully recommend this hammer to all brother craftsmen. A drill press is another good machine to help out in busy times, for a lot of drilling in hot weather is a man-killing work. A power blower must be used to force work and save your men. I have a ventilating fan which I find pays for itself twice over every summer. Emery wheels and buffers for polishing make good business in Iowa in the spring time, for Iowa farmers use all kinds of plows. I also wish to call attention to disc sharpening. I have a machine which does its work as fine as silk. I sharpened sixty-nine discs this spring before April first.



A VERY SERVICEABLE NEVERSLIP WRENCH.

A Neverslip Wrench.

ROBERT WERK.

The illustration reproduced here is that of a Neverslip wrench, one of my own make. It is made with an oblong hole and notches or teeth, and is intended to be used with an ordinary brace. It will be found a very serviceable little tool for the calks of the Neverslip Manufacturing Co., New Brunswick, N. J.

Blacksmithing in the Tuskegee Normal and Industrial Institute.

By courtesy of Mr. Booker T. Washington, principal of the above school, we are able to publish an account of the work done in the blacksmithing department. This institution was established by an act of the Alabama Legislature in 1880 with an appropriation of $2,000, under the name of the Tuskegee State Normal School. The first session was held in a rented shanty-church with thirty pupils in attendance and one teacher.

The object of the school was and still is, to give a thorough moral, physical, literary and industrial training to young colored people. This object appealed so strongly to the public that during the first session the present location, consisting at that time of one hundred acres with three small buildings, was purchased by Northern friends. By Act of Congress in 1890, a tract of 25,000 acres of mineral land valued at $125,000, was given to the institution. The present endowment is thus about $400,000, or including property and equipment, in the neighborhood of $800,000. The institution is well situated about a mile from the town of Tuskegee, and comprises over a score of well-appointed, up-to-date buildings, devoted to the purposes of dormitories, training halls, libraries, trades buildings, etc. The course is so arranged that no student can obtain a literary education without learning at the same time a suitable trade, and the expenses are placed so low that tuition is easily within the reach of every young, able-bodied, intelligent and industrious colored man or woman.

The blacksmithing course (the subject of interest to our readers) is very complete and extends over two years. During the first year, the boys are taught to clean the shop properly and to make fires. They learn the names and sizes of tools with the care of them and their places; and also to practice economy in the use of material. They also study the formation of iron and steel and the different kinds and grades of each; the various modes of welding and the use of sand and welding compounds; how to weld and set tires and axles; measurements of track of axles; dish of new wheels; making clips, nuts, trace-ends, and putting work together. The bench work comprises filing, clipping, jointing and fancy work, with the use of emery and sand paper. In fact, every branch of the trade is considered. Essays are written and monthly examinations held on all topics.

During the second year, the main training is in horseshoeing. The preliminary instruction consists in the condition of the shoeing floor, and how to make a shoer's fire; the names and sizes of tools; how to make a mould; also how to strike on a shoe; the names and sizes of shoes and nails; how to file a shoe, and how to pull off an old shoe. Special lessons are given in fitting shoes to horses with different gaits and differently shaped feet. In this year instruction is given in the making of tools, also fender work, dash and rail work and tempering. Carriage work with the repairing of wagons and buggies and estimating costs of jobs are all handled in the second year, and at the end of each month, examinations are held as in the first year. Lectures are given daily. Thus at the end of his course the student is thoroughly

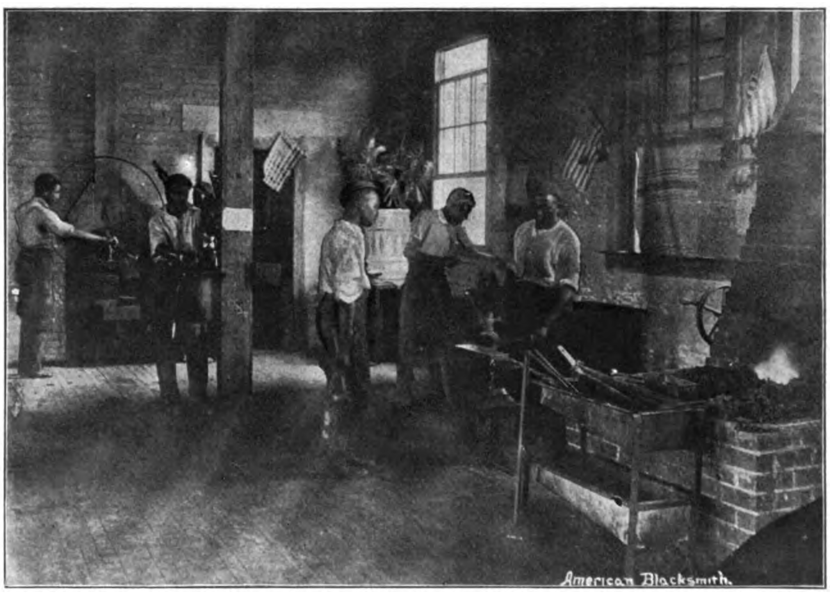


Fig. 1. A BUSY CORNER IN THE TUSKEGEE SHOP.

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informed in both the practice and the theory of his craft.

In every branch of the mechanical department are introduced what are termed Industrial or Theory classes.

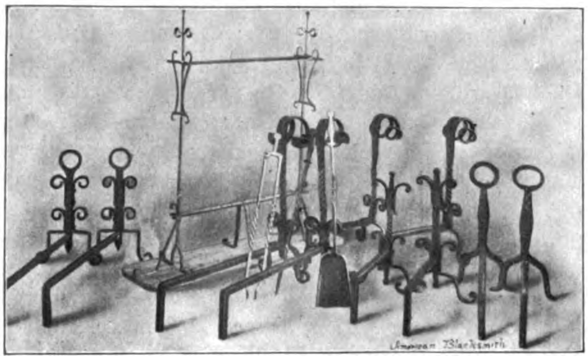

Fig. 2. SOME WORK OF THE TUSKEGEE BLACKSMITHS.

These classes are held every afternoon except Saturdays, and last forty minutes. Problems are discussed and any work of the day that has presented special difficulty, receives attention. The principles of the trade and the materials with which the students work are taken up and studied.

In the horseshoeing department a horse's hoof and leg, properly mounted and capable of being dissected, is kept in the shop to enable the students to study the anatomy of the horse's hoof and leg and how the different diseases affect the various parts. The benefit arising from such classes must be apparent, for thus are connected the theoretical and the practical sides of science. The academic work in such subjects as chemistry and physics is made to bear directly upon the shop practice. The pity is that all our horseshoers have not these advantages.

Another point emphasized at Tuskegee is the preparation of mechanical drawings. All work done by students in the blacksmith and carriage building departments is from drawings. Sometimes these are prepared in the regular drawing department and sometimes by the student making the article. This practice gives the boys an intricate and detailed conception of what they are about to do and the proper relation of parts. Besides blacksmithing proper, a similar training is afforded in the allied branches of wheel-wrighting (a three years' course in this), harness making, and carriage trimming and painting.

The engravings published herewith are from photos furnished by the Institute. The first is of a corner in the blacksmith shop, showing the forge in operation and several of the students at work. The second engraving illustrates a collection of andirons, shovels, tongs, and other fireside utensils. The third represents a couple of covered wagons made by the students for use in the establishment. The fourth is a reproduction of the blue print of a wagon plan made at Tuskegee. Fig. 5 shows the Slater Armstrong Memorial Building, and Fig. 6 the Boys' Trades Building, both fine structures.

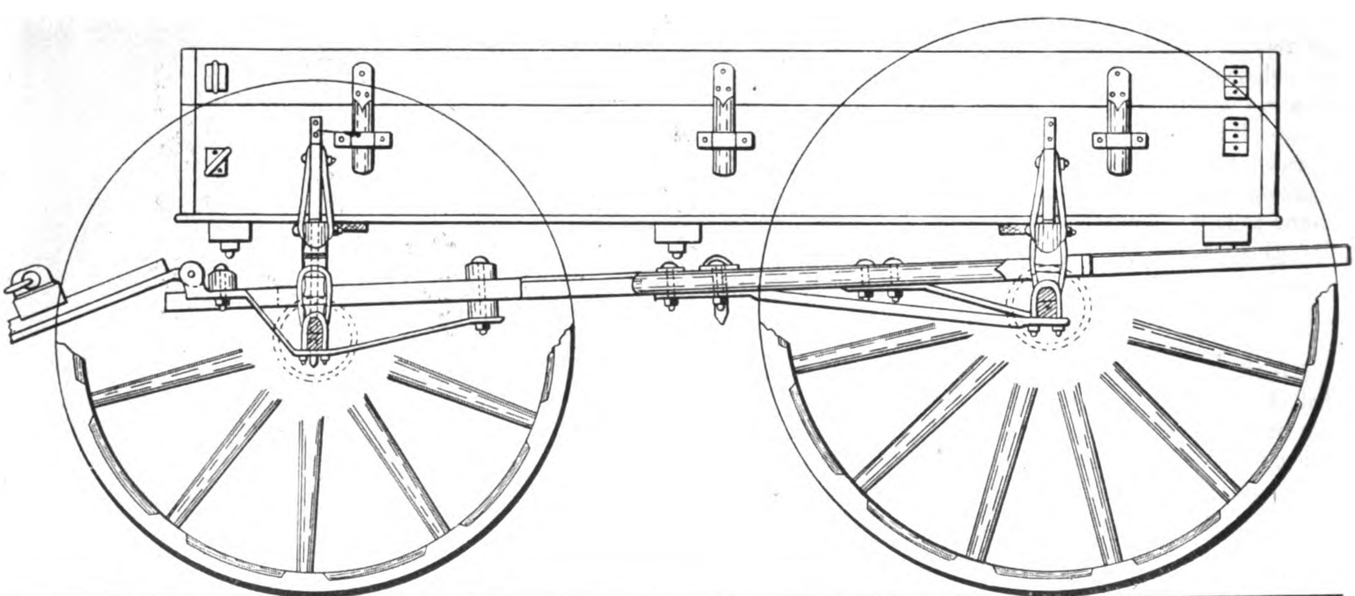

Fig. 4. PLAN OF A WAGON, FROM A BLUE-PRINT MADE IN THE DRAUGHTING DEPARTMENT AT TUSKEGEE.

The object of the Institution is so good and the work has been so efficient that its influence must tell beneficially upon the colored population of the "Sunny South."

The Gas Engine of Quality.

BILLY BUNTZ.

The superiority of the gas engine over other powers for the smithy is well established, yet when contemplating the purchase of one, the smith, bewildered by glowing descriptions, exclaims: "Each company claims to have the best."

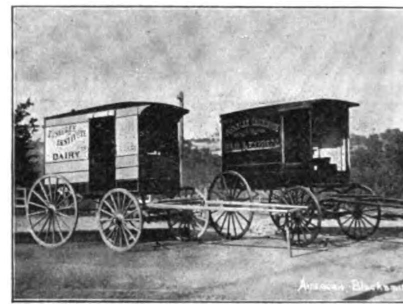

Fig. 3. WAGONS MADE BY THE TUSKEGEE BOYS.

A conclusion of this kind usually prompts a blind purchase, as shown by the experience of the smith of whom the following story is told:

"Slim's engine, being $50 cheaper," the smith contended, "will save me just that much money."

After trial, however, it proved to be a poor runner, and he thereupon visited Red Top where the engine was built.

"Where is the engine works?" he

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inquired, upon his arrival there.

"Right here," answered a boy, pointing across the railroad track.

"I can't see it."

"Can't expect to see through a box car; the shop is on the other side."

Some so-called factories cannot even be seen. They exist only for a short time, then go out of business, leaving customers with a cheaply constructed engine and no place to get a repair part. It is easy to make a difference of $50 or $100 in prices. Engines, like watches, are to be had in all grades.

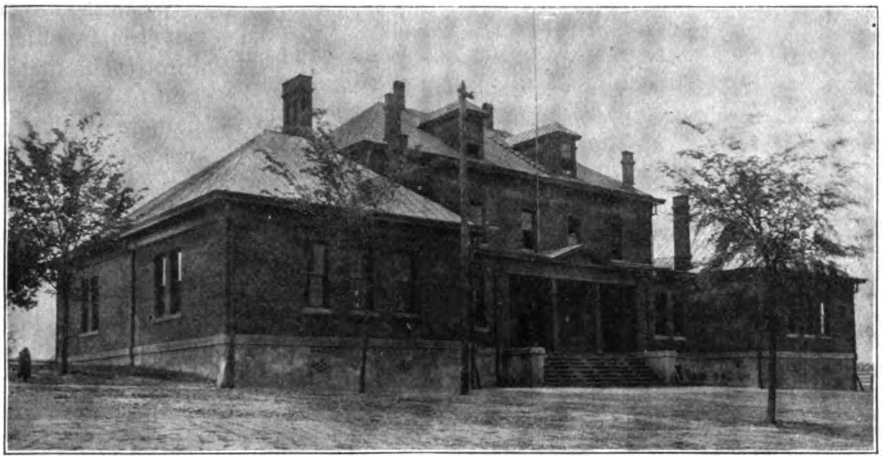

Fig. 5. THE SLATER-ARMSTRONG MEMORIAL BUILDING AT TUSKEGEE.

The supremacy of one engine over another is in its quality. To design an engine along conservative lines requires experienced workmen, expert in the gas engine business, and to construct an engine of this kind requires the very best materials. That the smith may not grope entirely in the dark in making a selection, a few points of excellence are here cited.

The cylinder should be of a high-grade gray iron of close texture, with internal apertures for the flow of water or oil in keeping it cool. Where water is used the cylinder must be drained in cold weather, else it will freeze, while with an oil-cooled engine there is no danger in this direction. No water supply is needed with cylinders which are oil-cooled. The cylinder-head should be separate and should also be water-jacketed or oil-jacketed like the cylinder itself in every case.

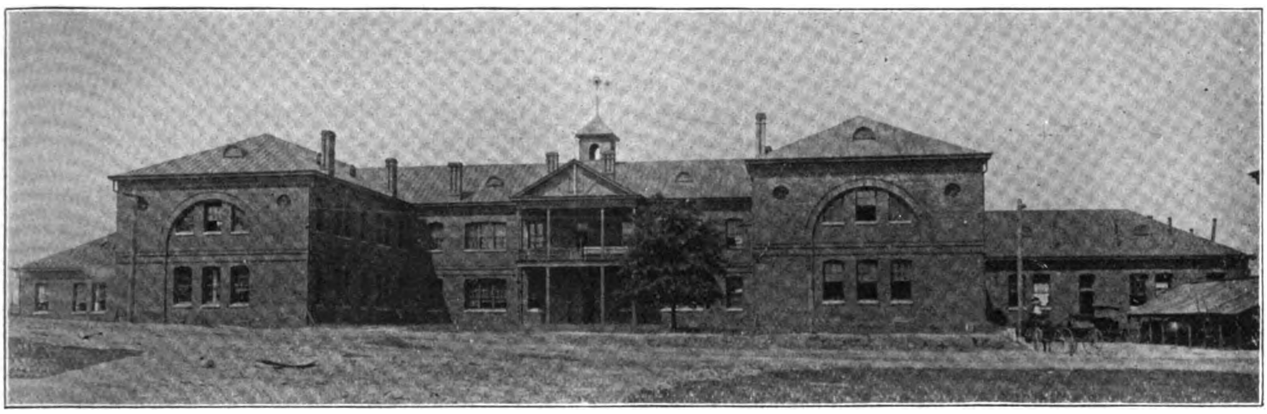

Fig. 6. VIEW OF ANOTHER PORTION OF THE SCHOOL—THE BOYS' TRADES BUILDING.

The piston should have metallic spring rings, so that all wear will be on the rings and not on the cylinder or the piston. When worn out these rings may be renewed at slight expense. Connecting rod and crank should be very strong, as they are subjected to the hardest service. The best cranks are drilled or cut out of a solid block of steel, without any welds or bends.

The engine of quality is of the four-cycle type and has electric ignition. An engine of this kind costs more than a two-cycle engine with hot tube ignition, but gives the best service in the long run.

There is perhaps nothing so provoking as a cheaply constructed gas engine which "bucks" every day or two by reason of the working parts having been inaccurately figured by the manufacturer. An engine of this kind is as troublesome as an old blind horse.

Before buying an engine it is well to visit shops that are driven by one. If an engine of certain build has been rendering good service for a brother smith for a number of years, it is likely that one of that kind will do the same for other folk. There is more satisfaction in buying in this way than by obtaining prices from a dozen engine companies and then buying from the company that sells the cheapest, gives the longest time on payments, or gives a guarantee as lengthy as the pedigree of a thoroughbred horse.

Where the shop is large or considerable power is required, it should be borne in mind that an engine of five or ten horsepower costs little more than a small one.

Quality, not prices or terms, ought to govern in buying an engine. A good engine speaks for itself, and, like a thing of beauty, is a joy forever; while a cheaply constructed engine is worse than a nightmare.

Attention to Detail.

THOMAS BEASLEY.

There is a certain class of blacksmiths that seem to think, since machinery is used to the extent it is at present, that they should slight their work because it is to be machined after they are done with the job. I don't wonder at the slurs that are often thrown at our trade by men who have to finish up work done by smiths too lazy or slovenly to finish their work as it should be.

Such workmen are usually ill-paid for their services, and how can it be otherwise when they take no pride in their work either as to quality or

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quantity? In my estimation there is nothing more pleasing to the eye than a neat painstaking job of forging, and when you show me a man that is particular with his work, I will show you a man who is a credit to his community and commands the best of wages.

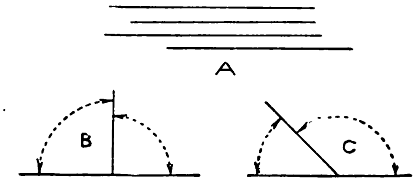

Fig. 4. PARALLEL AND INTERSECTING LINES.

Some trades are learned in a year, while others take longer to become expert in, but from my twenty-five years' experience at blacksmithing I can truthfully say that there is hardly a day while working at the forge, but what I learn something new and useful to be stored in my brain pan for future emergencies.

The trouble with most smiths in this "rapid" age is that they lose sight of the little things connected with their work and keep only the big things before them. For instance, they may need several tools on one heat, but never think to lay these tools out convenient to their hand, and in the order they are needed, but wait

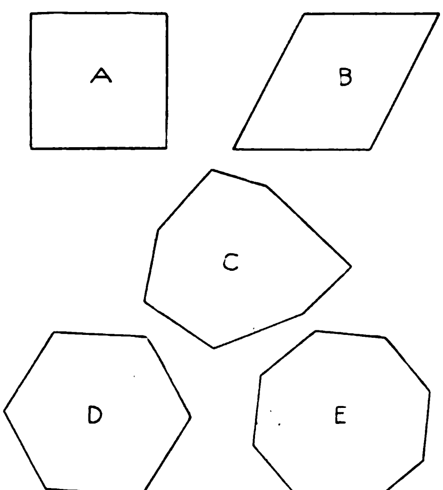

Fig. 5. RECTILINEAR FIGURES OF DIFFERENT FORMS.

until the heat is on the anvil, and then have to look over all their tools before finding the right one. I have seen men run all over the shop to borrow a needed tool or perhaps have to grind a chisel before the work could be finished as it should be. Time, tide and a blacksmith's heat wait for no man. Have a place for everything and everything in its proper place; then you will not be the laughing stock of your shop mates or perhaps working for less wages than those who pay proper attention to detail.

The Elementary Principles of Mechanical Drawing.—2.

The Simple Geometrical Figures and Terms.

To any man desiring to clearly represent a tool or piece of work or even to accurately understand the tool itself upon paper, some knowledge of the common geometrical forms and terms is of the greatest value. The uninformed person may, for instance, call anything with four sides a "square," or any figure having a round form, a "circle." He can seldom tell you what is meant by a triangle, a hexagon, rectangle or ellipse. And so many mechanical contrivances involve these figures that some understanding of them will solve many a problem for the reader of mechanical drawings.

The first principle of geometry is the point. A point is, of course, merely position in space. It has no parts and no size (or magnitude, as geometry names it). A point is marked, in drawing, by a small dot.

The line is the second principle. A line is simply length without breadth. In drawing a line, of course the ink gives it width, but a true line has none. The edge of a knife will illustrate a line. Lines may be straight, curved or crooked. A straight line is one that does not change in direction throughout its entire length. Curved lines change their direction regularly from point to point. A crooked line changes its direction without system or regularity.

The surface comes next to the line. A surface has length and breadth but no thickness. A plane surface is a perfectly flat one, or one in which a straight line passing from any one point to any other point in it, always lies in the plane surface. For instance, place the edge of a rule upon a polished slab of stone, and it will touch the stone throughout the length of the rule. But lay the same rule upon the surface of a block of rough stone and it will touch only the projecting places. The polished slab has a plane surface, the rough one has not.

A solid has length, breadth and thickness. Right here, may be noted the meaning of the word dimension. A point has no dimensions. A line has one,—namely length. A surface has two,—length and breadth. A solid has three dimensions—length, breadth and thickness. Solids are regular or irregular. Regular solids have all their surfaces the same shape and of equal size, such as the cube, whose six sides are all equal squares.

Facts About Lines and Rectilinear Figures.

When the direct or shortest distance between two lines continues the same throughout their length, the lines are said to be parallel (Fig. 4, A). Any number of lines may be all parallel to one another, as the lines on a sheet of foolscap paper.

When lines are not parallel they will cross each other. It may be noted that parallel lines can never be

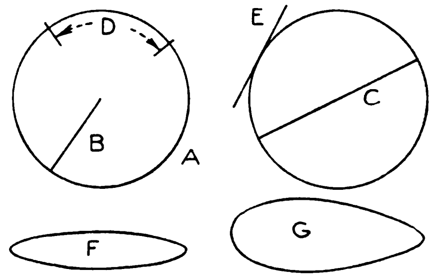

Fig. 6. CURVILINEAR FIGURES AND LINES RELATING TO THE CIRCLE.

made to cut one another, no matter how far they be drawn in either direction. When two lines meet or cut one another they form angles. If one cuts the other in such a way as to make the adjacent angles equal, the lines are perpendicular (See Fig. 4, B) and the angles are right angles. When they are not equal, the lesser angle is said to be acute (sharp) and the greater obtuse (dull). An acute and an obtuse angle are shown at C, Fig. 4.

It takes at least three straight lines to enclose a space. Hence, no figure can have fewer than three sides. The three-sided figure is called a triangle—meaning three-angled. It will plainly appear that since the sides of a figure all join forming angles, there will be as many angles as sides. Triangles are of various kinds. The triangle whose three sides are all equal is called equilateral. One having two sides equal and the third unequal is said to be isosceles. If the three sides are all unequal the triangle is scalene. When one of the angles is a right angle, the triangle is said to be a right-angled triangle.

A four-sided figure has also four angles, and any four-sided figure is a quadrilateral or quadrangle. When

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the angles are all right angles, the figure is called a rectangle. All rectangles have their opposite sides parallel to each other. A rectangle whose four sides are equal to one another is a square (Fig. 5, A). When the angles are not all right angles, we have a diamond or rhombus, as shown at B, Fig. 5, instead of a square. Any figure of more than four sides is called a polygon (See Fig. 5, C). The hexagon has its six sides all equal and its six angles all equal. Fig. 5, D, shows a hexagon. So with the octagon—eight sides equal and eight angles equal, as shown at E, Fig. 5. The total distance around any figure is its perimeter. The line passing from the boundary of one side through the center and terminating at the opposite side is called a diameter. The distance from angle to angle through the center is the diagonal.

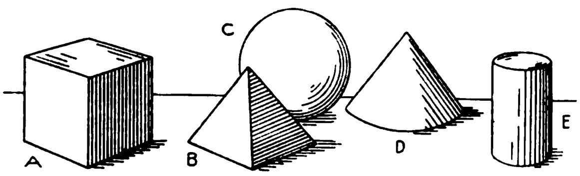

Fig. 7. A GROUP OF THE MOST COMMON SOLIDS.

Curvilinear Figures.

The circle is the principal curvilinear figure. A circle is a plane figure bounded by a curved line, called the circumference (A, Fig. 6). All the lines, radii (one alone is called a radius, see Fig. 6, B), drawn from the center to the circumference are equal to one another. A line drawn through the center of a circle to the circumference at either end, is called a diameter, as seen at C, Fig. 6. Any portion of the circumference of a circle is an arc (Fig. 6, D). A continuous straight line that touches a circle without cutting it is called a tangent to the circle. E, Fig. 6 is tangent to the circle.

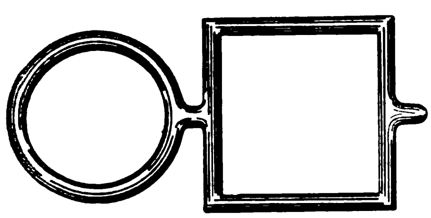
Fig. 1. DOUBLE WITHE FOR MAIN MAST AND TOP MAST OF SCHOONER.

Two or more circles drawn about the same center are called concentric. When they have not the same center they are eccentric. The other ordinary curvilinear figures are: the ellipse and the oval. The ellipse is peculiar. The best way to understand it is to draw one. To do this take a string, two pins and a pencil. Placing the pins a short distance apart, join the string to form a loop. Place this around the pins loosely enough to admit of inserting the point of the pencil to draw the string out a little. Holding the pencil vertically, pass it around with the loop of the string from one point to the other, then the other side the same, and the line traced will be an ellipse. This is illustrated at F, Fig. 6. An oval is an egg-shaped figure: i.e., it has one end smaller than the other (See G, Fig. 6).

Solids.

Solids are either regular or irregular. The most common regular solids are as follows: The cube (See Fig. 7, A) which has six sides, each being a square; the pyramid, (seen at B), the sphere, at C, the cone, D, and the cylinder as shown at E.

A good idea of the forms of these solids may be obtained by placing the figure upon a paper and drawing a pencil around the base, then turning carefully so that an adjoining surface may be similarly outlined. Then the solid may be turned until all the surfaces have been drawn round, and the result will be a pattern of the figure. The sphere, however, cannot be represented in pattern.

In concluding, a few words of ordinary occurrence may be defined.

To bisect means to divide into two equal portions. To trisect means to divide into three equal parts. Angles as well as lines, surfaces and solids may be bisected and trisected.

(To be continued.)

Iron Work for Schooner Masts and Spars.

W. L. PAUL.

For a schooner, say of twenty or twenty-five tons burden, we take stock $\frac{1}{2}$ by 2 inches to form a withe for mainmast head and topmast, which is a double withe, as shown at Fig. 1. This would be about seven inches inside for the mast head and six inches for the topmast. Take two pieces of the same length and lay them flat sides together, putting a collar or ring of $\frac{3}{4}$-inch round stock around both pieces as shown at Fig. 2, A. Place in the fire, take a good welding heat where the collar is placed, weld all together, and with the same heat spread the ends as shown at B. Heat and form withe for topmast as shown at Fig. 2, C. Next weld the ends together. Now lay off and bend the ends as at DD. Bend a piece of the same size stock in the middle, flat sides together, taking a heat and welding about two inches of the end together. Punch a hole half an inch from the end, and round up on the horn of the anvil, like Fig. 2, E. After taking a good heat, put it in the vise, eye down, bend like Fig. 2, F, turning up ends N N. Scarf and weld as in Fig. 2, C, and your withe is complete as shown in Fig. 1.

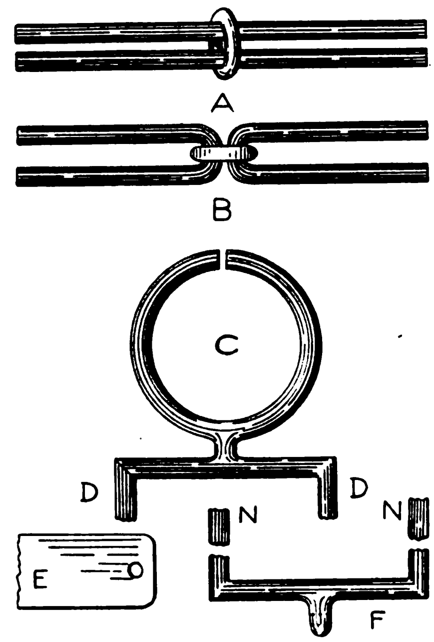

Fig. 2. PROCESS OF FORMING WITHE.

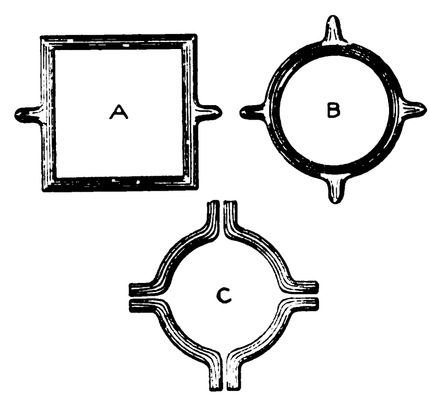

Fig. 8. WITHES FOR FOREMAST AND BOWSPRIT.

Fig. 3, A is the foremast withe, and is formed in halves like Fig. 2, F. Fig. 3, B is for the bowsprit and spars, and is formed as in Fig. 3, C with the ends welded together, holes punched and worked round on the horn of the anvil which completes it.

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The Builders.

LONGFELLOW.

All are architects of Fate
  Working in these walls of time;
Some with massive deeds and great
  Some with ornaments of rhyme.

Nothing useless is or low,
  Each thing in its place is best,
And what seems but idle show
  Strengthens and supports the rest.

For the structure that we raise
  Time is with materials filled.
Our todays and yesterdays
  Are the blocks with which we build.

Truly shape and fashion these,
  Leave no yawning gaps between;
Think not, because no man sees
  Such things will remain unseen.

In the elder days of art
  Builders wrought with greatest care
Each minute and unseen part,
  For the gods see everywhere.

Let us do our work as well
  Both the unseen and the seen;
Make the house, where gods may dwell,
  Beautiful, entire and clean.

Else our lives are incomplete
  Standing in these walls of Time,
Broken stairways where the feet
  Stumble as they seek to climb.

Build today, then, strong and sure,
  With a firm and ample base;
And ascending and secure
  Shall tomorrow find its place.

Thus alone can we attain
  To those turrets where the eye
Sees the world as one vast plain
  And one boundless reach of sky.

HEATS SPARKS WELDS

Looking ahead to midsummer trade?

Are you posted on styles for summer carriage painting?

Up with the lark is the rule of the energetic smith these summer mornings.

June—the summer opening season. Has it commenced well with you? Push the trade.

A new blacksmith shop will be put up by the Locomotive & Machine Company, of Montreal, Quebec.

No work is done well unless the workman's heart is in it and his mind attracted to it, work as hard as he may.

Have you benefited by any of the improvements that have come into the mechanical world since last June?

Pray remember that somebody is just waiting to answer that question that is bothering you. Send it in.

Good times continue and promise to continue in spite of the gloomy forebodings of a worthy contemporary of recent date.

Keep in touch with the craft. Your shop may be in the backwoods, but that is no reason why your ideas and methods should be, too. Keep up to date.

Think a minute! A clear idea of just what you want to do and how you are going to do it will save many a mistake and much waste of time and fire.

The University of Colorado, situated at Boulder, Col. (H. C. Crouch, M. E.), will add six or more new fires to their manual training blacksmith shop.

Business attracts business. Keep busy and full of energy if you would draw custom. Let your efforts flag ever so little and you will be rated a sinking ship.

A really successful business man must necessarily understand human nature. A little tact and management will often win and retain the most fastidious customer.

Necessity is the mother of invention; but it takes brains—and working brains at that, to feed and clothe and mature the invention. Necessity alone will not do this.

Wisdom, 'tis said, is experience turned to account. Even failures and loss of time are profitable to the wideawake man who has the brains to investigate a failure and trace its cause.

A rainy day comes as a pleasant break occasionally—if you have the proverbial something laid up for it. The man whose accounts lie uncollected cannot hope to find it very cheerful, however.

The University of Pennsylvania has just completed plans for a fine new engineering building, which will include among other laboratories on the first floor a well-equipped forge and iron working shop.

Some people spend the whole summer wishing for snow; and pine away the winter in dreams of leafy trees. The wise man makes the best of things as they are, and is surprised at how good that best turns out to be. There are two points of view.

A cheerful boss is a stimulus to his workmen. Not only the encouragement he may give in words, but the example he sets and the very effect of his presence helps to make the hours pass and the work get done quickly. Good temper is a habit.

Ten minutes today—ten minutes tomorrow and ten minutes every day—that makes an hour at the end of a week. Great deeds have been accomplished and great ideas formed in less than an hour. Hence, do not waste the minutes.

A substantial evidence of appreciation is an unasked increase of wages. Give the apprentice such wages as will make him respect himself and the work he is doing, and not feel like a "cheap John."

Talking things over with fellow craftsmen is of the utmost benefit to the blacksmith, as to other trades and professions. Why not? The yearly increase in the popularity of conventions and meetings testifies to the value of this.

The race track has done much to promote the science of horseshoeing in America Trotting is an artificial gait, and trotters are therefore subject to many artificial diseases. In treating these, the American horseshoer becomes very expert.

A legacy of prejudice is what many of us have to contend with; and it sometimes takes a lifetime to outgrow the antiquated notions instilled in us in childhood. More reason for fighting down the old and striving after the new when worthy.

The shop, where the workman spends almost all his waking hours, is surely worth keeping bright and attractive. The effects of a little care in this direction will show in the temper, the morals and the work of every smith engaged therein.

For painstaking work, does the American smith favorably compare with him of the old country? If so, why can the British mechanic, not only make a living, but grow rich while using old, out-of-date tools that the average American blacksmith could do nothing with? Why is it?

Who is to blame if a smith does not read up-to-date literature? Himself. In these days when books and magazines of every style and description are easily within the reach of all, even the poorest, most illiterate man can afford and obtain exactly the literature he needs. There is no excuse.

Horseshoes are at a premium in the Philippines. The natives take all the shoes they can get hold of to make over into spear and arrow-heads. Hence, the "shoemaking stands," where shoes are made by American machinery, are always crowded with horses, mostly cavalry horses, waiting to be shod by the farrier.

Perseverance is a very powerful factor in the history of every achievement. A Buffalo blacksmith relates how he succeeded, after a period of six months of repeated trial, in curing a horse of "Skelping." During that time he had tried one method after another without benefit, when a final trial brought the desired result and the horse went right.

A clever phamphlet has recently been published, emphasizing the joy of work. The true pleasure of toiling for a living, of feeling that you have earned what you get, the healthful weariness and the sound sleep, the hearty appetite and the wholesome fare, and above all, the freedom from the care of a large fortune—these are blessings that few workmen know how to appreciate.

Jack's a dull boy, when all work and no play is the rule. The blacksmith is no exception to the rule. It is the duty of every man to take some recreation every day. If his work be manual, let him spend some time each day in reading, writing or other diversion not of a physical nature. He returns to his craft abler, brighter and better satisfied with life, and time thus spent will be more than repaid.

America ranks first among the nations for inventiveness, and Connecticut first among the States. Second on the list stands Great Britain, and third, Germany. The German Emperor recently paid tribute to an American inventor, Mr. John Arbuckle, of New York, by personally dictating a letter thanking him for a device to extricate stranded vessels, and expressing interest in the American's invention.

Management, not extent of business, makes the difference in the profits of a concern. A certain manufacturer found upon looking into his affairs that he was handling $500,000 worth more business than the year before, but his feeling of increased wealth disappeared when investigation at the year's end proved that his profits had increased just $8.08. Good management is an essential to any business, large or small.

What's that? we asked Tom Tardy. He was looking over a stack of torn and dirty papers that he had collected from various nooks and corners of the shop.

"Them's my memos," he replied, throwing out bits of newspapers and wrapping paper as he sorted them. "And I'm blest if I know which is which. Here's a bill of five dollars, but—can you make out whether Brown owes it to me or me to Brown?—I can't jest remember like. I'll have to ask Brown." Then he went on examining others. This is Tom's way of balancing up his books. We do not recommend it.

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American Association of Blacksmiths and Horseshoers.

Excellent reports of progress come from many quarters. No mistake has been made in thinking the time is ripe for the blacksmiths, horseshoers and wheelwrights to organize in every county of the land where not already banded together for common interest, nor has any mistake been made in thinking that practical working associations can be formed to bring immense benefits to their members. The first thing necessary is for every man to lay aside every particle of prejudice and to co-operate with his brothers and neighbors. Pull together instead of apart.

In its recent experience the Association has learned of men who were actually resetting and shoeing for eight and fifteen cents, and in the rich State of New York, too. Think of it! On the other hand, craftsmen have told how raises in prices from 25 to 30 cents on each shoe brought them $300 and over extra each year. Figure it out yourself and see what it would mean. Then again take a county with one hundred shops. If each shod on an average of but five horses a day, a raise of five cents a shoe means a total of $30,000 a year divided among the smiths of that county. There's food for thought and a spur to action! It is only our just dues, too, for isn't the farmer, the hardware dealer and everyone we buy from, charging higher prices, more than ever? The country was never richer and more prosperous than it is to-day. Shouldn't the blacksmith, upon whose skill so many depend, feel some benefit from this prosperity instead of getting poorer every day? One smith told his wife that at the present price of stock, the more work he did the poorer he got. And this is not so far from the truth either. The low prices seem to be one reason why so many smiths are going out of the business.

This should not be, for there is no mechanic who works harder with head and hands, or in more trying situations, to earn a living for himself and his own, than the blacksmith.

The Association named at the head of this article was incorporated under New York State laws, to carry out all possible reforms and benefits for the craft. Already efforts are under way to secure Lien Laws in our States so that the craftsmen can always be able to use as security for payment the animal or vehicle worked upon, and that too without holding the article in his shop. Liens of this kind are filed, and do not become void by the sale of the article any more than do mortgages upon property. Laws of this kind exist in but few states and should be in force in all. This Association proposes to procure them for the craft if it possibly can be done, and prospects are very bright.

As to prices, the American Association has the authority to grant charters to branch county associations, and to provide plans for their formation and regulation. This Association has a number of representatives at work forming branches, but as it would require a small army to cover every state, we desire to hear from interested smiths in every part of the country, who will take hold of the work in their own home county. By our plans they would be repaid for the time taken from their shop. The Association will gladly give the benefit of its past experience to any interested craftsmen. Literally bushels of letters have come from all sections and a great many branches are being formed. Bear in mind that the American Association does not fix the prices—these are agreed upon by each branch itself after organizing.

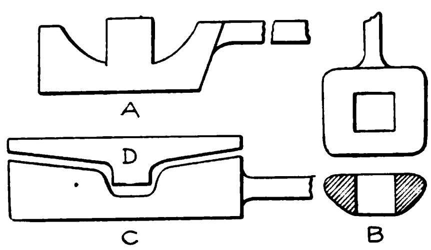

Fig. 35. TOOLS AND PROCESS OF FORGING YOKE ENDS.

The American Association simply furnishes charters and all necessary literature, and gives its help in every possible way.

All who are interested should address the American Association of Blacksmiths, Horseshoers and Wheelwrights at P. O. Drawer 974, Buffalo, N. Y., for plans and information. State what county you are in and how many shops it contains.

Local Items.

The Livingston (N. Y.) Branch of this Association was organized at Mt. Morris, N. Y., May 14, the following officers being duly elected: President, W. E. Cole, Avon; Vice-President, Wm. Mate, Mt. Morris; Secretary, A. C. Palmer, Dansville; and Treasurer, M. J. Scully, Geneseo, N. Y. The meeting was a most enthusiastic one, and adjourned to meet May 30th at Livonia, at 3:30 p. m.

Meetings will be held at early dates in Genesee, Chautauqua and Monroe counties, New York State.

The Railroad Blacksmith Shop.—8.

Making a Valve Yoke.

W. B. REID.

Opinions as to the best and most economical manner of making valve yokes will naturally differ. The result of years of practical experience suggests the following:

First Method: In railroad or contract shops, with suitable heating furnaces and appliances, where valve yokes are made in quantities, the following is practicable. Cut old car axles into pieces long enough to upset into ingots of sufficient size for yoke back required. Charge furnace with these (from ten to fifteen pieces) according to capacity.

Porter bars are heated in smith fire to apply to ingots as they are successively brought from the furnace to hammer. Draw the ingot down quickly to proper proportion and check down part for stem with triangular fuller as at A, Fig. 35. This can be done more quickly by checking down both sides at once by using two fullers, or one made in double form, B, Fig. 35.

Draw down both ends quickly, imparting proper taper in tool, C, Fig. 35. This tool is left open across as shown, for quick manipulation, and because it does not readily form coldshuts at the base of stem. It has the further advantage of keeping the iron compactly together in uniform mass, thereby preventing a defect at base of stem peculiar to second method of manufacture, to be described in the next article. This operation completes the piece in one heat, as at D, Fig. 35, and should be done so expertly as to be laid down while still almost at a white heat—and as smooth as silk. In this way ten or fifteen pieces can be forged in a very short time.

The other half of yoke may be made of bar or forged iron, preferably forged to preserve uniform quality of material in yoke. Subsequent operations take place at anvil. With a welding heat, round and draw down the short stem to proper size. Draw down ends and bend same over anvil or former, A, Fig. 36. Driving the iron downwards with a fuller as shown, prevents

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cold-shuts inside of corners. Scarf the parts, splice fashion, clamp together and weld from sides, B, Fig. 36. The top plate of clamp made with a hole for stem, C, Fig. 36, permits the placing of clamp at center of yoke. The welding of stem carefully either by lap or splice scarves, completes the job.

The stem should be made of good hammered iron in preference to rolled iron of any kind. The manner of forging the back of yoke, as just described, is not regarded with favor by many writers. The cross grain of iron in stem is the theoretical objection urged, an objection which practical experience very often largely discounts. Forged as we have described, an approximately perfect, homogeneous piece of iron should be the result; leaving little if any trace of cross grain at any point.

The same objection and answer is applicable to a large variety of forgings made in the same way, such as motion links, motion link hangers, etc., having equal, if not more, strain to encounter than valve yokes.

The cause of such imperfections is more generally due to careless, slovenly manipulation by the smith or forger, loosening and shattering the fibre of the iron by hammering the same when too cold. In shops where an occasional yoke back has to be forged at an ordinary smith fire, the writer would not recommend this method. In this case several heats would probably be required to finish the piece, which would not produce that solidity which forging the piece in the mass at one heat ensures.

(To be continued.)

Kinks and Conveniences in the Wagon Shop—3.

BY D. W. M.

Plan and Arrangement of Shop and Office.

The arrangement of the shop has everything to do with convenience in handling goods. There are many excellent plans in common use, the principal being the square, the L-shaped, two parallel buildings with a yard and drive-way between, and the T-shaped building. In any case, the office should be located alongside the entrance-way.

For a large establishment, the T-shape has many advantages. The main essentials are, to be able to go or communicate quickly from the office to any part of the factory. Also, every department should be easily accessible to any vehicle without taking off its wheels. For these purposes, the ceilings should be high and the doors opening properly. Attention to these points in the outset will greatly facilitate future operations. Regarding an elevator, when one is employed, the cross-beam should be high enough and the platform large enough to accommodate the largest city truck or buss without unhanging. A chute is very handy for conveying small pieces to any spot desired. An incline may be substituted for an elevator and has the advantages of rapidity and saving of labor, but it takes more room. In case the vehicle must be unhung, that expense should also be reckoned in with the cost of the job. So much for the large concern.

In a repair shop, of course everything should be arranged with reference to handling work with the greatest convenience. The woodworker's bench should be on the same floor as the smith shop and adjoining it, or even in the same room. The stock room should be situated near the main entrance. The scales, the wash-stand, or platform on which the old or new vehicle may be run to be washed, and a bench for odd repair work should all be near or adjoining the stock room. It should be so planned that a vehicle may be removed from or entered at any part of the shop without disturbing the other parts.

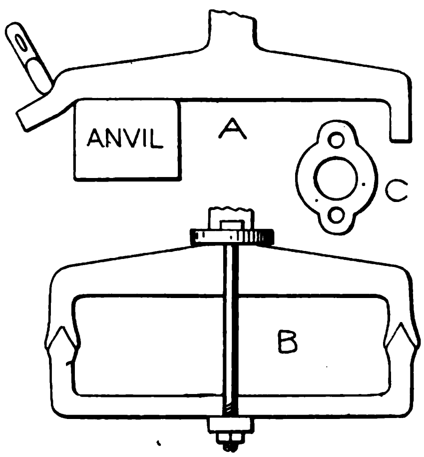

Fig. 36. SHAPING AND WELDING THE VALVE YOKE.

To-day, everything possible must be done to turn capital more rapidly, if the establishment is to be successful. How to make the same shop, in room, time, labor and permanent investment of capital do the greatest amount of business—that is the problem of the business man. Time saving devices that allow the work to be done in, say, half the time employed by other methods, save not only half the cost of labor but of shop rent and insurance. Every step and movement of a workman takes time and costs money.

One mistake often made by employers is that of keeping the foreman utterly in the dark concerning the business, except about his own immediate work. In the case of a large establishment, the foreman of each department should know something of the requirements of all the other departments. This is necessary to the intelligent co-operation of departments. A good plan is to have duplicate cards of all orders relating to each vehicle, given to each department. Another plan is to have a separate card attached to each portion of the vehicle likely to be removed or detached. The full directions are placed in a book, one in each department which is open to every employee. This insures against all misunderstanding. The latter plan has the advantage of saving the time required in hunting up the vehicle body, gear, wheels, shafts or other parts every time one wants to consult the card for instructions, by simply consulting the book at the foreman's desk. In this book a margin may be left in which to enter, each day, the state of progress of the vehicle. These conveniences are as applicable to the small as to the large shop.

In adopting any new device the shop owner should carefully consider the expenditure and the benefit likely to be obtained by its use. In the small shop, it is often cheaper and quicker to do much by hand than to put in a lot of expensive machinery.

(To be continued.)

Some New Ideas Relating to Hoof Contraction.

So many diseases in horses' feet take their rise from contractions of the hoof that any new means to prevent or cure this defect must be of very great interest to every farrier or horse owner. Therefore, in the interest of the craft at large, we give, herewith, a description of a set of new devices in the form of heel expanders—the patented invention of Mr. Robert Moser of 1916 Baltimore Avenue, Kansas City, Mo.

These expanders, says Mr. Moser, are intended to check the tendency of the hoof to grow inward and to gradually force it outward from the frog until

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normal shape and conditions are restored. Or when the abnormal condition has become chronic, the device will give relief and render the animal fit for use. The expanding devices are of many kinds, but only three varieties of them are taken up in the present article. The first expander is intended for hospital use—that is, for sick horses not working (See Fig. 1). The forward end of this expander is usually supported only by a bandage. They may also be used with rubber pads, on horses in use.

For ordinary style of expander, Mr. Moser has devised a practical means of supporting the front end of the angular spring; this is furnished with a threaded loop-hole or eye at the angle, to which is rigidly secured a flat, fork-shaped attachment of soft steel by means of a little set-screw. Both arms of this attachment extended outward between the hoof and shoe so that the ends rest upon the former. It is made quite thin so that the arms may be bent in any direction thus to accommodate themselves to hoofs and shoes of any size and form. Any excess in length may be clipped off.

This same device may also be used on invalid horses in pasture cure, by fastening the flat ends to the hoof without the support of shoes. In this case, another soft steel attachment is selected with broader arms and two little holes are punched at the proper points on the extended ends of this fork-shaped attachment to meet if possible the old nail holes of the toe part. Both punched arm ends should be cut or let in to the horn of the toe sufficiently to save them from too much direct contact with the ground, and fastened with two extra light nails or wood screws. This operation is so simple that it may be performed by any horse owner. When this arrangement is used on working horses, care must be taken to have the fork-shaped attachment level with the surface of the horn, as this prevents their pressing on the hoof more than any other point of the shoe does. When the hoofs have short toes and thin soles, a soft steel form must be attached to the expander with extended arms wide enough to allow the ends to run out away from the injured or weak toe.

Mr. Moser states that he has applied over six hundred of these expanders to various kinds of working horses and has never lost a single piece. The little pointed hooks on the ends of the spring arms, when adjusted into the hoof, make it very secure, exerting a strong and continuous pressure upon the side of the heels to which they are applied. This pressure prevents the frog from being crowded by contracted heels. The pressure of the spring continues uniform, accommodating itself without noticeable diminution of force to the heel as it expands.

One very important point is emphasized by the inventor of these devices: viz.: he advises horse shoers not to saw or cut through the hind ends of the heel as it weakens the whole hoof. On every horse's foot a pair of horny braces extend from the heel, where they are connected with the shell of the hoof, to the sole, along the sides of the frog. These braces are easily separated from the heel by careless cutting; hence the danger.

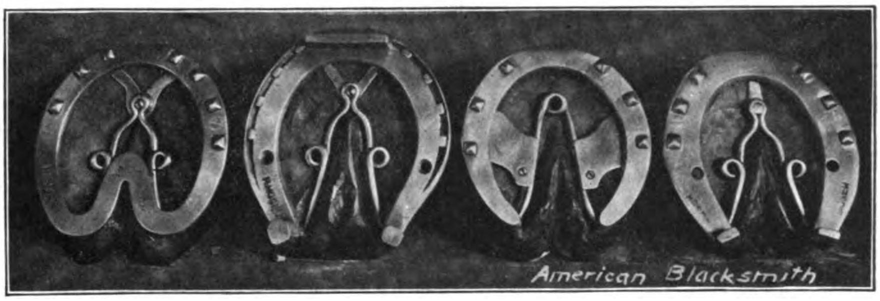

Fig. 2. EXPANDERS APPLIED WITH SHOES.

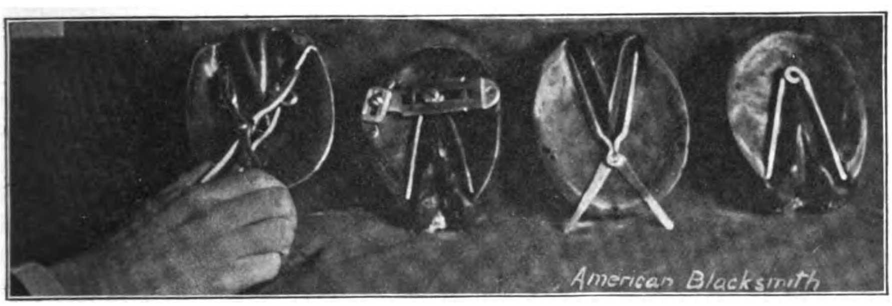

Fig. 1. PATENT SPRINGS APPLIED TO THE HOOFS WITHOUT SHOES.

These expanders are all made of round silver steel wire about $\frac{3}{16}$ of an inch in diameter. Its pressure depends upon the extension of the side arms and especially upon the hind ends of the pointed hooks. These latter should be about $\frac{1}{4}$ inch to $\frac{5}{16}$ inch long. The width behind from hook to hook should be about one inch greater than the width of the heel. In contracted feet, there is usually thrush in the frog. When the expanders are applied, the hoof is opened up immediately and often to such a degree as to be perceptible to the operator. The opening is often from $\frac{1}{8}$ to $\frac{1}{4}$ inch according to the conformation of the hoof.

In case the heel and frog are very hard and dry, a small hook should be filed on the expander, and when the parts are very closely presssed together, take an iron or file shaped similarly to the hook filed on the expander, heat it red hot and press it down between the frog and the heel about $\frac{3}{8}$ of an inch deep—never less than $\frac{1}{4}$ inch, according to the level or bottom line of the heel. In the event of specially stubborn cases, a special spring of double coil is substituted, as shown in the engraving, Fig. No. 2.

The inventor has made a special study of this phase of horseshoeing and is an enthusiastic student of the scientific principles of his craft. His ideas are well worth considering.

A Georgia Price Schedule.

GEO. P. BLANCHARD.

Shoeing, all around	$1.00
Shrinking tires	0.50 and up
Refilling a wheel, new spokes	0.10 to .25
New buggy rims	$1.00 to $1.50
Wagon tongues	1.50
Shafts, each	.75
Cross bars	.50
New tires, per set	4.00 to 8.00
Painting buggies, three coats	3.50
New wheels, per set up to 1¼ in.	10.00

Recipes for Tempering Steel Springs.

A very common query from smiths is how to temper various kinds of steel springs. Hence, for the benefit of the craft, we give the following recipes for performing the operation in several cases.

When the spring has been carefully

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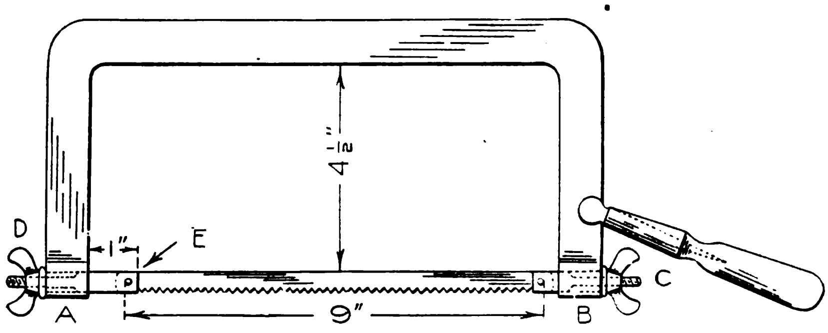
forged, finished up and is ready for tempering, clean out the forge and make a brisk fire with good, clean charcoal, or, if bituminous coal must be used, see that it is well burnt to a coke, in order to free it from the sulphur that it contains, as sulphur will destroy the "life" of the metal. Carefully insert the steel in the fire and slowly heat it evenly throughout its entire length. Give it time to heat through its thickness and when the color shows a light red, plunge it evenly into lukewarm water, or water from which the cold chill has been taken off, so as not to chill the surface of the metal too quickly before the inside can also harden, and let it lie in the water until it is of the same temperature as the water. A much better substitute for water is a good quantity of animal oil—whale oil or lard oil is best. As a substitute, we have used lard, by melting it before we inserted the heated steel in it. The advantage of using oil is that it does not chill the steel so suddenly as water and there is less liability to crack it. Remove the hardened spring after it is sufficiently cool and prepare to temper it. Make a brisk fire with plenty of live coals and smear the hardened spring with tallow. Hold it over the coals, but do not urge the draught of the fire with the bellows while so doing. Heat gradually, moving the spring over the fire to receive the heat evenly. In a few moments the tallow will melt and take fire and blaze for some time. Let it blaze freely, circulating from end to end, to thoroughly envelop the spring. Blaze (again smearing with tallow) a second time. If the spring is to be subjected to a great strain or is to perform much labor, it should be lightly blazed a third time. If it is to be exposed to heat and cold, it should be left to cool off and not cooled in water or by throwing upon the ground.

Spiral springs of steel wire as used for spring balances are tempered by heating them in a close vessel with animal charcoal or with bone dust packed around them, similarly to the process of case hardening. When thoroughly heated, cool in a bath of oil and proceed to temper them by putting a handful of them in a sheet-iron pan with tallow or oil and agitating them over a brisk fire. The tallow will soon blaze and the shaking will cause them to heat very evenly. If a long, slender spring is needed that requires a low temper, it can be made by simply hitting the soft forging on a smooth anvil with a smooth face hammer. The metal will be sufficiently compressed to form a very good spring without further tempering. A light hammer and "many blows," and the spring will last a long time, when there is to be no great labor in its action.



AN IMPROVED STYLE OF HACK SAW FRAME.

An Improved Hack Saw Frame and Holder.

JOHN.

The trouble I have had with the hack saw frames that have been on the market, was that they were as a rule, too light, and the handle was so small and ill-shaped that they cramped the hand, and as it became painful, one lost control of the saw and made a misstroke which resulted in a broken saw. Therefore I took a piece of tire steel, 1 x ⅜ inches, bent it into shape as shown in the cut, scarfed and turned the end, B, over a piece of round ⅝-inch steel and welded the scarf, which for all practical purposes only requires sticking. The end, A, was turned over a square piece in the same way, and the hole trued up with a square file. The round hole was squared only at its front ends so that when the thumb nut, C, was turned only two turns, the square part of the saw holder could be turned in other directions. The saw holder at the other end of the saw was left longer, so the end of it would strike the piece being sawed and not the thumb where it usually strikes at E. The handle was a chisel handle, 1½ inches at its largest part, the shank being welded to the frame as shown and bent down until the natural center of the hand was in line with the saw blade. Otherwise the frame could be made in the manner hack saws usually are. If made of spring steel, the frame might be made lighter, but I find the extra weight an advantage rather than a fault and I find the frame being made 4½ inches from the saw a still greater advantage. The handle may seem out of shape when the saw is turned to the side, but it is not more so than on those now in use, and its much greater convenience when used where nearly all of the sawing is done is too great for it to signify. No brother blacksmith will regret the time spent in making one, if he has use for one at all. I would not exchange mine for any other I ever saw unless I received besides it the price of making one of these. This handle can be applied to saw frames now in use.

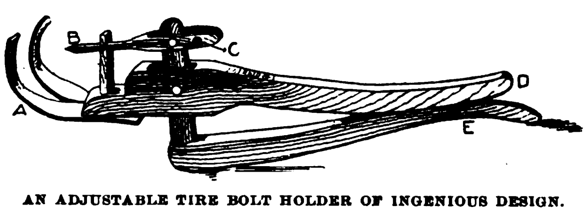
A Rule for Measuring Tires.

G. B. BUSSEY.

Take the wheel to be tired and place the open joint on the end of the tire, roll once around and mark it. Allow three times the thickness of the tire for bending, and also enough to make the weld. This will give you the point at which to cut the tire iron. I have no trouble with this method and it is quick and easy.

Still Another Tire Bolt Holder.

An interesting model of a tire bolt holder, the invention of Mr. A. D. McShane, of Monument, Colorado, has just been received by THE AMERICAN BLACKSMITH. The model is cleverly executed in wood and iron. The accompanying sketch is taken from this model, showing the levers and pin of wood and fork of iron. The tool, however, is intended to be made of iron or steel, the pin B, being of steel.



AN ADJUSTABLE TIRE BOLT HOLDER OF INGENIOUS DESIGN.

To operate, place the forked hooks, A, over the felloe of the wheel, and by swinging the lever, E, from the handle, D, adjust the pin, B, to hold bolt in any thickness of rim. To further graduate

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the tool to fit still lighter wheels, the pin may be moved forward and pivoted from the holes at C.

Steel and How to Treat It—1.

Selection, Experimental Treatment and Testing of Steel.

JOSEPH V. WOODWORTH.

The treatment of steel is a subject of unending interest and although it has been discussed quite fully, there are still large numbers of mechanics who are not familiar with the fundamental principles, and practical points necessary to treat steel successfully. In these articles it is the purpose of the writer to discuss the treatment of steel, and present clearly and concisely the various practical, approved methods for heating, hardening, tempering, annealing and forging, and while some may find in them nothing new, I am certain that many others will find much of interest. The articles will be written from a distinctly practical point of view and anything purely speculative will be omitted.

The first thing for the steel worker to appreciate is that in order to succeed it is necessary to commence with good steel, and the sooner he realizes that good results can not be secured from poor steel the quicker he will commence to succeed. The keystone of successful steel treatment is economy, and this can only be obtained by purchasing steel which is uniformly of the best quality, as its ability to retain a cutting edge for long periods makes it the cheapest and most economical in the long run. Any mechanic that has worked the different brands of steel into tools for cutting purposes knows that cheap steel *is very expensive.*

In regard to the selection of steel, too much can not be written. It is an art by itself and one can become proficient in it only after long experience in treating and using the different brands. Thus, one will strike a grade or brand which can be hardened successfully, with the positive assurance that satisfaction in use will be guaranteed. When a brand of steel which will do this is found, it will be well to stick to it.

To decide whether a brand of steel is of high grade, one must understand how to treat it. Very often a piece of steel is condemned as being of poor grade when as a matter of fact the man who treated it was to blame, because he did not understand the proper processes, or else the steel was used for a purpose for which it was not intended. Numerous, indeed, are the causes of failure in the use of high-grade steel. Very often the steel is overheated when forging, hardening or annealing, or the percentage of carbon is not right for the purpose for which the tool is to be used. However, the most frequent cause of failure in the treatment of steel is found in the hardening process, as all too frequently those who do this work fail to realize that it is an operation requiring experience and skill of a high order.

In order to determine the correct hardening process for high-grade steels the mechanic must first be familiar with the characteristic appearance of the grain of steel that has been hardened properly: as the condition of the grain denotes whether the process has been correctly applied or not. Let us say that a bar of high grade steel is selected, and grooves turned into it as shown in the figure, after which

A BAR OF HIGH-GRADE STEEL WITH GROOVES FOR TESTING.

we place one end of the bar in a good fire up to the first groove. When the section of the bar in the fire has reached a white heat and the remainder of the bar a dull red, we quench it in cold water until perfectly cool, then remove and dry it. We may now test the different sections with a file, and will find that the first section is glass hard, and the intermediate sections of degrees of hardness passing from the hardest to the softest. Next we will break the different sections apart and find in the grain of each the results which occur in steel sections hardened at different temperatures, and from them learn at what temperature the ideal results may be obtained. We find that the first section has an open and crystallized grain; and that the other sections get closer in grain as they approach the end. Somewhere around the center of the bar we will find the grain of an even and velvety appearance which indicates a hard and tough structure. This is the section that has been subjected to the proper degree of heat in accordance with the carbon percentage of the steel. For a piece of steel to be hardened properly it must be both hard and tough, and to attain these results the heat must be high enough to harden it through, but not high enough to open the grain.

The proper treatment of steel cannot be learned from books or articles alone. They will, to be sure, teach one to understand the nature and peculiarities of steel and point out the way to successful results; but the road of experience must be traversed by the individual before he can hope to become expert. First let the mechanic learn the different brands; experience in their use will show to what purposes they are best suited. Although one may be familiar with all brands of steel it is not always well to depend on this knowledge altogether, especially when a large number of tools are to be made from the same grade. When this is the case it is always best to test the steel before using it, as it *may* be found wanting. Cut off a thin disk and harden it at a low red heat. Then crack it across the center and any defect which may run through the center of the bar will be apparent. If the steel proves defective do not use it; if sound examine the grain, being careful not to wet the fracture. If the steel is good and has been properly heated and quenched, the grain will appear fine and close. If the process has been wrong or the steel is poor, a coarse appearance similar to broken cast iron will be presented. While a coarse grained steel may be safely used for tools which will not be subjected to much strain, it should never be used for tools which have to do heavy work. For hardness test the center of the fractured disk with a file, while for great hardness try an edge of the fracture on a piece of glass and if it cuts the glass, satisfaction will be assured.

Aside from hardness and temper, there is another condition which should be present in steel which is to be used for general work and that is toughness, and while many steels will become fine grained after hardening and will be of proper carbon percentage they will not toughen. This is the quality to be prized in steel which is to be used for making expensive tools, and whether the steel possesses it or not should be ascertained before proceeding with the working of it. To do this, harden a thin disk and place it on the anvil. Then strike it heavily with a hammer; if it breaks instantly, the steel is brittle and not tough

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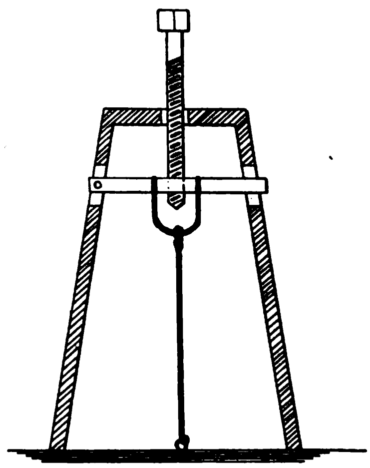
enough, while if it requires several blows to break it, and the surface flattens a little before breaking, it is steel of the finest grade and may be used with the certainty assured that it will stand up well.

To some it may appear that the testing methods are both unnecessary and expensive; but this is only at the beginning and although the tests may be often dispensed with, it will be well to try them before making costly tools and thus prevent mistakes, which would mean much more than the time spent in testing. We are constantly hearing of what this machine or that machine can do but very rarely indeed are the cutting tools used in them mentioned, and still if these cutting tools were not hardened and tempered properly, what would be the accomplished results? I am sure that but few men in places of importance in shops realize how much depends on the man who does the hardening, and that but for him a large amount of money would be lost. When it is considered that where the cutting tools are not properly hardened, accuracy and economy are impossible, the factor of proper hardening will be appreciated. Thus today, the hardening of tools in many shops has become an art by itself and only those who have devoted years to becoming expert in it are employed to do the work. It is not unusual to see an advertisement in a trade paper calling for an expert hardener at good wages; in fact there are any number of shops where such positions are not filled merely because they can not get men sufficiently expert to do all of the work in this line. Manufacturers are beginning to appreciate the fact that they are losing a lot of money through their tools not being hardened properly, and just as soon as this fact becomes universally appreciated —as it will soon be—there will be a demand for expert hardeners that will be difficult to supply.

Hence it would be well for those who now have the opportunity, to become skilled in the art of steel treatment. But let it be remembered that it *is* an art and *not* a side line, and that to become successful in it, constant application, high grade skill, experience and good sound judgment are absolutely necessary.

Naturally the reader is apt to ask: "How can one become a successful hardener of steel" and it is my purpose in this series of articles to point out the way to succeed in this line as well as in the other processes of steel treatment. The first requisite is a knowledge of the nature, and peculiarities of steel, and I have pointed out how to go about learning these things.

Of course all grades of steel can not be used for the same class of tools. Thus a fine edged cutting tool cannot be made from chisel steel, nor a good milling cutter from hammer steel.



A NEW AND USEFUL WHEEL-BENCH.

Hence to do the first operation properly in the treatment of steel—that of heating it—one must first be familiar with the peculiarities of the particular steel of which the tools are made, as but few steels are affected alike by the action of heat. So before closing and taking up the heating processes I repeat: *Know your steel before attempting to heat it.*

(To be continued.)

A Wheel Bench of Useful Design.

B. B. TICHENOR.

I wish to describe here the way in which I have fixed my wheel bench, so as to save a great deal of heavy lifting. I take a piece of 1½-inch axle stub from six to eight inches longer than the distance across the bench, and punch a hole through one end to hinge on one side of the bench. Then I put a hole far enough from the end to come directly under the hole in the bench through which the bolt goes that fastens the wheel. Next I drill a hole on each side of the center hole and through this put a staple which extends about four inches below the first piece. This staple is for the purpose of fastening the hook that leads to the floor. Cut threads in the center hole and put a bolt through it from the top by which it can be drawn up tight. This will be understood from the illustration herewith. The cross bar should be so fixed that it will drop enough to let the hooks out easily when the bench needs to be moved. There should be a hook or something to hold the bar up level, so that the bolt will start easily. I make two bolts of different lengths, one for wagon work and one for buggy work. This saves lifting the wheel over the center rod.

Tales of a Traveller.

JOHN T. CHANDLER.

While recently paying a visit to my old home in England, I had the opportunity of studying the condition and circumstances of my brother smiths and particularly the country smiths, as I stayed for a time in my native home with one of them whose father and grandfather were both smiths, his father being one of the prize horseshoers in the north of England, while his brother is a horseshoer in a cavalry regiment in South Africa. The condition of the smiths in that part of England, Yorkshire, is good and compares favorably with the conditions of the smiths in the United States, but they are away behind us in the matter of tools, working along with the same old tools that their fathers and grandfathers used, although some of the more progressive smiths are putting in modern tools.

Going to the shop where I spent five long years as apprentice, with no wages, only my board and aprons found, I discovered the son of my former master with the same old tools and same old ways, no drilling machine, only the same old crank and beam process that I know has been used for fifty years; the same anvil, bellows, vice, taps and dies that I used to use, together with the old-fashioned lathe, and seemingly in as good condition as they were fifteen years ago. And yet this man has a fair amount of work and makes a good living.

In the village of Tanfield, one of the prettiest places in England, lived old man Smith. He died last December, aged 65, and left a comfortable fortune to his children. This smith worked in the same shop for fifty years and his father worked there before him, and I believe the same tools that are there today are the same as the elder Smith worked with, and yet these men turned out work superior in quality and finish to our present day smiths with all their improved appliances. These are a few instances of the kind of smiths I came across. On the other hand, of course, there are smiths who have

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improved machinery. However, I saw only one tire shrinker there and that one was bought by my brother-in-law at my persuasion. Their work is principally horseshoeing and repairing.

I saw very few machine-made shoes in England. They all make their own horseshoes, hammer out the old ones into new ones when they have them, and if not, make them out of bar iron. The horses are nearly all shod with plates, except the very heavy horses that are used exclusively for draying. There is a great deal of repair work, such as repairing harrows, plows, carts, etc., and which keeps the blacksmiths busy. Prices are good, that is, for England. A scale of prices which I cut out of one of the papers reads as follows: "Owing to the advance in price of iron and steel, the Blacksmiths' Association of Darlington have been compelled to put in a new scale of prices for work done as follows:

Heavy cart horses, per set, 6 shillings	$1.50
Ordinary cart horses, per set, 5 shillings	1.25
Farm horses, 3-6 to 4 shillings	.85 to 1.00
Toe piecing extra.	
Carriage horses, 5 shillings	1.25
Hunting horses, 5s, 6d.	1.35
Setting cart and wagon tires,	
3 to 4-inch tread, per set of two, 10 shillings	2.50
2 to 3-inch tread, 8 shillings	2.00
Heavy rolley tires (4 tires), 12 shillings	3.00
Light rolley and cab tires, 10 shillings	2.50

This is but a sample of the prices received, so that you will see our English brothers do not suffer in comparison with our prices when it is considered that iron and nails and hardware are from twenty to thirty-five per cent. cheaper in England than in the United States.

A Time Saving Tire Measurer.

J. DOWNSWELL.

The tire measurer which I here describe will prove a success to any who will make and use it a short time. Using it, I have put on sixty new tires in an hour with one helper. I have my tire form just in front of the anvil. The helper fits up the wheel while I run another wheel. I heat in the forge, and it requires just a turn in the fire to expand it enough.

The sketch shows a view of the tire measurer in operation. A is the handle, with a $\frac{3}{8}$-inch set-off to keep the wheel B from the bolt holes in the felloe. C shows a section of the felloe. With this device you can run a wheel or tire and strike the mark every time with no trouble at all.

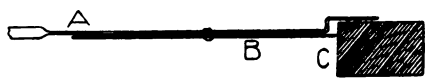
Luck in Blacksmithing.

THOMAS BEASLEY.

Many circumstances are ascribed to "luck" which, in reality, are the outcome of careful, painstaking work. The following is an example:

A Yankee blacksmith who took great pride in the fact that no job ever stumped him, went to England to see how the trade flourished on the other side of the pond. After arriving in Liverpool he made a tour of inspection, and being somewhat short of cash, decided to seek a job and at the same time show the "blooming Britisher" what a "blasted American" could do. He went into a little repair shop on the water front and asked the proprietor for a job, explaining that he was well up in marine smithing.

The boss told him he was just the man he was looking for, as he had a 15-inch by 45-foot steamship shaft that was broken and had to be welded. As his means for this job were somewhat limited he could not induce any smith



AN INGENIOUS DEVICE FOR MEASURING TIRES.

so far to take it up. Our American friend was keen for the job and asked the boss to show him the smith shop so he could figure the best way to do it. After the inspection the Yankee stated that he would undertake the work and guarantee results, if the proprietor would furnish the help and not interfere with his arrangements, all of which he agreed to do. Our Down Easter's first request was for the best cricket players in the city—about a baker's dozen would do, and about ten men to help handle the shaft and wield brickbats for him. Of course these requests made the Britisher open his mouth to expostulate, but the man from "Bosting" got in ahead of him by saying he was doing that job and would deliver the goods when the Britisher kept his promise.

To make a long story short, he organized his gang and instructed them minutely what to do. Instead of welding the shaft with sledges he used cricket players with brick bats to pelt the hot iron, and by having rounded bats and soft ones to finish the work with, succeeded in doing a job that upheld the prestige of our country and caused the Britisher to faint with envy and surprise. I don't vouch for the truthfulness of this story, but as an Irishman told it, and they have a national reputation for veracity, it must surely be so. However this may be, it teaches a lesson.

There is nothing like using a little originality. Who but an American would have thought of making use of cricket players to supply power in a blacksmith shop! And the result was not only the accomplishing of the job, but the winning of a reputation.

Master Boiler Makers' Convention.

The second annual convention of the International Railway Master Boiler Makers' Association was held at Columbus, Ohio, May 19th to 21st, with 100 delegates in attendance. The Rev. Byron R. Long invoked Divine blessing, after which Governor George K. Nash made a very pleasing opening address, which elicited much applause. The association was welcomed to the City by Mayor R. H. Jeffrey, George T. Spar, of the Columbus Board of Trade, and especially by S. D. Bush, president of the Buckeye Malleable Iron Works. A response to these addresses was delivered by President F. J. Graves, whose words were full of appreciation of the royal welcome given.

Denver was chosen as the next meeting place and the following officers were elected:

F. J. Graves, C. & O. Ry., Huntington, W. Va., Past President and Chairman of the Board of Finance.

J. A. Doarnberger, N. & W. Ry., Roanoke, Va., President.

W. H. Laughridge, Hocking Valley, Columbus, Ohio, First Vice-President.

J. T. Goodwin, Richmond Locomotive Works, Second Vice-President.

C. L. Hemple, C. B. & Q., Omaha, Neb., Third Vice-President.

James Johnston, N. P. Ry., St. Paul, Minn., Fourth Vice-President.

W. J. Richie, C. O. & G., Shawnee, Okla., Secretary and Treasurer.

The following report on flue welding was one of many interesting papers read:

Mr. President and Gentlemen of the Convention:

Your committee to report on setting flues and manner of taking care of same, desire to say, that while they appreciate the fact that there is considerable difference of opinion as to any method which may be adopted by this convention, to suit the different ideas of the foremen of boilermakers throughout all sections of the country, due to limestone and hard water that is commonly used, yet after due consideration we would respectfully recommend the following practice for setting flues, to-wit:

First. The flue to be swaged $\frac{1}{8}$ inch under size of original diameter, then the

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flues to go to annealing vat, which consists of lime and sawdust. After flues are cooled off, the flues are taken to cutting machine where length is gotten. While flues are at this machine, the scale is removed from swaged end by a small emery wheel or file; when repieced flues are being used, would recommend that the front end of flue be heated and allowed to cool off before applying to boiler.

The copper ferrules that are used in back flue sheet to be No. 14 or No. 16 in thickness, being ⅛ wider than thickness of sheet. The ferrules to be slightly rolled in sheet to be flush with face of sheet in furnace. Then the flues to be applied with allowance of 3-16 inch for beads, and by clinching same to hold in position by lipping one edge of flue with hammer. The flue to be rolled and prossered, then beaded. After this process, flues should be lightly rolled. The best tools for setting same are roller and sectional expanders.

The question of caring for flues while in service depends largely on engine house management, as well as proper judgment being exercised by engine men in their daily performance of delivering the required tonnage on their divisions. At ash pits, judgment should be used in keeping air draughts from furnace, fire doors and ash-pan dumpers.

We are constrained to believe that education along these lines by our master mechanics and the men who handle the engines, in cleaning of fires and reducing pressure for boiler washing, etc., would no doubt make a very noticeable improvement as regards engine failures, as well as getting the desired mileage out of the flues, thereby showing a saving that would be very acceptable to any management. J. T. GOODWIN, Chairman.

By *W. H. Shaw:*

In my opinion, the best fuel for welding flues is oil, and it is cheaper than coke. In most places where flues are welded they have two men with a coke fire and one has to be poking down the fire nearly all the time; and if you have poor coke there is always a scale on the flue when it comes out of the furnace when hot. This is bad and it sometimes spoils the weld.

It is not so with an oil furnace. If you supply the oil furnace with oil and air, you get better results. Your flues will heat quicker and have no scale to contend with. A bumping block can be placed at the rear of the furnace for the welder to bump the flue when it gets hot. And one man can weld all the flues you can handle for almost any shop with an oil furnace and a Hartz flue welding and joining machine. The reason why I favor the Hartz flue welding machine is this: When a flue leaves the mandrel the weld is rolled and it makes a very neat weld. The flue is not lumpy like old hand or trip hammer welding. The percentage is very small for leaky welds. We never test our flues. We take them from the machine and put them in the boiler, and in 300 flues, we take out from four to six, on an average, that have leaky welds. This speaks well for the Hartz machine."

QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

Drawing Temper—I wish to know how to draw the chill temper from chilled castings. JOHN A. DANIEL.

Setting Buggy Axles—I would like to know a simple way for setting buggy axles and also a rule for making wagon axles. E. A. LOCKHART.

Turning a Small Crank—Can some brother blacksmith tell me how a small crank is turned—a shaft two feet long and a 6-inch crank in the center? M. H. MATTHIESEN.

Shoeing Question—What kind of a shoe will stop a horse from mixing, that is, crossing from pacing to trotting when driving? Will somebody tell me? J. ARCHIBALD.

Blacksmith Coal—Will some one tell me where I can get a good, clean blacksmith coal? The coal which we get here is both dull and dirty, and I do not know where to get any better. WILLIAM FOLEY.

Tempering Springs—To temper cast steel springs, all that is necessary is to heat them in the dark just enough to see that it is red. Then cool in lukewarm water. Draw the temper. I have always found this successful. W. M. F.

A Shoeing Inquiry—Will some of my brother smiths give me instructions of how to shoe a horse which throws out his front feet and strikes on his heels and then rocks over on the toe? He wears his shoes off on the heels round up to the hoof. J. M. R.

A Recipe for Mill Picks—Two ounces of alum, two ounces of saltpetre, one-half ounce of salammoniac, one and one-half pounds of salt, and three gallons of soft water. Heat the picks to a cherry red and plunge them in the above preparation, and draw no temper. W. M. F.

Shoeing a Hopping Horse—In answer to Mr. N. T. Outwaters in the April issue as to how to shoe a hopping horse, my advice is to make the heel calks one inch and the toe calks ¾ of an inch long on the foot that hops. He can try this and see what that will do for the horse. JOHN H. LAYNG.

Ship Smithing—For an answer to his question on page 138 of the April AMERICAN BLACKSMITH, J. E. Clark is referred to the article by W. L. Paul on a foregoing page entitled "Iron work for Schooner Masts and Spars." THE EDITOR.

Hardening Plow Lay Centers—Will some brother blacksmith give me a recipe for hardening soft center plow lays perfectly so that it will neutralize the scale and leave a nice smooth surface, and one which will do the work uniformly at a low heat? W. A. HENRY.

A Question About Machinery—Will some brother craftsman tell me if it would pay to buy foot power machinery such as rip and cut off and band saws when unable to buy a gasoline engine? I need these machines, but would like to know if it is advisable to buy them or not. G. P. BLANCHARD.

Shoeing a Cow-Hocked Horse—In reply to Herman Hoffman's inquiry in the March issue of how to shoe a cow-hocked horse, my experience has been to shoe them with a low toe and a fair length shoe with side calks. I find that they travel the best when shod in this way. F. J. HEYWOOD.

Interfering—I should like to have the opinion of my brother smiths in regard to a case of interfering. I have a mare that hits her right hind foot with the left, and I have tried most everything in the line of side weights, also raising the inside a little, and none seems to work. JNO. P. WINTERS.

Another Shoeing Question—Will some brother blacksmith tell me how to shoe a horse which I would call passing-gaited, that is, she starts with a pace, and when she slows down, she strikes a pace, and ofttimes changes from a trot to a pace. What I desire to know is how to shoe her so as to make her trot and stop pacing. The fault is common. CHAS. D. BRIDDELL.

Welding Toes on Horses' Shoes—In answer to Mr. E. D. Hayden's question as to how to weld toes on horse shoes, so they will wear sharp, take a piece of steel about 3/16 of an inch and weld soft band iron on both sides of it. Now sharpen and weld on the shoe, and the toe will always wear sharp, if the horse wears the shoe down level. Let Mr. Hayden try this. L. E. MORRIS.

Toe Calks—I make my toe calks from the iron bar and weld them on the shoe, and after they are dressed, as also the heel calks, and the shoe fitted to the foot, I heat the shoe on to case harden them. I put on, when hot, prussiate of potash, finely pulverized. This kind of work on toe calks keeps them from breaking. I have used this for thirty-six years and had success. W. M. F.

A Ratchet-Wrench for Tire Bolts—First forge a piece as shown at A, from a piece of steel, 1 by ¼ inch with an inch hole in the head. Then forge another part, B, 1/16 inch wider than the first, after which cut it out, as indicated, making it from some old mower section or other light steel. Place the two pieces together, put a ratchet on each side and rivet together. Adjust your spring, and you will have a labor-saving wrench. G. L. COLEMAN.

Galvanized Piping—Will some one tell me through these columns how long a galvanized pipe will lie underground without

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any water passing through it? How long can it lie before it is entirely rusted away? Also how long will it last above ground when well covered with paint, and how long will galvanized sheet iron last above ground before it is entirely gone? HANS HANSON, JR.

Iron To Tire a Wheel—In answer to the question of H. W. Berge as to how much iron it takes to tire a wheel, would say that one way to determine this is to lay the tire down on the floor, take the wheel and put it on the tire, and then, putting one joint of the rim at the end of the tire, roll the wheel once till you come to the joint at which you started, allowing an inch for shrinking when bending and welding. CLAUD BAILEY.

Tempering Turning Chisels—I notice one of the craft desires to know how to temper turning chisels or tools. I dress them to the shape I want them and then push them in the ground, filling the hole with strong salt water. Heat the tool to a cherry red and put them in the hole to stay until cold. This is good for high speed tools. It may seem a crude method, but I have found it to answer my purposes. W. M. F.

Welding Axles—A good way to weld axles is to upset a little, scarf down at an angle, take your chisel and cut like a file only coarser and about 3/16 of an inch deep on the scarf side of each piece. Weld with old mortar that has been used for plaster. I find that it is just as good for low steel as most of the welding compounds. The notches keep the lap from slipping. I have never yet had one rip at the weld.

FRANK HALL.

Another Shoeing Question—We have a fine trotting mare, who ran a nail in her foot a year ago last January. We have shod her every way imaginable with bar shoes and tips, and have left the tips on as long as advisable. She went very well with the tips, but we thought we had better take them off as her foot was beginning to get sore. We then put pads on her, but she does not go so well. How ought she to be shod? B. W. S.

A Few Questions—Can some brother smith tell me the best way to shoe a stifled horse. I have the care of a very valuable horse which is stifled.

Will some veterinarian tell me some remedy for a colt which has the bloody gravel? That may not be the proper name for the disease, but it is the only one I know for it. It is very common in this country, especially in colts when a few days old, which take the disease and die, and there does not seem to be any remedy for the same, although there might be. J. H. WHEELER.

A Horse's Gait—In answer to J. W. Erven's question about changing the gait of a horse from trotting to pacing, I would say to him that if he will have his horse shod with shoes on the two left feet as light as can be made and save the foot, and on the two right ones as heavy as the shell will carry and be a little careful about driving for awhile, in a few months he will pace all the time with common shoes on. In shoeing a horse to trot he must be well balanced, and to change him from trotting to pacing he must be unbalanced. I have tried this method of shoeing with good success. IRA A. MUNSON.

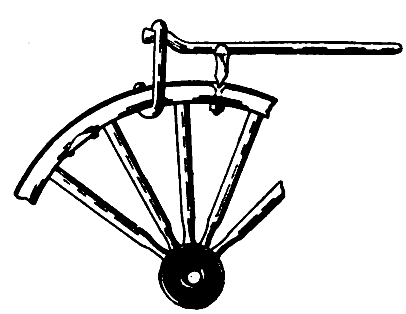
Questions as to Long Fires and Turning Lathes—I should like to know the best way to arrange a forge so I could heat a piece of iron twelve inches long and one inch in diameter to a good uniform welding heat, without having to have a larger fire than necessary.

I am building a lathe for turning balustrades. I should like to know how to make the bits and how to fasten them to a slide so that I can turn the full length at one time by simply moving the slide bodily up to the piece being turned. I feel this would be as long a space as I should want to turn at one time. W. L. PAUL.

Home Horseshoeing—Seeing J. B. M.'s question on how to prevent home horseshoeing, I would say that my idea is that every horseshoer should pass an examination and hold a diploma. The Society for Prevention of Cruelty to Animals ought to look after such cases as J. B. M. speaks of. If such officers would look after such cases instead of some other trifling things that don't amount to much, there would be fewer lame horses, as lots of fine horses are ruined by such cases of shoeing. I think the State ought to pass a law to help the horseshoer. There is no other class of men that need more protection. As we all know, horseshoeing is no light work. J. D. C.

Tire Bolt Holder—The accompanying sketch of a tire tool for holding buggy tire bolts shows something which I think can not be beaten.

I would also like to say to Brother William Duff that I have made one of the tuyere



A NEW CONTRIVANCE IN THE WAY OF A BOLT HOLDER.

irons which he described and I like it much better than my old one. I must say it is O. K. J. A. GRAY.

Bolt Holders—If Brother A. Bruton would make a brace on the end of the tire bolt wrench which he described in the April paper, I think it would improve the tool.

I have a tool for shaft bolts for repairing shafts made like a bench brace and also a clamp for holding these bolts from turning and spoiling the paint. I also use it for reach bolts. I made the latter of eight-inch bar iron, having a short right angle bend at each end. One bend hooks over on to the wood at the side of the shaft iron. The other end is threaded to receive a pointed rod which screws down on the bolt head. This tool saves a great deal of time and trouble with tongs and wrenches.

E. D. PENDLETON.

Questions on Vulcanizing and Tooth Chisels—Will some one with experience please tell me how to vulcanize rubber tires? Please state how it is done, and what is used.

Also, I should like to know how to cut tooth chisels for marble cutters. I have seen them cut only one tooth at a time. Is there not a way to cut more than one at a time? JOHN R. THOMPSON.

To mend rubber shoes, balls, hose or tire, the "Deutsche Chemische Wockenschrifts," recommends the following process: The articles are first freed of adhering mud particles and thoroughly dried. Varnish, as for instance, on rubber shoes, is removed by means of emery paper or a file, and the part thus treated is rubbed over with benzine. The edges of the hole are then painted over with a solution of para caoutchouc in benzine, a fitting strip of natural rubber is laid over it and a solution consisting of four parts of benzine, three of carbon sulphide, O. 180 parts of sulphur chloride is applied to the edges by means of some cotton wool tied to a wooden holder, this solution serving to vulcanize and to increase the resistance of the rubber. The joined parts have, of course, to be well pressed together.

What Troubles the Foot—I should like to have information on the following question. A customer of mine has a horse whose left hind foot is split from the top to the bottom of the hoof, and it rises about every three months just in the edge of the hair. I believe there is something in her foot. I wish to know how to find out the cause of trouble and if there is something in the foot, whether there would be any danger in cutting into the foot. Also I should like to know what kind of a shoe I should use, so as to make the foot grow together. When it swells, I open it, and after all the matter has been taken out, she will stop limping until it rises again. G. P. BLANCHARD.

For Brittle and Crumbling Hoofs—Mr. Thomas Robberts would like to know the best liniment for a hoof that is brittle and crumbles. I have used Dr. Danniels' (No. 1 Staniford Street, Boston, Mass.), hoof grower and softener, and I find there is nothing to equal it in keeping the hoof in good condition.

No part of the horse is less understood or more neglected than the foot. The horse was created to run wild, barefooted, with his feet constantly moist. Man has changed his condition, keeping his feet almost constantly dry. This causes at least half the cases of lameness in horses.

This remedy is a positive cure for all ailments of horses' feet, I find, whether caused by hard and constant driving on hard roads or by standing in the stables.

I am very much in favor of organization as I think it will be of benefit all 'round if all would work together. JAMES E. DOLAN.

Horseshoeing of Long Ago—In the past twenty years all styles and designs have changed considerably and especially in labor saving machines, but horseshoeing remains about the same. The first horseshoes recorded in history were made by the peasants in England. These did not resemble our modern ones, but were made of coarse grass, constructed so as to cover the whole hoof and were tied on. As these shoes did not last long in the mountainous country, the peasants made great numbers of them and sold the same to travelers who came into the highlands, who would buy them when their horses' feet became afflicted.

Later on, horseshoes were made resembling the ones of today. When King Alfred came to reign in England, he ordered his horses shod with silver shoes. These were simply tacked on with small nails and not clinched, and when the horse jumped and pranced, he threw his shoes, which had to be tacked on again by a farrier who accompanied the King's carriage.

Before the Revolution, farmers wore leather aprons similar to those worn by the blacksmith of today. OTTO STIEFEL.

Removing Broken Spokes—In reply to Mr. A. Bruton, I will say the wedge and ring is all right for whole spokes, but if broken off at the hub, I should like to have him try the following method: Take a piece of good iron seven inches long, 1½ by ½ inch. Punch a hole two inches from the end, and then cut out to the other end (A, Fig. 1.) Now open out and swage ends round. Next

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take a ½-inch coach screw, weld it on one end of an 18-inch piece of ½-inch round iron, and weld the other end to the handle. Slip on an old wagon box of good weight and the tool is complete.

Now screw your wheel down tight on the wheel horse. If the spoke is not broken off close, saw it off. Bore a 5/16-inch hole in the tennon, take the tool with the box on it, screw in the hole tight. Take the box in

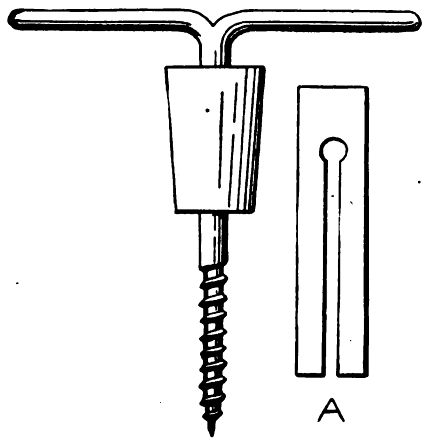

Fig. 1. TOOL FOR REMOVING BROKEN SPOKES.

hand, and strike good, smart blows on the handle of the tool and out comes the tennon. I can clear an old hub in fifteen minutes, unless newly spoked with glue. If the spokes look tight, strike a couple of blows with a heavy hammer on the back of the spoke before sawing off. If the spokes are larger than 2½ inches, use a ⅝-inch coach screw. GEO. W. HOLTON.

Toe Calks That Wear Sharp—In the April issue, Mr. Ed. Hayden desired to know how to make toe calks that will wear sharp. Here in Illinois, we nearly all use what we call self-sharpener shoes for winter. We must make our own calks, as they are not to be had in the market, and I think it queer that some one has not yet thought of this question of calks. We buy iron ½ or 5/16 by ½ or ⅝ inches, and steel of a good grade, ⅛ by ½ or ⅝. It depends on the size of the calks you desire. We place the steel between two bars of iron and weld all three together with borax, making it the desired size for toe calks. Now turn the heels on the shoes, and with a thin hardy or chisel split them and break small pieces to suit the size of the shoe. We mostly use old worn-out sickle sections, as they make good plugs. The next step is to weld with sand or borax. After the shoe is fitted, heat the calks cherry red and cool off by holding them in water until cold. A little good judgment in welding is all that is necessary for a good job. We never get less than 50 cents for a shoe like this, and in some places they get more. It is the cheapest kind of a shoe a farmer can put on his horse in winter, or in fact any time of the year if the horse is continually on the road. H. H. KAHL.

Remedying Decayed Feet—In answer to Mr. S. Shindledecker's question in the May issue, would say, make a bar shoe, using a leather pad riveted on the center of the bar with a copper rivet, which will hold it in place. Drill two holes in the shoe and pad at the third nail-hole, about ⅜ of an inch in diameter. Clean off the foot, take some pine tar and oakum and pack the foot with this. Use the tar cold, as you can do a better job with it. Use plenty of tar. Nail the shoe on the foot and clinch. Next cut a groove in both sides of the foot where you drilled the holes in the shoe, but slant them forward. Take a piece of 5/16 round iron, flatten it to about ⅝ of an inch wide, bend it over the foot near the top and put the ends through the holes in the shoe so as to see how much thread you need to make it tight enough. Cut the thread on both ends of the clip. Flatten the clip to about ½ inch from the thread and fit closely to the foot. Now put on the clip and fasten it just tight enough so as to be comfortable. Clip off both ends of the clip with a bolt clipper and rivet a little so the nuts won't come off. Now file the inside nut a little round so the horse don't interfere. By using this method you will see a change in the foot by the next shoeing, but be sure that you do not leave the toe too long. Shorten the toe from the top and leave the sole as thick as possible. I have been using this method for five years with great success. E. G. BEHLING.

From a Shop in Missouri—My partner, J. W. Reger, and I have a shop 22 by 70 feet, with a partition dividing the iron and wood departments, and with a paint room by the side of it 20 by 30 feet, though not large enough for the amount of work. We have a 2½-horsepower Weber gasoline engine, and it is a dandy; a 2½ by 12-inch emery wheel; a 12-inch polishing wheel for polishing plow shares and other work; a grind stone; a shaper, which carries a five-inch cutter head and for which we have several sets of bits for different kinds of shaping, such as bolsters, tongues, hounds, sandboards, wagon felloes, etc. This is one of the best tools we have in the shop. Also a saw table with 14-inch rip and cut off saws; a jig saw; a spoke tenoning and felloe boring machine combined, and a Bailey's No. 2 Power Drill. We have a power blower for four fires. Our little engine will run all of the machines at once, except the shaper, or former as we call it, which takes more power to run it, but we can run this machine with any one of the other machines. We might also say that we have a wood turning lathe. We build new wagons during our spare time, which gives us plenty of work all the time. The following are a few of our prices:

Horseshoeing, per span	$2.50
Horseshoeing, per shoe, old	.20
Polishing plow and lister shares, 14-inch	3.00
Pointing a plow	.75

The use of the engine takes off much of the hard work attached to the blacksmith's trade, and I do not know of any better engine made than the Weber for power. It is safe and simple. S. G. MOONEY.

Hints on Brazing—I saw in the last issue of the paper, an inquiry about an oil furnace, by Mr. W. B. Wolf. I am only a young smith, but I will give my opinion on brazing and oil furnaces, as it might do some good.

To begin with I think the new way, with "Ferrofix" is the only one that can be relied upon, and if Brother Wolf has much brazing to do I think it would pay him to invest in a shop right at least. I am situated in a town where all kinds of castings are kept on hand, and a farmer never thinks of having anything brazed.

There are many ways a smith can repair castings without brazing. A farmer came to my shop last week with a casting and told me that the other blacksmith had tried to fix it, but it was so hard he could not drill it. This blacksmith advised him to take it where he could get it brazed, or get a new one. But I informed the farmer that it did not have to be brazed and that I could drill it. He thought not, but I just laid it on my fire, (not in the fire) and blew gently till it became moderately hot. Then I dropped a piece of brimstone about as big as a hickory-nut on the places where I wanted to drill, and sure enough, when it was cool, I drilled it and riveted a strip of one-inch by one-quarter inch on each side of it and made a substantial job. Mr. Farmer was pleased and has since that day given me all his work. This is only one of the many ways one can get around brazing. What I mean to say is that I would not advise Brother Wolf to rig up for brazing unless he has considerable of it to do, and if he did I would not advise him to prepare to do it by any other means than by "Ferrofix." M. L. BEAL.

About Drawing Boards—Every one who uses a drawing board ought to know that the pieces attached to the bottoms or ends are put there to keep the board from warping, and when placed on the under surface they should be applied as follows: The pieces must, of course, be placed so that their grain will cross the grain of the board. Then, the pieces should be strong enough to resist the tendency of the board to warp. On a board 18 inches by 24 inches and ½ inch thick of pine wood, the cross pieces should be of ash ⅞ inch by 1½, and placed about 1½ inches from the ends of the board. Now comes the important part, these pieces should never be glued to the board, but should be fastened with screws. A screw may be put in the center of the piece—*i. e.*, 9 inches from either end and countersunk in the usual way. Then the rest of the holes should be made oblong so that the screws (which are firm in the board) may have a chance to play back and forth as the board shrinks or swells. Of course, these screws should be sunk so that their heads are not in the way, and if a washer is placed under the head and round-headed screws used, it is best.

ANDREW F. JOHNSON, Instructor-in-chief, Technical School for Carriage Draughtsmen and Mechanics, New York.

NOTE—We are always glad of criticism—even when adverse, and try to profit by every suggestion. Perhaps the description of the mode of constructing a drawing board in our May number was not very full nor clear, but lack of space obliges us to cut down such descriptions to the most essential facts. The above detailed directions will be found a very useful supplement to our last article on mechanical drawing. We thank Mr. Johnson for the interest he has shown in this matter. [ED.]

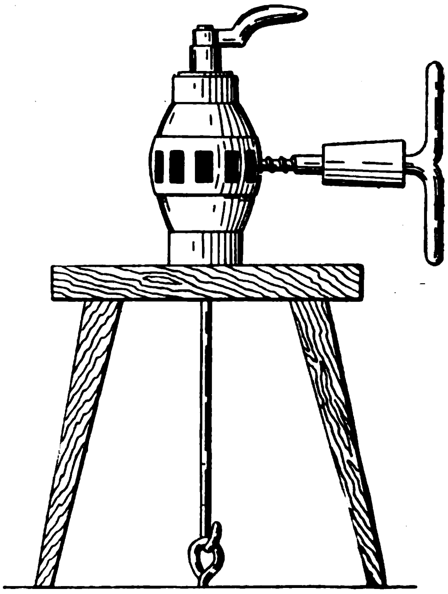

Fig. 2. REMOVING BROKEN SPOKES FROM A HUB.

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THE AMERICAN BLACKSMITH

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National Railroad Master Blacksmiths' Convention.

At Buffalo, August 18th to 20th, will be held the eleventh Annual Convention of the National Railroad Master Blacksmiths' Association. Prospects are bright for a largely attended and most interesting convention. No member should miss it. Blacksmiths who are eligible for membership, foremen of railroad, car and locomotive smith shops, and who contemplate joining this splendid association for mutual and craft advancement, should lose no time in communicating with the Secretary, Mr. A. L. Woodworth, Lima, Ohio, regarding early membership, and should by no means miss making the trip. Buffalo, Niagara Falls and the Convention form a combination of attractions for a summer jaunt, which is rarely excelled.

Rubber Tiring a Profitable Line.

Attention is directed to the short article on rubber tire work in a following column of this issue. This is a most interesting class of work, and we should like to hear from others of our readers, as to their practical work-shop experience in putting on and repairing rubber tires.

The mechanic who has an eye to business will anticipate the wants of his customers. Opportunities for increasing the profits should always be watched for. The repair of rubber tires is a line which a number of AMERICAN BLACKSMITH subscribers have taken up, and which pays them well. Have you yourself thought whether there was any chance for profit in rubber tire work? Are there enough rubber tires in your vicinity to make it worth while? It pays also to be the first to take up a given line of work in any locality.

Carriage Builders' National Association.

Official notification has been issued for the thirty-first annual meeting of the above association, to be held in Boston, Mass., during the week commencing September 20th, 1903. At the same time and place will be held the annual exhibition of vehicle and automobile parts, models, new inventions, harness, horse equipments and materials pertaining to the carriage, wagon, automobile and accessory industries. The largest hall in Boston has been secured for the purposes of the exhibition. Full details regarding membership in the Association and representation at the Convention can be secured by addressing the Secretary, Henry C. McLear, Wilmington, Del.

The American Blacksmith Offices Burned Out.

Fire destroyed the offices of the THE AMERICAN BLACKSMITH Company on the evening of June 19th. The subscription lists were saved entire, and as the printing plant was untouched, publication of the paper will continue uninterrupted. The paper will continue on the same lines as heretofore, with the determination to make it a better journal for blacksmiths of all classes than before. Suggestions from readers as to how the paper may be made of greater value to them thankfully received.

On page XIV we take occasion ot thank the many friends who have sent us their regrets, together with many kind offers of assistance, all of which we very much appreciate.

New and roomy quarters have been taken in one of Buffalo's finest office structures, the Mutual Life Building, where our facilities will be greatly improved.

Personal Magnetism in the Horseshoer.

Perhaps no craft affords a better chance for the cultivation of that peculiar quality, called personal magnetism, than horseshoeing. By this is meant the power to influence and lead intelligent things (people included) by sheer force of character.

The successful wild beast tamer possesses this magnetism to a very great degree. But even a dog-trainer, a horse-trainer, or a good rider, must be able to exert unworded authority and to inspire the sense of submission in animals. No man who is afraid, even slightly afraid, of a horse, can ever hope to influence him. The timid rider is always coming to grief, so with the timid horseshoer. The horse knows something about human nature. He feels instinctively who is to be master, and, if allowed to rule, will play the tyrant to the highest degree of perfection.

It is not at all necessary to be cruel, or even unkind, in order to inspire respect in the horse. In fact, kindness, with force behind it, is the surest means of attaining this end. The man who unflinchingly takes up the foot of a vicious horse and places himself at the animal's mercy, shows considerable courage and self-confidence which the horse is the first to appreciate.

The Scroll in Wrought Iron.

Scroll designs in ornamental wrought iron may be executed in almost endless variety, to suit either a heavy, massive piece or a lighter one. The two designs given herewith, both embrace the scroll, but are, yet, entirely different

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in style. In the first, a very harmonious effect is secured by adapting the slender bars of the gates below to fill in the arch, fan-fashion. In the second, the scroll is rather more elaborate, and is very artistically combined with the hollow ring.

Photograph No. 1 is a wrought iron entrance to the Lying-in Hospital, 18th Street and Second Avenue, New York City, Mr. R. H. Robertson, Architect. Richey, Browne & Donald, Long Island City, N. Y., executed all the ornamental iron work throughout this building, such as stair-work, elevator enclosures, grilles, guards, etc. Photograph No. 2 is a wrought iron stair rail and newel at a private house in Scarborough, N.Y., Messrs. McKim, Mead & White, Architects. All the ornamental iron work throughout this private residence was also executed by the above firm.

Pointers on Wheel-making—1.

JOHN MILLIGAN,
Teacher of Carriage Building, Durham University, Newcastle, England.

Hubs.

The timbers that are to be used in wheelmaking should be well and carefully selected. The nave or hub, which is sliced from the limb of a tree, should be as nearly as possible the size required in its natural growth, so that it will require little reduction beyond what it receives in the lathe in bringing it up to the true circular form. The reason of this is that the annual rings which mark the grain of the timber should be as little disturbed as possible, as they are not all of equal strength and durability. The outer rings are pretty strong, but as they get nearer to the centre, the wood is much softer. If, then, this outer hard casing is cut away, it is signing the death warrant of the nave, for the interior parts of the timber are not nearly so capable of resisting the destructive influences around, and in a very short time they will become completely soft and rotten.

In seasoning, the hubs are cut from the limbs of trees after having been allowed to lie twelve months, into lengths of ten or twelve inches, and the bark removed. By removing the bark, drying is greatly facilitated, and for internal drying, a hole should be bored completely through the centre, care being taken to remove the pith, as, if this is left on one side of the centre, the nave is liable to split in seasoning. The ends should have a coat of paint, or be covered with some air resisting substance, such as resin, or a mixture of boiled oil and tallow may be substituted.

The greatest care should be exercised in storing naves for drying, in a perfectly dry place, neither too light nor too dark. They should be placed on their ends in rows separated by strips of timber, and turned over once every three months. The time required for seasoning a nave thoroughly, varies from one to two years, according to the conditions to which it is subject.

Spokes.

The tree is cross-cut into lengths varying from about 1 foot 8 inches, to 2 feet 4 inches, and this is better done a short time after felling. Cleft or riven spokes are better than those that are sawn, as the grain is preserved throughout the whole length. In cleaving, the log is split longitudinally by wedges, and marked off in a series of wedge-shaped divisions, these being cleft out with a large knife. The spokes should then be piled or stacked in the open air, protected from sun and rain. After drying nine months in this way, they should be transferred to a dry shed, and there stored until thoroughly seasoned and ready for working up. The time occupied in seasoning a spoke in this way is from eighteen months to two years.

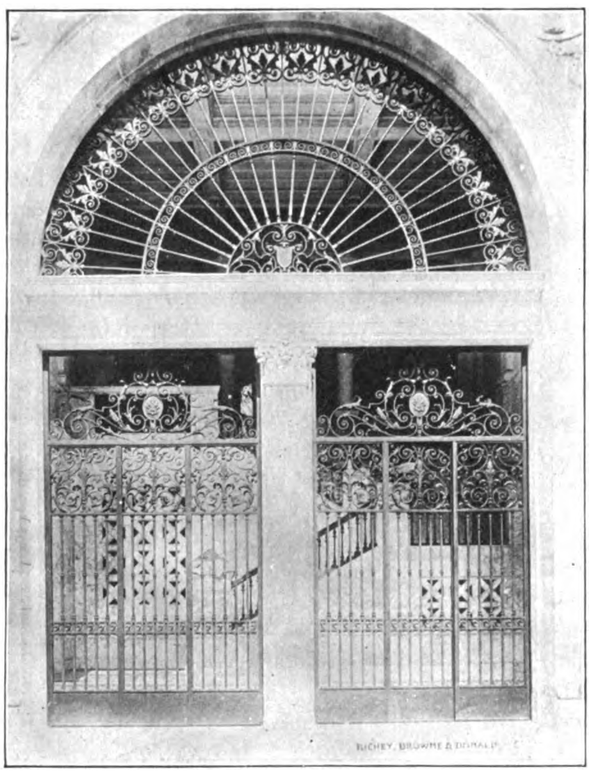

Fig. 1. ONE OF RICHEY, BROWN AND DONALD'S ARTISTIC WROUGHT IRON GATES.

Felloes.

Ash, if felled in the winter months, is exceedingly durable, and, as in the case of spoke wood, is benefited by being left in the round for a short time only. The tree is planked and cut by a saw to patterns or templets of the required curve, the grain in all cases running with the length. Two felloes are sometimes cut at one operation. The sizes in the rough vary from 14 inches long by 1¾ inches by 1⅞ inches to 2 feet 4 inches by 3 inches by 3 inches. For seasoning, felloes are treated in the same manner as spokes.

Bent rims, which are used in America and frequently in England in place of sawn felloes, are made of hickory or ash. These are cut into lengths of the required size, and planed, after which they are steamed from thirty minutes to an hour and a half, according to size. They are then bent four at a time in a machine.

They are allowed to remain here until properly set, when the ends are strapped together to prevent opening, and are then stored for drying.

It is of great importance that wheel wood should be thoroughly seasoned; as, if worked up in an unseasoned state, the tenons of spokes become too small for the mortises, the nave or hub shrinks and the tire works loose and requires resetting. For rapid seasoning heated rooms are frequently used for storing the timber; but besides splitting, the wood is weakened by this process. In America, and sometimes in England, wet timber is boiled or steamed, before being seasoned, and by this means the drying may be accelerated, although I am of opinion that the timber is less durable when so treated. There are also several other methods of seasoning timber by carbonic acid gas, chemicals, etc., but there is no method better than the natural one.

Construction.

A hand-made wheel is fast becoming a thing of the past, as some part of every carriage wheel used at the present time is more or less the production of machinery. Before the advent of machinery the craft of a wheelwright was one of some importance, and demanded a great deal of mechanical skill and knowledge. The timber was all

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cleft and sawn from the tree by hand; the spokes, felloes and stocks were formed by hand, and with tools of a primitive description, yet these wheels were very durable, although the work of the hand is in a great measure uncertain, when compared with the mathematical accuracy of a machine.

Today the spokes are formed, tenoned and polished by machinery; the stock is turned, bored, and mortised by machinery; the felloes are cut, shaped, planed and bored by machinery; but with all these advantages, it is a fact that hand made wheels sometimes outlast those made by machinery.

The proportions of a wheel are questions of grave importance, as, if too light, it will not support the weight resting on the axles, and, if too heavy, the draught is increased by adding to the weight of the carriage, though the increase is but trifling.

(To be continued.)

The Use and Application of Solid Rubber Tires.

A. J. YEAGER.

My experience with rubber tires extends over a period of five years. In that time, I have come into contact with all the different makes. When I first started I paid $50.00 and freight from New York for my first tools. I could have made those tools for less than the freight. The mode of fastening rubber tires into the channels then was by two wires running through the rubber and fastened together by twisting the ends. The Kelly Springfield people used the electric welding process. But we were too far from the center of rubber-tire business to pay $100 per year for the use of an electric welder. After we had the wires twisted and the rubber ends together again, we put the tire on the wheel with a tool made for the purpose of springing them over the channels. Of course a tire put on that way was nearly always loose.

The Kelly Springfield people however, soon put a stop to this two-wire business, claiming an infringement on their patent. Manufacturers of solid tires then began to look around for some other way to fasten tires. I was informed that my tools were no good any more, as we could not get tires of that make, but that we could get a tire that had a flat band running through it, which was simpler to mount, and the tools only cost $15.00. We got those too, and started to sell tires as fast as we could so as to get our money back before that way of mounting went out of style again. That style worked very well for about a year, when the flat bands began to break, and the tires would come off and often be lost. In order to pacify the people, we would, where they had the tire, put the same on again without charge. But before we lost all of our tire business, there came a reaction, and the two wires came back as the only good and the best way to fasten rubber tires into the channels. Litigation was begun which finally settled down to the Goodyear Tire & Rubber Company and the Kelly Springfield Rubber Tire Co. When the Kelly people lost their patent claim, the two-wire fastening was thrown open to the world. Now it was a case of prices and who made the best compound. (Compound is the name of rubber in the rubber tire parlance.) Of course they all made the best when you would hear their side of the case. But actual tests after a while proved some of the fellows' statements very untrue. And it caused many a tire to have to be replaced. I am not going to advocate any particular kind or make of tires in this article.

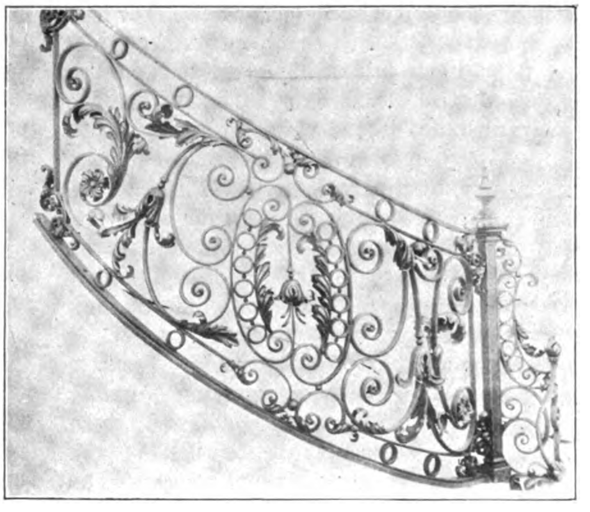

Fig. 2. PART OF A WROUGHT IRON BALUSTRADE OF PLEASING DESIGN.

Now, as to the use of rubber tires. I have known some people to spoil a tire in a very short time, and I have known tires to be in constant use for five years and still be good and be of the same make. A rubber tire to wear well must be put on tight so that it cannot creep on the channel. If not tight enough, it will creep and chafe itself through on the bottom and in a short time be ruined. Then the manufacturer will be blamed, when it is the fault of the man that put the tire on the wheel. Sometimes when a tire is on loose and becomes wet, the ends will come apart for a space of from two to eight inches and the man owning the vehicle will start for the shop with his bad tire to have it repaired or to give the man fits. After he gets to the shop, oftentimes he cannot find where his tire is open or that there is anything the matter with it. The tire will close up itself and be all right again. This is not always the case, however.

Some manufacturers in putting on rubber tires want to save money and have their tires cut too short for the size of their wheels. When this is the case the ends will come apart and stay so. And then there is only one way to fix this and that is to take the tire off and add a piece of tire to the original tire, which is done simply by taking a new pair of wires and putting on enough rubber to make the tire long enough so that there will be an inch compression to the foot for the circumference of the wheel. This is conceded to be the rule that all manufacturers advocate for good results. I have had wheels sent me with old tires attached, requesting me to put back on the old tires when there would not be enough left of the old tire to make more than a quarter of a tire. The reason for such requests usually is that the other tires are nearly worn out and a new one would not look well with the others. I sometimes do this with such people. I always have a scrap box in which I put the pieces which I sometimes have to cut off of tires that are too long. I take a lot of these pieces and string them on to the wires and when I have a long enough piece I put these on the wheel for about half price. As to the wearing qualities it is just as good as if it were in one piece. In this way I sell all my scraps at a good price. To repair a tire that has a piece cut out of it and the balance of the tire good, I take off and cut out all the bad places and take the pieces and string them on to the wires with enough new ones to make a good tire, put it on the wheel and as long as the wires hold the rubber will stay there. I use the machine put out by Morgan & Wright of Chicago, to pull my wires up and hold them while I braze them. Then I have a device made by the Hartford Rubber Works Company, of Hartford, Conn., to take out the compression and bring the

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rubber tire together. This last device is the best that I have been able to get hold of for the purpose and gives splendid satisfaction.

In mounting rubber tires, be sure and always use high carbon steel wire which will not stretch, for if you use soft wire, such as can be welded with electricity, you will find that in a short time you will have loose tires and your customer will have a kick coming. In brazing your wires, do not use the fine spelter such as is sent by the rubber tire people. Get what is called spelter wire and you will find that you can braze a wire in half the time that you can with the fine spelter. In brazing, I use the Turner brazing torch, Turner Brass Works, 63 No. Franklin St., Chicago, Ill., which is the only torch that will satisfactorily fuse brass. Some use gas brazers which are very nice if you are so located that you can use them. In conclusion I will say that when you put on rubber tires, be sure that you have good tires and put them on tight and even, and you will give satisfaction.

Talks to the Jobbing Shop Painter.—4.

Brush Keepers—Paint and Putty Keepers—Paint and Varnish Strainer, Etc., Etc.

M. C. Hillick.

No well regulated varnish room—and let us hope that all varnish rooms may very soon be so regulated—is without its varnish brush keeper of approved

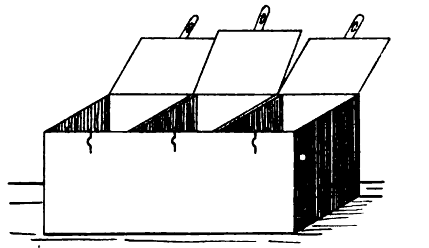

Fig. 1. A VERY CONVENIENT BRUSH KEEPER.

pattern. Of the making of brush keepers there is no end, but not a few fail of being surely practical. First of all, the keeper should be, when closed, perfectly air tight, and if it is such it will be dust proof. It should be light enough to handle easily, and sufficiently compact to store in small compass. It should, moreover, be strong and durable, and furnished with a lock to insure the safe keeping of the brush equipment. In Fig. 1 is shown a brush-keeper, possessing all the merits above enumerated, and quite large enough to nicely house three full sets of varnish brushes. As will be noted, this keeper is so arranged that any one of the three compartments may be opened without disturbing the other two. This enables the workman to remove a set of brushes without exposing other sets to any disturbing elements. If desired, each compartment of the keeper may be wired to hold two sets of brushes and

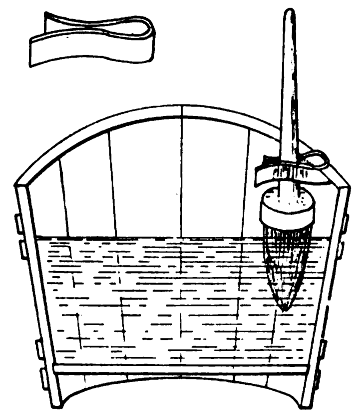

Fig. 2. THE PROPER WAY OF KEEPING BRUSHES IN WATER.

in the country shop the one keeper will suffice to hold all the varnish brushes, both for gear and body work. The cost of such a keeper should not exceed $2.00 and this price will provide for the use of good, durable tin. The keeper once installed in the varnish room, write to your favorite varnish maker for a quantity of finishing varnish to be furnished minus the addition of dryers. Such a varnish does not skin over, to the later injury of the brush equipment; and if properly cared for will last a long time.

For the ordinary paint brushes, bristle brushes for applying priming, lead and rough stuff coats, etc., there is needed a device for holding the brushes in suspension in water. The practice of many painters of dropping the brushes into a pail containing a greater or less quantity of water and allowing them to rest upon the points, very soon puts a brush out of proper condition. It gets mis-shapen, loses its "hang," and elasticity, and presently becomes an expensive tool to handle. Fig. 2 shows a section of a paint brush keeper that needs only a cover to make it practically perfect for holding the class of brushes referred to. Bend a piece of spring steel to the shape illustrated, and then drive it into the staves of the pail as shown and you have a device that holds the brush securely and without injury to any part of its composition. These pails may be bought at confectionery or tobacco stores for five cents each. Change the water every other day at least, in order to insure pure, clean water which latter will add length of days to the life of the brush.

Sometimes it becomes necessary to carry over for some days a quantity of mixed color, and, as nearly, if not quite all, colors used in the carriage paint shop are quick drying, they are apt to dry up, crust over and otherwise deteriorate. In Fig. 3 is shown a utensil by the use of which such a condition of things can be avoided. The sectional opening reveals the principle of the device. You provide a shallow pan into which a quantity of water is poured. Then into the water set the cup containing the color. Over this, place the boiler shaped cover which sets into the water forming a moist, air tight and dirt-proof compartment for the housing of the color. Thus conditioned, a mixed color will keep satisfactorily for weeks. In many large carriage paint shops this same device is used for keeping the putty supply. Float a bit of water over the mass of putty as it is placed in the large cup, then cover cup as here shown, and the putty will keep for months in perfect condition. In carriage painting, putty and color are perhaps two of the most important constituents entering into the paint and varnish fabric, and it is in the highest sense essential that they be handled and cared for in the most skillful manner possible. Especially is this true in the village paint shop that depends upon a strictly local patronage for its existence.

Another indispensable utensil in the carriage paint shop is shown in Fig. 4. Without a paint and varnish strainer, the shop is like unto the ocean liner bereft of chart and compass. The cut explains more clearly than a written

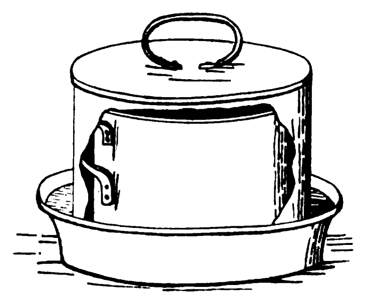

Fig. 3. A SATISFACTORY UTENSIL FOR PRESERVING COLORS IN THE MOIST STATE.

description the strainer and its accompanying fixtures. There is the funnel shaped strainer with its broad flange to fit over a cup or pail. Then the steel or iron ring to slip over the nose of the strainer after the piece of wire mesh or the cheese cloth has been drawn over. Next the cup with handle. The cost of

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the device complete should not be more than $1.00. Two of these strainers should be kept in every paint shop, one for paint and one for varnish. There is use for the paint strainer every working day, and use for the varnish strainer every time any varnishing is done.

However clean the varnish may look

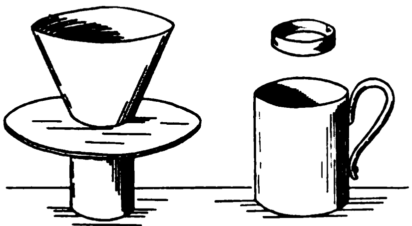


Fig. 4. A PAINT AND VARNISH STRAINING OUTFIT.

or be, it is a wise practice to strain it before using, and with this view the best carriage finishers the country over will be found to agree. The only provision for a sure thing in the varnish room is the perfection of details, and straining the varnish before using, is an important detail.

(To be continued.)

Forging Grips for Mine Cars.

STEVEN GATH.

The figure which accompanies this article shows the various steps in the process of forging grips, which are used in mines on cars for hauling coal from the mines. These grips are fastened on the draw-bars, and arranged so that by screwing up the cap, the cable is tightened and the car thus hauled up. This is an illustration of the work which we do here at the Monongahela Manufacturing Company, Monongahela, Pa. Our shop is a general jobbing one, doing all kinds of light and heavy work.

How to Advertise the Smith Shop.

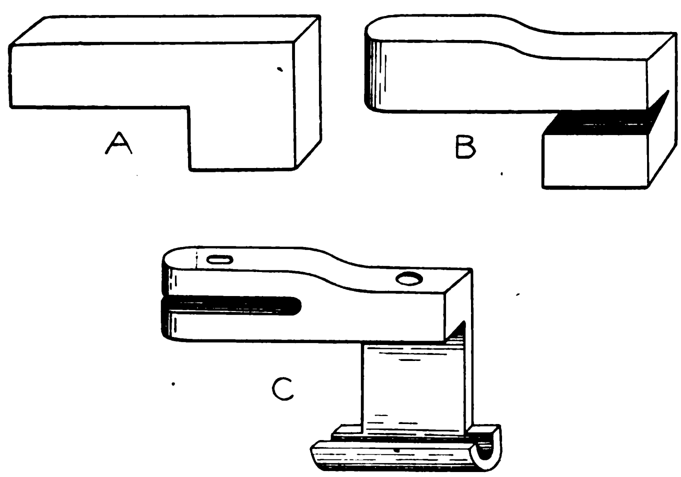
BILLY BUNTZ.

In pleasing his customers the progressive smith uses tact by catering to their whims and treating impracticable hobbies with a little "molasses" or an unprejudiced opinion, so as to prevent ill-feeling. When a customer is obstinate, by way of illustration the smith may cite the case of one Black, who proposed that a job be done a certain way, which did not prove satisfactory upon trial, and Black himself afterwards so admitted; while a similar job done for Brown under a well-established method held together for five years.

Treating customers so that they do not become disgruntled or dissatisfied, is the first step in advertising. It may bring the smith all the work he can handle with his present facilities, and by his customers speaking good words of him he will obtain still further trade. A great deal of advertising is done by the mouth—in so pleasing customers that they will talk about your business, somewhat unknowingly, but very effectively; while a curt reply may not only lose one job but forestall others as well. Even old customers dislike to be rebuked or laughed at. This method of advertising, that is, by satisfied customers, is inexpensive and hence should be practiced.

Where additional custom is sought it may be obtained through numerous channels. By the smith's having the interests of his town at heart rather than shutting himself up in his shop, profitable, as well as recreative results will follow. He may attend church, lodge or public meetings, while should he favor these institutions with donations it will probably be mentioned by the local paper and talked over by the folk. The talk advertises. Nothing shines so bright publicly as a dollar given in the proper spirit. Folk prefer to patronize a brother. A card in the church or lodge directory sometimes serves well.

In making a business of soliciting additional trade, it naturally means change in shop tools and methods. Machines should be added from time to time as needed or finances permit. They advertise also, as well as increase output and make the work easier. Hence, if Jones, the smith, has much grinding or hammering, he should install a gas engine to drive the emery, and buy a trip hammer at the earliest possible moment. He need have no fear that the expenditure will prove unprofitable. On the contrary, he will surprise himself and it will be a splendid advertisement.



METHOD OF FORGING GRIPS FOR MINE CARS.

Advertisements in the home paper bring good results, as they keep the smith always before the people. Such advertisements should be made interesting, however.

Of course, men will always be found who think advertising does not pay. Perhaps they have tried it by putting in advertisements which were left to the editor to get up, rather than doing their own thinking. It depends altogether on how it is handled. If none of the first principles are observed, it is not likely they will overstock the smith with work. Advertising, like other things, has to be studied. This kind of advertising will be more fully described, and some useful hints given in next month's article, entitled, "Jones as an advertiser."

Fence signs are good advertisers and may profitably be placed miles away from home along the country roads. They should also contain a little reading rather than be a mere card. By having a stencil made, as many signs as desired may be printed. These signs may also be put on barns. If made in the shape of a bird house, they make good souvenirs.

Of course, the smith may go still further in advertising as his business prospers. There are many little ways of advertising which suit his locality and are timely or likely to bring trade. These are for him to think up.

Some smiths have stencils for wagon boxes, such as "Examine This. Built by Jones, Farmington." "Welded by Scott," or other wording may be stamped on iron work. "Shod Maud S," or well-known horses in his locality, may be used by a shoer, which avoids worn expressions. Think up something original and use it in advertising what the people want.

Kinks and Conveniences in the Wagon-Shop.—4.

BY D. W. M.

Shop Conveniences.

It often happens that the body of a carriage must be lifted off the gear in order that certain repairs can be

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successfully done. If it is a buggy body or wagon bed it can be readily lifted by hand. But if it is a rockaway, brougham or coach body to lift off by hand means the employment of a number of men and the use of bars to lift it, while others pull the gear out from under. I shall describe a much easier manner of handling such a body.

It will be necessary to put up either a long wooden roller, or two pulleys, (on either side of a space to be occupied by the vehicle), fast to the ceiling or joist and strong enough to hold the weight of the carriage body. Over these rollers or pulleys are passed ropes operated by a windlass in a convenient location. These ropes have iron hooks at the ends, which attach to rings in the ends of strong bars placed conveniently under the body. One man operates the whole thing. He can place the bars under the body and attach the ropes. He can draw up the ropes by the windlass until the body is held so that when the bolts are drawn, which hold the body and gear together, the gear can be carefully pulled out on its wheels and the body remain suspended, the windlass being held in position by a chuck and ratchet. He can then let the body down gently to the floor, or better still, to a truck. When repairs are made the body is placed in position, the ropes fastened to the bars as before, and the body lifted to the proper height. Then the gear is run under and bolted in place.

There is no bruising or straining of the body, one man has done the work neatly and quickly. A two-wheeled truck made like an ordinary trestle, but with an upright slide bar on one side to accommodate irregularly shaped bodies, is useful. That is, one of the top bars is made double, with a bar and two uprights to work between. Holes in the uprights are made for pins to hold it in position. One of the lower bars is made heavy and the ends rounded like an axle, on which are fitted two wooden wheels about 18 inches in diameter made of inch plank and nailed together with the grain crossing, so that each wheel is two inches thick. An ordinary linch pin holds them on. Make a square shoulder on the axle. Now use a pole resting on top of the trestle axle and under the bar on the other side of the trestle, the long end projecting towards you. You can then tilt the trestle with the body on it, and wheel it around with one hand, even if it be a coach body. Let the body almost balance over the wheels so that the man who moves it will have but little weight to lift. Instead of the sliding uprights with the bar some prefer to use a box to prop the body, say on the front, as the uprights will sometimes break at the pin holes unless made very strong and of good timber.

Generally, as many trestles are in use as there are heavy bodies to handle at any one time. The trestles are cheaply made and it does not pay to lift the body off and on the trestle. Yet if this must be done, tip the trestle enough to allow one end of the body to touch the floor, then an assistant can hold the body while the trestle is drawn out. The body can then be lowered. Some kinds of work, such as wood work repairs, require removal. Place two planks on the trestle lengthways of the body on which it may rest. These will enable one to slide the trestle out and the planks are good levers to hold to in letting the body down to the floor, or they furnish a convenient method of sliding the body off the wheel trestle on to a woodworker's trestle if desired.

In the paint room the two-wheeled trestle is the most convenient method of handling a body and turning it easily to the light or moving it wherever wanted, and every paint room should have several extra ones, so that no carriage body need ever be removed from its trestle from the time it goes in to the time it goes out to be hung on its gear.

The paint department of a carriage shop is often divided into body and gear rooms. These again are subdivided into priming and rough stuff rooms, color and varnish rooms, finishing rooms and dark or dry rooms, for bodies; and for gears, into priming, sanding, color and varnish, striping, finishing and dry rooms. But in many shops, especially those where repairing is the principal part of the business, the gear and body room is all one, with a small room partitioned or curtained off for finishing coats. Since a curtain moves with every breath of wind and never fails to scatter more or less lint in the air, unless kept constantly wet, (which involves an endless waste of time and labor), a firm partition should be used, provided with a sliding door. The entire interior of a finishing room should be well painted, and the ceiling should be ceiled so that no dirt can sift down from above. Windows should not be open during or after applying a coat, but ventilation may be provided by wind wheels inserted in place of a pane in each window. The large sliding door in the partition should have a small door in it to permit of passing out or in without shaking the partition. Every precaution must be taken to prevent draughts of air. It is not wise to dampen the floor of a finishing room just before or after applying a varnish coat. It is apt to cause trouble with the varnish. Keep the floor clean but not wet.

The use of inferior varnishes is often resorted to for repair work when it would not be used on new work. It is a common practice to use "one coat coach" varnish for even fine work as a finishing coat, because it is heavy and fills up some irregularities. Now there are cases as on a close bid or a job that would not permit a first class finish anyway, where a "one coat coach" is the proper thing. But people who want fine repairing done are usually willing to pay for it, and the only way to get the price is to do the work in truly first class style, using first class material. First class repair shops are in the minority and when once found out will secure a patronage that is not easily taken away, in spite of low bids.

A paint shop for carriage bodies should have a rubbing platform where water may be used plentifully and drain off without leaking through to the floor below. No body paint shop is complete without one. The gear room should have that portion where the sanding is done separated from the remainder so that the wind will not carry the dust to the color and varnish or striping work; and the gear finishing should be done in a separate room. The effect of dust on a finished gear is like a light sprinkling of sand thrown into the varnish. Paper screens made on light wooden frames should be prepared to lay over any panels exposed to any possible falling dirt or draught, of course made large enough to form a complete protection, and so placed as not to touch the varnish.

The place for keeping paints and varnishes should be convenient and yet dark and cool. Varnishes may even be kept in a damp place, also keg lead; but dry white lead or any dry ground paints should all be under lock and key accessible only to the foreman painter.

The equipment of the trimming shop is comparatively simple and should embrace the necessary work bench and cutting table, closets for goods which may be locked, sewing machine, stitching horse, etc., not omitting a small heater for the paste pot, unless the

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paste is bought ready made. Like the paint shop, this room should be large enough and so arranged as to take in a complete carriage on wheels, whenever desirable.

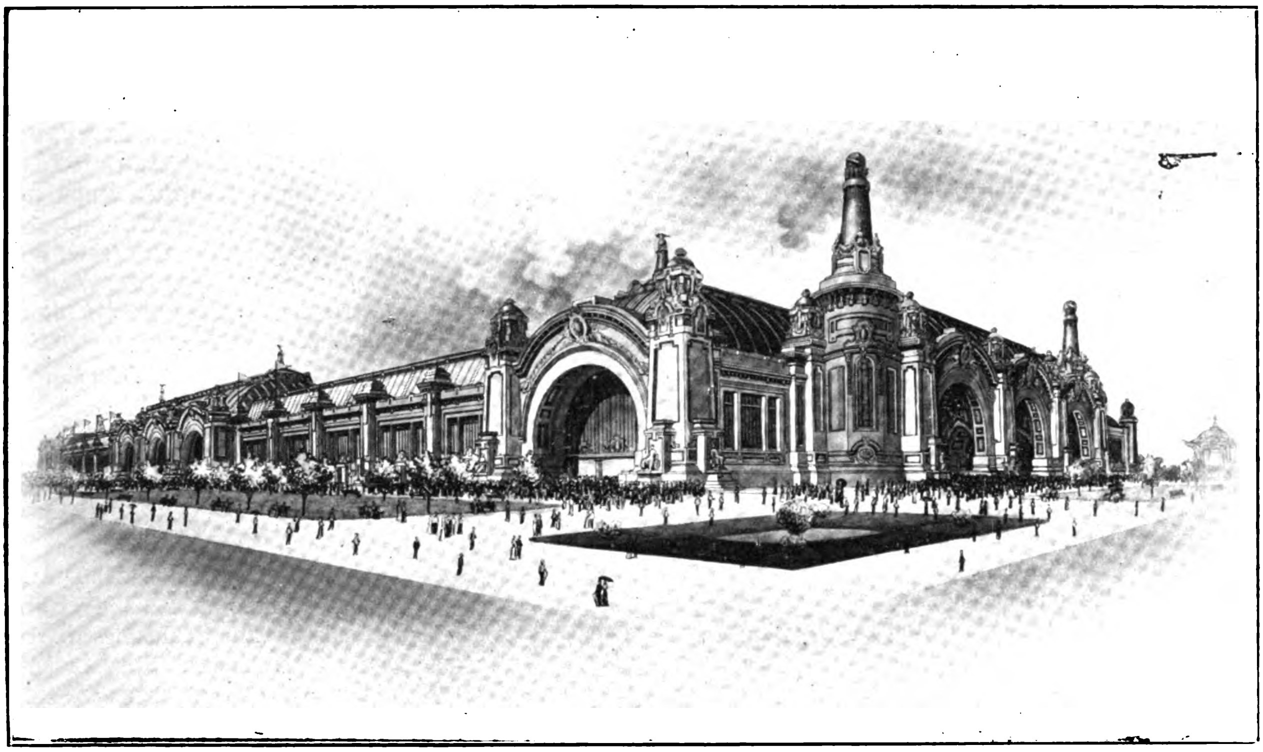
(To be continued.)

Transportation Building at the World's Fair.

The Transportation Building, the great structure which will stand in the northwest corner of Forest Park and is of special interest to readers of THE AMERICAN BLACKSMITH, owing to the fact that it will contain the immense proposed exhibit of vehicles of all descriptions, will be 525 by 1,300 feet. The general plan of the building is continent. These two essential elements are apparent throughout the structure. On the east and west fronts are three magnificent arches which embrace more than half of the entire façade. Each of the arched openings will be 64 feet wide and 52 feet high. Through the archways fourteen permanent railroad tracks will be laid from one end of the building to the other. At the sides of the three openings the projecting angles are accentuated by tower or pylon effects which reach to a height of 150 feet to the base of the crowning statue. The pylons are not so much accentuated as to be obtrusive or out of harmony with the structure.

happy. Over each of the big archways is a lofty curve which supplies a background for the architectural features.

The statuary is placed in front and at the base of the main piers at the sides of the grand openings. This affords sixteen groups which will illustrate Transportation in all its phases as well as the progress made by the United States in this science. There will also be four groups of statuary surrounding the four pylons placed at the east and west fronts. The architect has subdued the use of sculpture in the building. He depends on mass effects and the grouping of masses. That is, he depends on architecture rather than on tawdry decorations for his effect. The man-



EXTERIOR VIEW OF THE TRANSPORTATION BUILDING AT THE WORLD'S FAIR, ST. LOUIS.

rectangular. There will be no court. The great distinguishing feature is the massing of the three entrance ways so that they will form an arcade, and this feature will be repeated along four sides of the structure. The three arched entrance ways will take up almost the entire 525 feet of the façade on the east and west sides. On the north and south sides these arcade entrance ways are placed in the center.

The Transportation Building covers over 15 acres. The façades show a most pleasing adaptation of the French Renaissance. The building combines a feeling of the magnificent Exposition building and of the high-class railroad depot which prevails on the European

On the north and south fronts the architect has deemed it well to repeat the three massive archways which form the center feature of smaller fronts. This treatment pleasantly breaks the unwieldy façade of 1,300 feet. On the north and south fronts the pylon feature is omitted, but massive piers are repeated at intervals and lend dignity to the design. Flanking the three openings on the long fronts are great rows of magnificent windows as wide as the archways. Not only will visitors be admitted through the twelve huge portals, but subsidiary entrances are supplied at frequent intervals in the remaining stretch of walls. The roof treatment of the building is peculiarly

agement of the plan is simple and direct. The entire width of the building is spanned by five well-designed uniform trusses. Special endeavor has been made to afford plenty of illumination by day without the use of skylights. Light is introduced through the monitor windows over each span of the five trusses.

The building will contain about four miles of standard gauge railroad track. Even with this immense trackage two entire bents of the building are left free of rails and afford an exhibit space of 270,000 square feet. At the east end a gallery 20 feet in width extends across the building. This affords an excellent place from which to view the picture below.

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In order to secure space it will be necessary for those wishing to exhibit to make early application, for a very large number of applications have already been made, especially by foreign countries. No charge will be made for space, the only expense being the installation and care of exhibits.

The Elementary Principles of Mechanical Drawing.—3.

Common Problems.

Problems Relating to Lines and Perpendiculars.

It is very often convenient to locate a certain point on a drawing without actually measuring distances. For example, to find the middle point of a straight line or arc of a circle. To do this, as in the case of the straight or curved line XY (Fig. 1, A), take any radius, and placing the compass point upon X, draw two arcs of a circle, one at either side of the line. Next, take Y as a center, and with the same radius, draw arcs intersecting the first arcs at R and S. Join R and S, and this line bisects the straight line XY at P and the arc XY at Q. Any arc may thus be bisected.

To draw a line perpendicular to another line from a certain fixed point in it is a very simple problem. In Fig. 1, B, a line is to be drawn from P at right angles to the given line MN. Take any radius and with centre P mark off equal distances from P, giving S and Q. Then with S as center and any radius (greater than S P) describe an arc of a circle. Similarly, with Q as center and the same radius describe another arc intersecting the first at R. Join R and P and this line will be perpendicular to MN.

Sometimes a line must be drawn at right angles to a given line from a point outside it. At C, Fig. 1, this process is illustrated. YZ is the line and P the point. With P as center and any radius (greater than the distance from P to YZ) describe an arc YZ. With center Y and same radius describe arcs on both sides of YZ. With center Z and the same radius describe an arc intersecting the first at L. Join PL, and this line will be perpendicular to YZ and pass through the point P.

When the perpendicular is to be drawn from the center point of the given line, as at 1, E, with center M and with any radius greater than MP, describe an arc at O. With center N and the same radius describe a second arc intersecting the first at O. Join OP.

No matter at what angle to the horizontal a line may be inclined, other lines may always be drawn parallel to it, and at any required distance from it, by the following method: To draw a line parallel to the line X and at a distance from it equal to Y (See Fig. 1, D) take any two points, R and S, on X as centers and a radius equal to Y, and describe arcs T and U. Then draw a line tangent to these two arcs, (just touching but not cutting them) and it will be parallel to X at the distance Y.

Constructing the Ordinary Three and Four-Sided Figures.

An equilateral triangle may be described upon a given base by the method shown at A, Fig. 2. To draw such a triangle upon XY, as base, take X as center and XY as radius and describe an arc. Next with Y as center and XY as radius describe a second arc cutting the first in P. Join XP and YP.

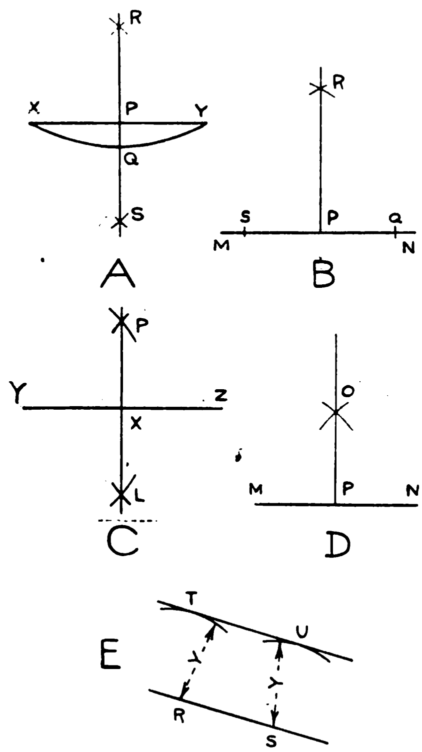

Fig. 1. PROBLEMS RELATING TO PERPENDICULARS AND PARALLELS.

A perfect square whose side is YZ (See Fig. 2, B) may be obtained by erecting a perpendicular from Y. Then with center Y and radius YZ describe an arc to cut the perpendicular at M. Then with M as center and the same radius describe an arc at N, and with center Z and radius still the same describe an arc to cut the former at N. Join M, N and Z and the resulting figure is a square.

At C, Fig. 2, is shown the mode of constructing a rectangle whose sides shall be equal to two given lines. Here XZ is one line and Y the other. At X erect a perpendicular to XZ. Cut off XQ equal to Y. With center Q and radius XZ describe an arc at P, and with center Z and radius Y describe an arc intersecting the first arc at P. Join Q, P and Z and the rectangle is obtained.

A circle, O, is given, and it is necessary to describe a square about it. This is done at D, Fig. 2. Draw two diameters LM and NQ to the circle, at right angles to each other, intersecting at center P. With center L and radius LP describe an arc at R and another at S. With center M and the same radius describe arcs at T and X. With center N describe similar arcs at R and S intersecting those first drawn at these points. Next, with center Q and radius still the same, describe arcs at S and T intersecting those already drawn at these points. Join R, S, T and X and the square is complete.

Three lines are given, as XY, PQ and RS. To place these three in the form of a triangle, take X as center (See E, Fig. 2), and PQ as radius and describe an arc at M. Take Y as center and RS as radius and describe an arc at M intersecting the first at M. Join XM and YM.

Problems Involving Division of Lines and Angles.

Any angle may be bisected by the method shown at A, Fig. 3, where the angle QPR is to be bisected. With center P and any radius PR describe an arc cutting the arms of the angle at R and Q. Next, with center Q and any radius describe an arc, and with center R and the same radius describe an arc cutting the first at S. Join SP, and this line bisects the angle P.

At B, Fig. 3, is shown the method of drawing an angle equal to a given angle. Here TQV is the given angle. With center Q and any radius, as QV, draw an arc intersecting the arms of the angle at T and V. Take a line, as LM and with center L and radius QV describe an arc. With center M and radius TV describe an arc intersecting the former at N. Join LN and the angle at L is equal to the one at Q.

Since the circumference of any circle is considered to be divided into 360 degrees, it is an easy matter to obtain an angle of any magnitude simply by dividing a circumference into the required number of parts. Take the circle O. Draw two diameters at right angles to each other, QR and ST, intersecting at the center P. Then SPR is a right angle. To obtain an angle of 45 degrees, divide this angle into two

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equal parts, as SPZ or ZPR. An angle of 22½ degrees may be had by dividing 45 degrees into halves as ZPV or VPR,

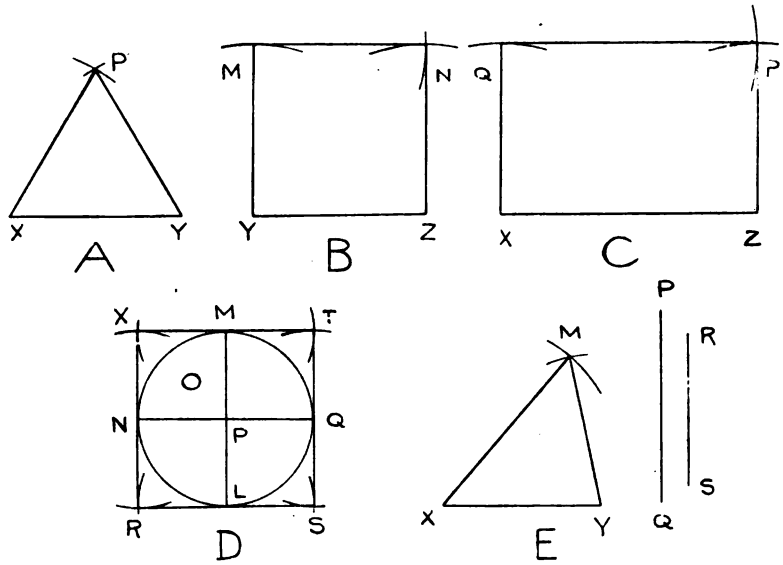

Fig. 2. CONSTRUCTION OF RECTILINEAR FIGURES.

and one of 15 degrees by dividing 45 into three equal portions as SPW, WPX, and XPZ. This must be done by spacing, since no true method has been found for trisecting an angle. Similarly, an angle of any magnitude may be obtained. The angle SPX is thus one of 60 degrees, and WPR one of 75 degrees.

Fig. 3, D shows a good method of dividing any line into any number of equal parts. XY is the line here, and

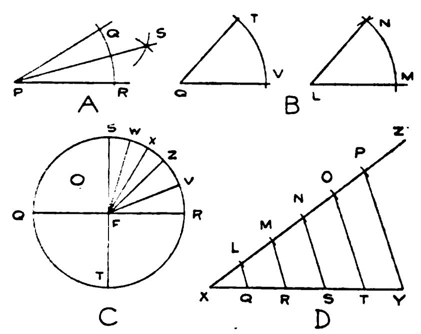

Fig. 3. A FEW PROBLEMS ON ANGLES AND LINES.

it is to be divided into five equal portions. Draw a line from X, any length XZ, and with the compasses or dividers step off five equal divisions of any convenient size XL, LM, ML, NO and OP all equal to XL. Then XP is divided into five equal parts. Now join PY and draw through L, M, N, O, lines parallel to PY, cutting XY in Q, R, S, T, and these points Q, R, S and T will divide XY into five equal portions.

Constructing the Hexagon and the Octagon.

The hexagon is of frequent occurrence in blacksmith drawings and is very easily constructed. Suppose it is required to draw one in a circle, or to inscribe it in a circle, as it is termed. X is the circle (See Fig. 4, A). Draw a diameter of the circle, NO, in any position required. Then with center N and radius equal to the radius of the circle, describe arcs at P and S, intersecting the circumference at these points. Next with centre O and the same radius, describe arcs at Q and R. Join N, S, R, O, Q and P. It may be noted that the sides of the regular hexagon are all equal to the radius of the circle described about it.

Sometimes a regular hexagon must be made, having its sides equal to a given line. This is done at B, Fig. 4, where YZ is the line. With center Y and radius YZ describe an arc at P. With center Z and radius YZ describe a second arc at P. Next, with center P and same radius YZ describe a circle, which will pass through Y and Z. Keeping the same radius mark off the circumference at L from Y, thence from L at M and so on, dividing the circumference into six equal portions, at L, M, N and O. Join Y, L, M, N,O and Z.

The octagon is the only remaining figure of common occurrence. To inscribe a regular octagon in a square (as at A, Fig. 5) draw the diagonals KL and MN intersecting at P. With center K and radius KP describe arcs cutting the sides of the square at Q and R. With center L and radius LP draw arcs S and T, and with center M and radius MP describe arcs at V and W. With center N and radius NP describe arcs intersecting the sides of the square in X and Y. Join VX, QS, YW and TR.

To erect a regular octagon on XY as base: At X and Y make angles 67½ degrees (i. e. three-fourths of a right angle), PXY and PYX. Take P, the point where the lines intersect, as center and describe a circle with radius PX. Produce XP and YP to meet the circumference in Q and R. With center X and radius XY describe an arc to cut the circumference in S, and with center Y and the same radius describe an arc to cut the circumference in W. With center Q and radius XY describe an arc cutting the circumference in T. Lastly, with center R and radius XY describe an arc at V. Join X, S, T, Q, R, V, W and Y.

Great accuracy must be employed in performing any of the operations of geometry described above, for the width of a pencil-line out of the true, will sometimes throw a whole construction wrong. Special care must be taken in obtaining the correct angle, for an error of a

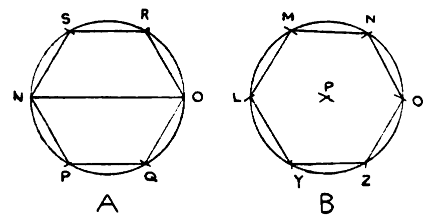

Fig. 4. HOW TO MAKE HEXAGONS.

fraction of a degree at the center of a circle will make a large error at the circumference of a large circle. Of course accuracy can only be cultivated by practice.

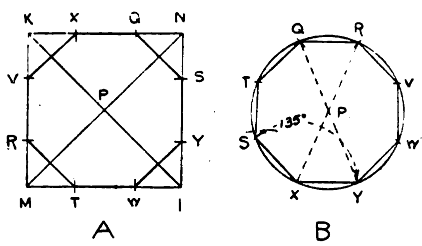

Fig. 5. MODES OF CONSTRUCTING THE OCTAGON.

In constructing any of these figures, the construction lines should be sketched in very lightly so that they may be easily erased when the problem is finished.

The Horse vs. The Auto.

Visiting any of the parks just now and noticing the processions of vehicles that throng the drives, one is led to compare the different styles. The most marked distinction lies between the horse-carriage and the horseless. There is something lacking in spirit in the latter. No amount of style nor finish can make up for the absence of a span of lively, well-groomed horses. It is doubtful whether the automobile will ever supplant the horse with the wealthy pleasure-seeker of taste.

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Pullin' Down The Shop.*

EDNA MANNERS.

When eighty years has passed an' gone,
An' brought their cares an' joy,
A feller may be smart an' strong
But yet he ain't no boy.
So, as I look acrost the street
The tears they will not stop—
It's mighty hard to set an' see
Them pullin' down the shop.

An' Joe an' Billy look askance
At Gran'pa when he cries.
It makes me feel ashamed to see
The wonder in their eyes.
They say "It's jest the greatest fun
To see the old walls drop,"
An' play they're men a-helpin' hard
With pullin' down the shop.

It seems a-most jest yesterday
Since I such frolics planned,
An' since I shot up tall an' strong
An' toiled with brain an' hand.
O, proud the day I learned my trade,
An' struggled to the top,
An' set a-buildin' yonder, where
They're pulling down the shop!

The city slowly come our way
An' land was sellin' high,
An' still I worked in yonder shop
And dreamed of days gone by.
The home ones—some are dead,
And some in distant lands now stop—
So where's the good of mournin', though
They're pullin' down the shop?

Each brick an' timber holds a spell
To touch the old man's heart.
The hopes an' fears of sixty years
All yonder bore their part.
I've played my game—a good one too—
It's time old Jim should stop,
An' yet—the tears will come, because
They're pullin' down the shop.

*Written expressly for the July issue of the AMERICAN BLACKSMITH.

HEATS SPARKS WELDS

Midsummer greetings to the smith!

A first-class horseshoer is an artist in his own line.

Uphill, or down, a concern must go. Nothing in this world can stand still.

How about the harvesting repair work of your locality,—is that competitor getting it all?

Comstock-Haigh-Walker Co., Canandaigua, N. Y., are in the market for a couple of new fires.

Have you a library? A few well-selected trade text-books should form a part of the stock of every blacksmith.

Every craft will be represented at the World's Fair at St. Louis next year. Will the smiths present a proportionately good showing with the others?

An attractive sign to a blacksmith shop is a great trade winner. Try to think of something new and catchy in this line. It will pay.

The working classes are indeed coming to the front now-a-days. In Boston and some other large cities, a "working horses' parade" is one of the latest institutions.

Are you one of those who grumble because prices on materials are high, or one of those who are determined to make prices on work high? Don't grumble. There are too many grumblers in the world already.

A curious little horse has been brought to Tampico, Mexico. He is 22½ inches high, weighs 73 pounds and is seven years old. He was stolen from an island off the coast of South America, where the natives worship little horses of this kind.

An engine is like a horse. It will last longer and do better work if not worked to the full extent of its power. The engine, however, has the advantage of consuming only enough food to produce the power required, and so is more economical.

Old fashioned tools may be interesting to the hunter of curios, but just step into my shop one of these July days and work my old bellows during your noon hour, with the forge in full blast, and you won't want to hunt curios any more.

A sensible horse, says a contemporary, will never hurt a man, if used right, but a horse without sense cannot be trusted. If a horse is vicious from lack of sense, it can certainly do no good to treat him cruelly if he has not brains enough to understand.

At different seasons people want different things. Think just what your customers need done at present, and let them know that you are waiting to give them the best work in that line. You can even make them want things by a little careful advertising. Ever tried it?

Mechanical power is taking the place of living force in every possible line. One of the newest things is a trackless traction train for drawing timber in lumber districts where it is not convenient to install a railway. The mill-owners find these trains more economical than horses.

Keep right on. Results may be slow, but time will tell. Set about organizing your business and installing method, and you will one day discover that you have attained a degree of perfection that will surprise yourself. The result will be apparent in the class and attitude of your customers as well as in your profits.

Do not say to your customer that his job cannot be done, without first carefully thinking whether you cannot work out a way to do it. He may take it to a smith who will think the matter out, do the work and boast that "So-and-so said it could not be done." Make a desperate effort to accomplish it even if it is the smallest piece of repairing.

An interesting branch of the shoer's work in Texas consists in shoeing oxen for mountain travel. The ox to be shod is thrown down by means of ropes, and separate plates are fastened to the portions of his cloven hoof. The operation involves considerable excitement and danger to the shoers, and the poor animal is often sick for days afterwards.

A really good thing is always good. You may have a tool or method that is an old stand-by, handed down from your grandfather, and yet another smith may never have heard of it. Describe it to him and he may be able to suggest improvements that will make it of value to the whole craft, and thus you will benefit each other. Think about it.

A complete system of book-keeping in a blacksmith shop should show just how much material of every kind is on hand, and when received, so that the old may be used first. Such a set of books may be kept extremely simple and convenient in detail. Any man may gradually work out a system to fit his own needs and ideas. The degree of perfection to which he may bring them depends upon himself.

Slurring over the unnoticeable parts of work is a fault of the present-day American. Manufactures presenting a good appearance to the casual observer will not stand the test of close scrutiny. It is just this that has spoiled the foreign market for American products. Likewise, is the slipshod worker found out and shunned by the paying kind of customers. A reaction has set in, and even Americans want good value rather than cheap trash.

A new material has been produced by the American inventor of carborundum, Mr. E. G. Acheson, of Niagara Falls. The new substance is called Siloxicon and is a product of the electrical furnace. It is formed from ground coke and sand, after the manner of carborundum but does not require so high a temperature. It is of a gray green color. Siloxicon will stand very high temperatures and is very useful for furnace linings, fire-bricks, etc., in the case of furnaces where oil is used as fuel.

Ever tried to make an artistic piece of wrought iron after your own original ideas? This is an excellent way to put in odd minutes. It affords play to the smith's artistic tastes as well as practice in detail work, besides forming an interesting change from the ordinary routine work. This line with a little practice may be made a profitable one as well, for ornamental wrought iron is constantly growing in favor. It isn't everyone who can put his ideas into iron, however.

It was raining when we passed Tom Tardy's shop one evening last week, and we stepped in to get out of the wet.

Tom was very busy and somewhat excited, and upon looking around, it was easy to see the cause. In about a dozen places the rain was coming through the roof and already several of the tools lay in little puddles.

"It keeps breakin' out in fresh places, that's the trouble," said he, as he shifted things to escape the latest drip.

"Wouldn't it pay you to have a new roof put on?" we asked him.

"Well, you see it's jest after a dry spell that it acts like this—I dunno, though,—but it'd cost a heap o' money.

And he began to think seriously about it.

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American Association of Blacksmiths and Horseshoers.

What thought have you, reader, put on the subject of craft organization and co-operation, and what has been your conclusion? Have you been contented to watch the prices of stock and living necessities go up on the one hand, without the power, as you thought, to ask correspondingly higher prices for your work on the other? If you are a shop-owning or a shop-running smith, the situation needs no describing.

Strange as it may seem, to persons working for stated salaries, prosperous times bring hardships, because the purchasing power of their money is diminished. Hard times are good times for them. It is very evident that blacksmiths who fear to raise their prices on account of competition place themselves in very much the same position as those who work for a fixed salary, and hence good times are anything but good for them. There are some mechanics running shops who realize the foolishness of working at old scales of prices, and who in the face of competition pluckily advance their prices to a figure which will give them a proper profit, and we figuratively shake hands with everyone who has done this.

We should like to see prices raised in every smith shop in the land. We should like to know that every blacksmith was making as good a living as his skill and strength deserve. The object of the American Association of Blacksmiths and Horseshoers is to better the condition of the craft in every possible manner, and to point out ways for improving its welfare. It is a mistake to think, because there is competition from neighboring shops, that better prices cannot be obtained. Other crafts and professions long ago found that rate wars and price cutting were disastrous to all who participated and profitable only to customers and patrons. The sooner the blacksmith, the horseshoer and the wheelwright realize this fact, and see the advantage of the craft working together as a whole, the sooner will they be able to better themselves. Co-operation is the great need to-day.

If you have been asleep or your locality has been asleep, thinking that circumstances prevented a betterment of condition as far as prices for your work are concerned, wake up at once. Wake up, throw aside the jealousy or prejudice which may be standing in your way, and commence to agitate the question of better prices. We should like to see every county in the land organized and co-operating, and should be glad to lend all the assistance possible to any who would like to see an organization of this kind in their county. Whether such associations are formed as branches of the American Association of Blacksmiths and Horseshoers or not, we should like to see them formed everywhere for the benefit of the craft. The American Association is doing a good work in various counties of New York State, and will gladly assist in forming associations everywhere.

One or two enthusiastic smiths can accomplish wonders, and we are glad to give the benefit of our experience to any who wish it. Some counties are ripe for organizing at once, in others some effort may be needed to educate the men up to the proper point.

It is usually the case that we must labor for anything well worth having in this world. Surely the many advantages of a strong association are worth considerable time and effort.

Wake up, and wake your brother smiths. Get together, co-operate, work with instead of against each other. If you can succeed in forming a little independent association in your town or county, do so by all means. If you desire our help and wish to become members in the American Association we should be glad to have you communicate with us. But by all means talk up the matter with your nearest neighbors and brother smiths in the town and county. There is no telling what a little effort on your part will accomplish.

Remember also that every effort made by you is setting an example for your less energetic neighbor. In this way your influence will be doubled. There is nothing so helpful in such a case as earnestness and enthusiasm. Nobody can help being affected by these qualities in another. You may as well be a leader.

A NOVEL DEVICE IN THE WAY OF A WAGON TONGUE SUPPORT.

A New Form of Tongue Support.

A novel wagon tongue support is shown by the engraving on this page, and some of its features may be of interest to readers of THE AMERICAN BLACKSMITH. This support is attached to the front axle instead of to the tongue and its long arm gives it great leverage or supporting power. Adjustment may be made simply by turning up the bolts that pass through the eyes of the spring ends, and in this way the support may be adjusted for different weights of tongues. The construction of the support makes it very flexible, so much so that when the tongue is held by the support it moves freely up and down with the motion of the team, and again the weight of the neck yoke when no team is attached will cause the end of the tongue to rest on the ground. This support is the invention of H. C. Burk, Burlingame, Kansas.

Hints on Bicycle Repairs.

BY APPLETON.

Although many misfit jobs in the original construction of a bicycle are scornfully described as blacksmithery, yet no country bicycle tourist will hesitate to ask the aid of the village smithy when no repair shop is at hand and a break down occurs. If the smith is at all practical in his efforts he may turn many an honest dollar and make himself the undying friend of the cycler.

When first bicycles were made the frame and forks were brazed in an ordinary open fire forge, although a gas blast is now used. With a small stock of bicycle tube of different sizes, a supply of soft brass wire and the borax which every smith has, no difficulty will be found in replacing broken tubes or fork stems or rebrazing loosened joints.

If the roads in the vicinity of the smith shop are hilly, broken cranks and chains may bring frequent customers. The cranks may be welded if not broken too near the pedal end, in which case a new piece must be welded on and drilled and tapped for the pedal pin. A set of bicycle taps and dies are sometimes a useful addition to the stock of tools. With a few extra links of chain it is a simple matter to replace broken ones with the aid of a few blows from the hammer.

A Price Schedule from Missouri.

W. M. STRAIT.

Wagon tongues	$2.00
Hounds, each	.50
Front and hind bolsters, each	1.25
Front and hind axles	2.25
Coupling pole	1.15
Setting tire, $1\frac{1}{2}$, each	.40
Buggy and surrey tongues, each	2.00 to 2.50
Welding stubs, according to size, each	.50 to .75
Setting boxes, each	.25
" axles	1.00
" tires, per set	2.00
Horseshoeing, per team	2.40
Resetting " "	1.60
Wagon spokes up to $1\frac{1}{2}$ inches, set, each	.15
Buggy spokes, each	.15
Single spokes, each	.20

Steel and How to Treat It—2.
The Heating of Steel.

JOSEPH V. WOODWORTH.

Improper heating of steel in many shops, as well as a deal of unnecessary expense in forging, annealing, hardening and tempering steel, may be directly traced to inexperience; but more often to the crude and obsolete means employed for the heating. Hence, proper facilities should be provided for heating in all shops where expensive tools, forgings or tempered parts are made.

In heating for forging, a clean fire and plenty of fuel, so that jets of hot air will not strike the corners of the piece, are the first requisites. Care should be taken to keep the fire regular so that a good uniform heat will be given to the whole part to be forged.

A great many think that it is a too high heat that is responsible for trouble in forging, while on the contrary, it is usually uneven heat. Suppose we put a bar of fine steel into a very hot fire and bring it as quickly as possible to a high, yellow heat, or until it almost scintillates, the outside of the bar will be very soft and in an ideal condition for forging, while the center portions will probably not be even red hot. Thus the metal has separated into two distinct sections; the soft outside and the hard inside. We will now proceed to forge this end of the bar and the result will be that the soft outside will yield to the hammer quicker than the hard inside, thus tearing the outside particles away and leaving the inside sound. The forged piece will be useless unless turned down to the hard core. If on the other hand the bar be heated and then the outside cooled so as to get the inside much hotter than the outside and the piece forged, the result will be that the outside to all appearance will be sound until it is machined and then it will be found to be "piped" or hollow inside, and will be useless. In order to forge a piece perfectly sound and good, it is necessary that the steel be heated *evenly* red hot *all through.*

A high heat is never desirable except when mechanical means are at hand for heavily forging the bars, as this refines them. Thus where fine steel is heated until very soft, the grain raises and becomes coarse, and unless a very heavy steam hammer is at hand, it cannot be refined. The moral of this is never to heat a piece of fine steel, which has to be hand forged, higher than a bright red heat.

Again, large quantities of steel are ruined by being left in the fire after they are properly heated. When you get your steel to the proper red heat, don't let it "soak" for awhile, but remove it from the fire and harden or forge it as rapidly as possible. Allowing steel to soak in the fire after it has reached the proper heat renders it brittle and does great injury to it. If these precautions are taken, steel may be always heated safely up to even a bright yellow red, and at this heat it will weld easily.

Not only when heating for forging but in the other processes as well, always bear in mind that a uniform heat is necessary to insure success, and that every variation of heat which is great enough to be seen, will cause variation in the grain which will often result in ruining the steel. Thus the two things to be avoided in heating steel are *too high heat* and *irregular heat.* Too high heat raises the grain and makes the steel coarse, while irregular heat causes irregular grain, irregular strains and cracks.

In regard to the heating arrangements, while an ordinary forge is all that is necessary for the forging, annealing and tempering of rough tools it will not do for fine ones. When it is considered that an accurate cutting tool which has been annealed properly before finishing, and then carefully and accurately hardened and tempered afterward, will accomplish many times the amount of work that an imperfectly treated one will, the expense of providing suitable heating facilities is insignificant, especially when the longevity of the tools treated by them is considered. In shops where a fair number of fine cutting tools are made and used, the cost of proper heating arrangements will be made up in a short time by the money saved through the use of the properly hardened and tempered tools. Another thing; after having installed a suitable steel heating plant, hire a mechanic who understands the treatment of steel to run it. With this combination, and a supply of good, high-grade steel, there will be no dissatisfaction with the working qualities of the cutting tools. If there is, there will be no excuse for it; carelessness will be to blame.

Although in a great many shops very little importance is attached to properly placing the furnace, it will be found that if the location is in a darkened corner where the sun's rays will not come near it, the best results will be attained. No matter what kind of treatment is to be given steel, the heating arrangements should never be located where there is too strong a light. If the light is uniform, it will not be difficult to attain uniform results; while, on the contrary, if the light is too bright, there is a chance of heating the steel too hot and when it becomes darker not hot enough.

There is considerable difference between steel which is hard and steel which is both *hard* and *tough.* When a tool has been hardened and tempered and the edge crumbles away, the steel is hard but not tough, and was heated wrongly; either when forging, annealing, hardening or tempering, or was not quenched right. On the contrary, when a tool has been heated properly and hardened and tempered as it should be, it can be very hard and the edge will hold; because for a given degree of hardness the same degree of toughness has been imparted during the heating and hardening processes. So always bear in mind that successful steel treatment starts from the minute the steel

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enters the fire, and that unless the heat is applied right, failure will surely result, no matter how carefully the subsequent operations are carried out.

(*To be continued.*)

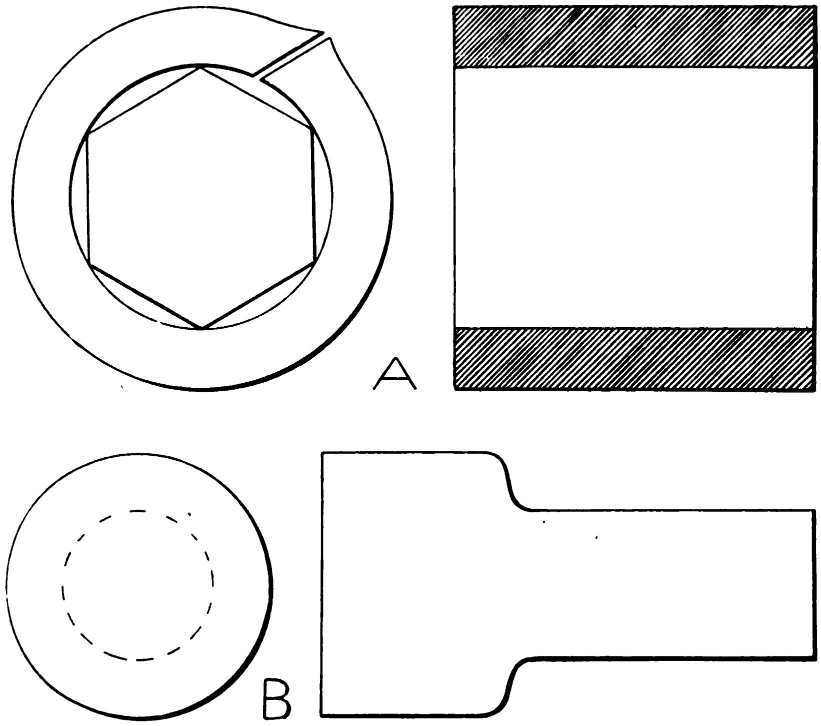

Fig. 1. CONVENIENT METHOD OF MAKING LARGE WRENCHES.

Convenient Methods of Making Wrenches.

S. H. HOOVER.

The accompanying sketches show designs for two different socket wrenches, which I think will be of interest to anyone who may have wrenches to make—especially if he is making them piece-work or if he is anxious to make the business pay, and I believe we all are.

To make a wrench of 1 inch up to 5 or 6 inches, first make a band as large as the largest diameter of the nut or a little larger so as to admit the mandrel easily. Fig. 1, A, shows an end view and a section of this band not welded. Next make the shank as in Fig. 1, B, large enough to fill up the collar very tight, so it will not be inclined to work off in heating. Now instead of welding the band and shaping the nut afterward get the stem or shank very hot, slip the collar on and take a good heat on the whole thing. When brought out to weld, let your helper slip the mandrel in place and if you have a steam hammer, put in a spring swage just the size you want the outside of your collar to be, and weld with the mandrel in place. This will allow you to make two wrenches where you would one in the ordinary way.

I once had a number of sockets to make for valve stems about the same as socket wrenches. They had long stems on them about 1½ inches in diameter to reach from the top to the bottom of a floating dry dock which was built here for the U. S. Government, and I made them solid in the wrench part. The wrench was 3½ inches outside diameter and 2¼ inches inside. The handle was 1½ inches in diameter.

Still another way of making socket wrenches is shown in Fig. 2. The stock used in this tool fills up the hole in the die, A, tight down to the shoulder, as seen in the sketch. By forcing the punch, B, into this stock we force enough down in the 2-inch part to draw out the shank in order to piece out the handle. Thus we make a nice socket in one pass.

Next to the hammer, the wrench is the most common and most useful tool of the mechanic. It is, therefore, very convenient to be able to make different kinds, suitable for different work, at the least possible expense of time and materials. The above methods will be found to fill both these requirements.

More Luck in Blacksmithing.

THOS. BEASLEY.

In a former article entitled "Luck in Blacksmithing" was described an instance in which a difficult piece of work was done simply by employing a little originality in making the means at hand suit the end in view. To my mind it is not the tools a man has to do a job with so much as the brains he possesses that help him in an emergency. By this means, things apparently impossible may often be accomplished, and the ordinary person will call it "luck."

I will illustrate to you now a job I did once that seems just as reasonable. I had a sand pump (used in drilling oil and gas wells) to mend. This one was made of 6-inch wrought pipe with ⅜-inch by 3-inch band and bail, attached. The bail was parted or broken loose from the band, and had to be welded back to the band without disturbing the threads on the inside of the band or getting it out of round, otherwise it could not be screwed on the pipe again. Like several other smiths, I pronounced the job impossible to do, but the oil well driller would not take "no" for an answer and begged me to try it, as he had heavy expenses and could do nothing without this implement. So telling him I would not guarantee the work I studied the job thoroughly and succeeded beyond my most sanguine expectations, in welding it so thoroughly that the 1¼-inch bail broke, and the band weld stood the strain.

You may say this was luck, and perhaps that had something to do with it, but at the same time you will admit that I must have made a lucky heat, had a lucky forge, used a lucky helper and a charmed hammer. Careful attention to detail is the main element in the so-called "luck," and those who practice this usually draw at least one-third more on "silver Saturday," than those individuals who stand off to themselves and say, "That's the darnedest, luckiest man I ever did see."

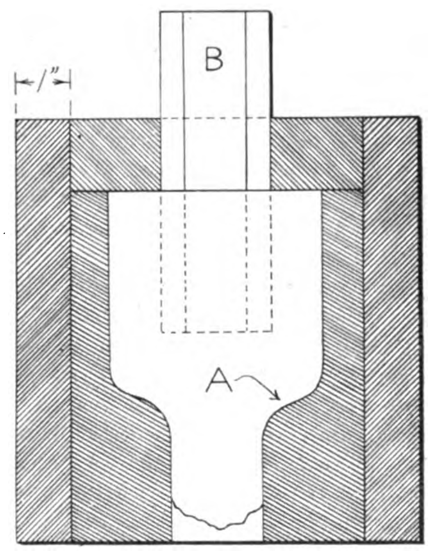

Fig. 2. A SMALL SOCKET WRENCH MADE FROM SOLID STOCK.

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Schedule of Prices in Uinta County, Wyoming.

W. T. LANE.

Horse shoeing, smooth, No. 0 to No. 3	$1.50
Horse shoeing, hand calked, No. 0 to No. 2	1.50
Horse shoeing, hand calked, No. 3.	1.75
" " " " " 4.	2.00
" " " " " 5.	2.25
" " " " " 6.	2.50
Setting tires up to 3¼ inches, each.	1.00
Setting tires up to 3¼ inches, per set of four	3.00
Setting tires up to 3½ and 3¾ inches, each	1.25
Set of new buggy tires	$9.00 to 13.00
Setting boxes, each	.50
Setting new spokes	.35 to .50
New felloes	.40 to .65
Pointing and sharpening plows	.75 to 1.50

"King Solomon's Smith."

And it came to pass when Solomon, the son of David, had finished the Temple of Jerusalem, that he called unto him the chief architects, the heads of artificers and cunning workers in silver and in gold, and in wood and in ivory, and in stone.—Yea, all who had aided in rearing the temple of the Lord, and he said unto them, "Sit ye down at my table; I have prepared a feast for all my chief workers and cunning artificers, stretch forth your hands, therefore, and eat, and drink, and be merry. Is not the laborer worthy of his hire? Is not the skilled artificer deserving of honour? Muzzle not the ox that treadeth out the corn."

And when Solomon and the chief workers were seated, and the fatness of the land, and the wine and oil thereof were set upon the table, there came one who knocked loudly at the door, and forced himself even to the festal chamber. Then Solomon, the king, was wroth, and said, "Who and what manner of man art thou?" And the man answered and said, "When men wish to honour me they call me 'Son of the Forge,' but when they desire to mock me, they call me 'Blacksmith,' and seeing that the toil of working in the fire covers me with sweat and smut, the latter name, O King, is not inapt, and in truth, thy servant desires no better." "But,'' Said Solomon, "why came ye thus rudely and unbidden to the feast where none, save the chief of the workmen of the temple, are invited?" "Please ye, my lord, I came rudely," replied the man, "because thy servants obliged me to force my way, but I came not unbidden. Was it not proclaimed that the chief workmen of the temple were invited to dine with the 'King of Israel?'" Then he who carved the cherubim said: "This fellow is no sculptor"; and he who inlaid the roof with pure gold said: "Neither is he a worker in fine metals"; and he who

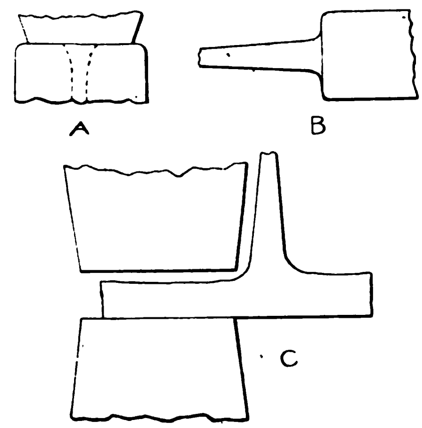

Fig. 37. METHOD OF DRAWING DOWN STOCK FOR VALVE YOKES.

raised the walls said: "He is not a cutter of stone"; and he who made the roof cried out: "He is not cunning in cedar wood, neither knoweth he the mystery of uniting pieces of strange timber together." Then Solomon said: "What hast thou to say, Son of the Forge, why I should not order thee to be plucked by the beard, scourged with the scourge, and stoned to death with stones?" And when the Son of the Forge heard this he was in no sort dismayed, but advancing to the table snatched up and swallowed a cup of wine, and said: "O King, live forever. The chief men of the workers in wood, and gold, and stone, have said I am not one of them, and they have said truly. I am their superior, and they are all my servants." And he turned him round to the chief of the carvers in stone and said: "Who made the tools with which you carve?" and that one said, "The Smith." And he said to the chief of the masons: "Who made the chisels with which the stones of the temple were squared?" and he said, "The Smith." And he said to the chief of the workers in wood: "Who made the tools with which you hewed the trees in Lebanon, and formed them into the pillars and roof of the temple?" and he answered, "The Smith." And he said to the artificers in gold and in ivory: "Who made the instruments by which you work beautiful things for my Lord the King?" and he answered, "The Smith."

"Enough, enough, good fellow," said Solomon, "Thou hast proved that I invited thee, and that thou art all men's father in art. Go wash the smut of the forge from thy face and come and sit at my right hand. The chief of my workmen are but men. Thou art more."

So it happened at the feast of Solomon, and smiths have been honored ever since.

The Railroad Blacksmith Shop. —9.

Making a Valve Yoke.

W. B. REID.

The second method of making valve yokes is slower, but is largely preferred, as it presumably overcomes the objection of cross-grain in stem. Proceed as in first method, (see article in June issue) or with a forged bar of right size, draw down stems and cut off pieces of suitable size, (Fig. 37, B). With second heats, these are drawn down under steam hammer in die or tool having a hole of suitable size for stem, using a round fuller or piece of iron for the purpose (Fig. 37, A). Pinch the piece out and drive together upon side, repeating operations until drawn out to right dimensions. Operations may be hastened by drawing out between hammer dies as in Fig. 37, C, using a tool similar to that shown in Fig. 35, C, (but with a round close hole clear through instead) to give proper taper (Fig. 38, A). When made in this way the stem should be left a little longer than depth of hole so as to strike the bottom. Should this not be done, a weak, atten-

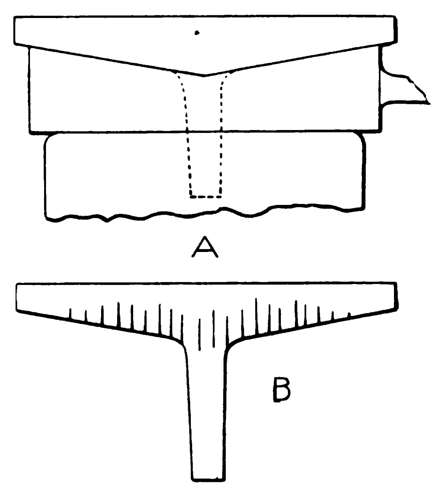

Fig. 38—A. TOOL USED FOR DRAWING OUT. B. RESULT OF WORKING IRON TOO COLD.

uated or "strangled" effect results at base of stem, caused by the stem and body of iron recoiling from each other at the heavy blow of steam hammer. This defect may often be observed also, in the stems of motion link saddles made in the same manner.

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The quality of forging in this method, also, is very often greatly impaired by working the iron too cold, the result

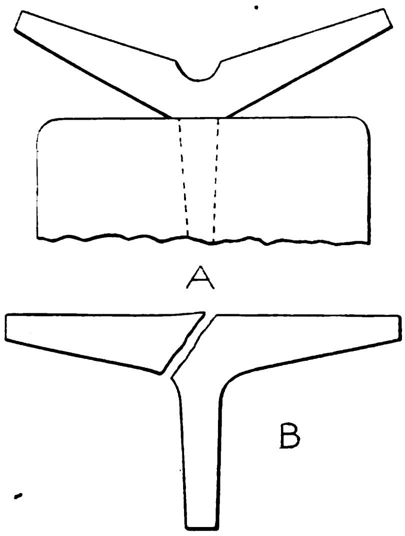

Fig. 39. TWO UNSATISFACTORY METHODS OF MAKING A VALVE YOKE.

being a tendency of the iron to crack perpendicularly across as in Fig. 38, B, a condition even more inferior than a tendency to cross-grain in a contrary direction.

Third method: Yoke backs are sometimes made by splitting and spreading the iron as in Fig. 39, A. Although producing a very strong result, this method is too slow, tortuous and expensive to be very largely practical.

Fourth method: The worst method we have seen described is that in which the yoke is welded as shown in Fig. 39, B. A frequent necessity in the life of a yoke is the renewal of the stem. A yoke made in this way would hardly stand this operation, if it should, fortunately, last long enough to reach this stage of valve yoke history.

Fig. 40, A, illustrates a method in which the entire yoke is forged in one piece, turned and welded at point D, Fig. 40. The preliminary process being that shown in Fig. 39, A. Whatever advantage this method may be supposed to possess, is altogether offset by its expensiveness and the probability of the iron being tortured and strained in the course of forging so intricate and unwieldy a piece.

It is very inferior practice to weld a valve yoke at corners as shown in Fig. 40, C. This method of weld, like that shown in Fig. 39, B, is of the most precarious and unreliable kind; especially so, should the yoke be machined in the inside surface, which is most frequently done. The method of weld shown in Fig. 36, B, will be found the most practical, expeditious and reliable.

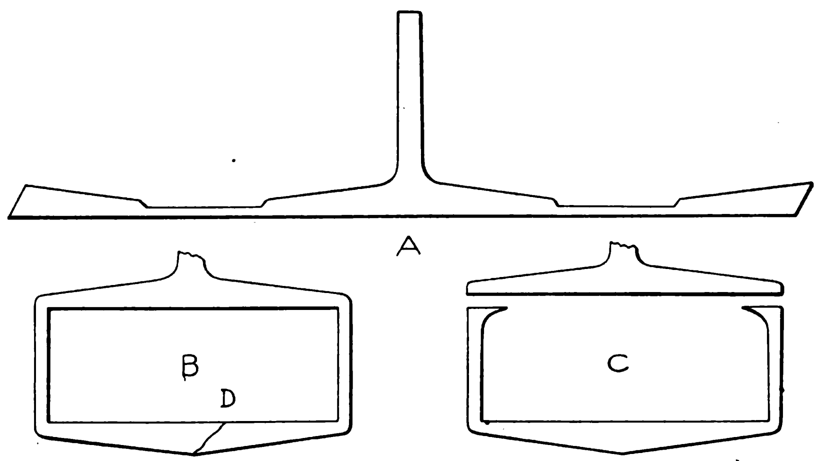

Fig. 40. METHOD OF FORGING AN ENTIRE YOKE IN ONE PIECE.

The method of making a complete valve yoke, or other forging, should largely be determined by a practical estimate of the strain or resistance the part is calculated to endure in actual service. The work a valve yoke has to perform is not of a violent or strenuous nature. The average breakage is small compared with the necessary renewal of worn valve stems. A method of manufacture offering a reasonably safe margin of strength at a low, if not minimum cost, is a practical one.

(To be continued.)

Beginners in the Blacksmithing Craft.

WM. P. DAVIS.

My first thoughts of being a blacksmith came to me when I was about twelve years old. I used to take my fathers' horse to the shop to get him shod, and what there was about the old shop or the hard and dirty work which should attract me I cannot tell, but this was my thought, that I would be a country blacksmith. I had no ambition to go to the city, or to work as journeyman, but to have a shop of my own and do jobbing for my neighbors.

When I was twenty years old I began working for a blacksmith who was to teach me as fast as he could, besides boarding me and giving me twenty-five dollars for one year. You will laugh at the wages I was to have, but I was not after money then—I wanted the experience. I commenced in good earnest but I worked only three months. I had to do the hardest of work, such as I already knew how to do and was not given any instruction at all, so I went back again to my father's farm. Farming had no attraction for me. The next spring I determined to go to California. I had no money and my father had none; and although I was not yet twenty-one years old, my father borrowed one hundred and fifty dollars and let me have it to go with. Let me say right here that I sent it all home to him in one year. The first man I hired with there was a blacksmith from Maine, a smart little fellow, weighing about 135 pounds. He took me into his family and I had a good home. He gave me $300 for one year, not agreeing to teach me anything, but to make me useful to him. I worked the year through and you may be sure that I learned something, for he raised my pay to $420 the next year, in addition to my board. I worked for him two years and more, not only at the fire but I used the sledge too. Then I went sledging in the navy yard at $3 per day. After three years I came back to my old home in Maine. This was my beginning in the blacksmith trade.

Now I know that all over the land there are young men who are starting in to make their homes and living by this trade, and to these I would give a few words of advice. Many are located away from the privileges which are to be had in the city. Many have not the means to put in power and machines which they would like to and which would pay. To this class I wish to speak. First of all keep your credit good and your promises sure. You will find in after years that it is worth a great deal to you. Treat all people courteously. Do not allow yourself to get angry under any circumstances. The man who governs himself can govern others. Do your work honestly and charge a reasonable price. If your prices are too high, you will drive the work to other shops; and if too low, you will fail. Learn to do your work quickly and do it well. Watch your chance for buying tools, often you will have a chance to get tools cheap of men who are going out of business. Keep your tools in readiness for any job that may come, repairing and sharpening them when other work is slack.

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Make your shop comfortable for those who have to wait; have a few chairs and a good fire (when cold) and the papers handy. Do not oppose a man too vigorously, you can convince him better by mild and pleasant language. Arrange your forge so as to get any kind of long iron in the fire. Keep all metals which would hinder welding (such as lead and tin), away from your forge fire. Decide what you are to do with your iron (when hot), before heating and have your tools handy. You cannot get a good heat under your fire where the wind blows on to your iron, nor can you get a good heat on top of the fire; but to get a good, clean heat have a clean fire, and have it all around the iron. See that the fire does not get hollow under the iron. I am aware that these suggestions will seem simple to the old smiths but there are many little things which bother the beginner.

Finally, the beginner should try to put his very best into his work. He cannot be too much in earnest. The great thing lacking in most craftsmen of the present day is earnestness and enthusiasm. When customers see a man interested in his work and always busy, they come to consider him a good man. They believe he is going to try his best. The fact of his being busy goes to show that he has plenty of work and hence, that other people believe in him and bring him their jobs. With practice will come the ability to fit in different odds and ends of work so that very little time or fire or material will be wasted, and the consequence will be more profit.

A Few Hints on Clipping.

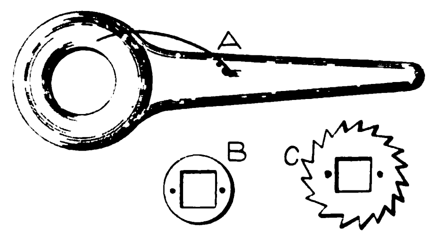
BY M. M.

Many smiths have introduced into their shops an apparatus for clipping horses, and this may be made a source of profit under proper conditions. But like everything else, the man who undertakes it should know something of the principles of the work he is going to do.

It is folly to suppose that all horses should be clipped. No animal with a tendency to skin disease should ever be clipped, but where the general health is good, both old and young horses may be greatly benefitted by the operation. The process, however, should be as quick as possible.

The horse in his long winter coat, perspires freely when at work, and soon becomes soaked with sweat. When greatly fatigued and the circulation weak, it may take hours for his skin to become dry. In such cases the long continued evaporation keeps the surface cold and not only induces obstinate skin diseases but may seriously impair the health of the internal organs by leading to congestion and inflammation.

When horses are in favorable condition to be clipped, the process affects them noticeably and beneficially. The appetite improves, their spirits are



A NEW AND INTERESTING MODEL OF RATCHET WRENCH.

greatly heightened, and they become more active and jaunty, throwing off any sluggish tendencies that they may have exhibited previously. In fact, the whole constitution is improved, and they can accomplish a far greater amount of work with less fatigue than when unclipped. It is, therefore, a point of economy to rid the animal of his long coat.

Of course, care should be taken to choose the right season for clipping. Some owners, when the month of October is mild and open, allow their horses to go until November before clipping, in which case an entire new coat is developed, but the wisdom of this is very questionable. It is, to my mind, a wiser policy to remove the coat while the weather is yet mild and before the new hair has had time to develop. The horse that is to be clipped might just as well be clipped earlier, thus to avoid any injury from possible changes of temperature. Besides, the effects of clipping are then less severely felt, and the increasing cold is better tolerated than when the process is left until later.

Some persons who shun singeing, are in favor of clipping two or three times in the course of the winter. But the clipping should not be done closely, or else, after the second or third time, serious consequences can be avoided only by greatest care.

With attention to the above hints (which I believe all practical horsemen will second) clipping may be considered a good thing. The blacksmith who would make a success of it should bear in mind these points for the benefit of his patrons.

A New Form of Ratchet-Wrench for Tire Bolts.

In last month's paper, under Queries, Answers, Notes, appeared an item by Mr. G. L. Coleman, concerning a very ingenius form of ratchet-wrench devised by him. The sketch was then omitted, but, being quite interesting enough to warrant a more minute description, we herewith reproduce the sketch and further details as to construction.

Forge a piece of steel as shown at A, from stock 1 by 1¼ inch, with an inch hole in the head. Another part, B, is next forged, $\frac{1}{16}$ inch wider than the first. The next step is to cut it out, as indicated, making it from some old mower section or other light steel. Place the two pieces together, put a ratchet on each side and rivet together. Adjust your spring, and the wrench is complete.

Such a tool is simply made, convenient and a great help towards saving labor.

A Useful Form of Pipe Cutting Tool.

B. E. PEASE.

The figure which accompanies this article shows a tool which is of great service as a pipe cutter for large iron pipe and boiler plates. It is forged like a cape chisel except the end, which is left square and cut off at a bevel as shown. The longest side has the corners ground or filed off as illustrated and the temper is drawn the same as a cold chisel.

This is a very useful tool in the shop when it is necessary to enlarge a hole in iron on one side, or to change the position slightly, as is the case in repair work. It does the work much better than a round-file and can be used when a file cannot. I find that several sizes can be made to advantage.

A USEFUL FORM OF PIPE CUTTING TOOL OF ORIGINAL DESIGN.

The blacksmith who once uses this tool will understand why I recommend it for cutting pipe and boiler plates or enlarging a hole as described. He will not be without it.

The Patience of the Horse.

Whether the horse is intelligent or not is an undecided point. Some people claim that he is the most intelligent and

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faithful of animals; while others declare he has not an atom of common sense and that his only instincts are of self preservation and self-comfort.

Be that as it may, nobody can deny his great patience. Nature has made him peculiarly dumb. He cannot complain. He must submit to every kind of usage. He may be driven painful miles on shoes that are all wrong, and if he raises any objection he very likely gets the whip. He is brought to the forge, and the sights and sounds and smells fill him with horror in remembrance of a former unpleasant experience in a like place. He begins to rear and plunge and is at once termed vicious and treated like a criminal. Submit he must, soon or later, although he has not enough intelligence to profit by a lesson in corporal punishment, but only to dislike the forge more and more.

He jogs through life obeying every word and gesture, silent and uncomplaining as any machine. He stands long hours in all kinds of weather. He takes what comes his way, eats what is placed before him, and does the work that is set for him to do. Then when he is quite used up and can work no more, he is just put out of existence. It is doubtful if any other living creature is so utterly a slave as the horse.

A Correspondence School Graduate as a Progressive Blacksmith.

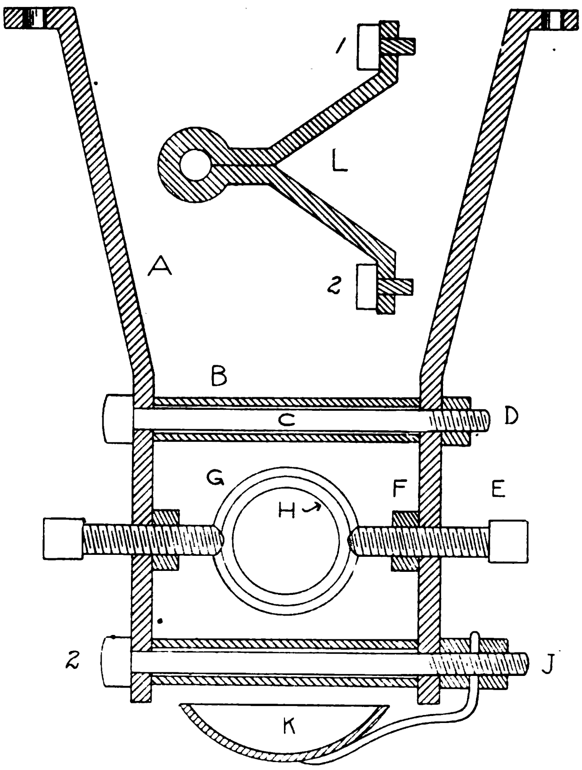
Situated on lower Main Street, in the little hamlet of Rogersville, town of Dansville, New York, is a modern blacksmith and woodwork shop owned by Mr. Byron Wallace. The woodwork is done by Mr. Wallace, the shoeing entirely by his son, Fay, a youth of twenty, who holds a diploma from the International Correspondence School, of Scranton, Pa.

Mr. Wallace is a subscriber to many scientific papers and boasts of having every number of THE AMERICAN BLACKSMITH ever issued.

Among the tools in the wood-shop are an 8-foot bed, 13-inch swing; reversible feed and swivel rest, power and foot lathe, manufactured by W. F. & S. J. Barnes, Rockford, Ill., a No. 7 Barnes Jig Saw, a Union emery grinder, carrying two wheels driven by power made from a bicycle, a Koch Universal tenon and boring machine made by the Koch Manufacturing Co., Montezuma, Iowa, and other useful tools.

The young smith uses an Eagle anvil from the Eagle Anvil Works, Trenton, N. J. The Green River horseshoers' and bolt heading vise made by Wiley and Russell, Greenfield, Mass.; the S. and R. back gear tire bender; the Silver Advance drill No. 12 of the Silver Manufacturing Co., Salem, Ohio; the Western Chief, No. 14 drill of the Canedy-Otto Manufacturing Co. of Chicago Heights, Ill.; the Bicknell shear made by the Bicknell Hardware Company, Janesville, Wis.; and the Antikink tire upsetter are also part of the equipment. Last but not least is the 17-pound foot hammer made by father and son, adjustable to any part of the anvil.

This smith is greatly in favor of the Lein Law and is doing all he can to actively help along the cause. He is very earnest in his work and has shown considerable pluck in starting up his shoeing shop in his own town within a short distance of four other shops.



A VERY CONVENIENT FORM OF SHAFT HANGER.

A Shaft Hanger of Useful Design.

JAMES H. JENSEN.

The accompanying drawing shows a shaft hanger, which I recently devised. It may be of interest to the blacksmith who is putting in power. It can be used for line shafts, and also for counter shafts by making the two bolts $\frac{1}{2}$ inch longer, on which to fasten the attachment L. I will not give any sizes or lengths, as they must be made according to the size of shafts and pulleys.

A is the arm of hanger, made of wrought iron.

B, a piece of gas pipe, which goes in between the arms.

C, a bolt which passes through both arms and the pipe.

D, nut for long bolt.

E, set screw which goes through arm and against box.

F, lock nut for set screw.

G, piece of pipe for boxing, which should be three times as long as the diameter of shaft.

H, babbitt metal, which is run in.

J, lock nut for holding oil cup, which can easily be taken out to clean.

K, is the oil cup, made of tin with handle riveted on.

I cut threads in the arm, where the set screws go through. The oil cup should be an inch or so longer than the box. The easiest way to babbitt these boxes is to have a piece of wood turned $\frac{1}{32}$ of an inch larger than the shaft with a shoulder somewhat larger than the outside of box. Stand it on end and put a little putty around the bottom of the box to keep the babbitt from running out, and you will have no trouble in making a good job. Bore an oil hole in the top, and on opposite sides bore holes for the points of the set screws, so as to adjust the box for lining up. By this arrangement of the lock nut, you can move the shaft from right to left and lock it up tight when in place.

At L is shown a guide for shipper lever, the bolt heads 1 and 2 being the same in each figure.

In lining up a shaft, I first put a spirit level on each hanger and lower first the highest and then the next highest and so on until I have them all level. Now hang a plumb at each end, just touching the shaft on the same side. Take a third plumb and go to each hanger and adjust the shaft sideways until it lines up with both ends.

Now that every progressive smith is putting in power of one kind or another, the shaft hanger is a very important item of the shop machinery. There are shaft hangers and shaft hangers of many designs.

This makes the best hanger for the least money and works the best that I

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have ever seen. All that the smith needs to buy are three pieces of pipe and an oil cup. The rest he can make from scraps in the shop and ends of new tires. If I had known about this before I started my shop, I could have saved $100.00 in hangers.

A New Shoe for Trotters.

Something new in the way of shoeing mixed-gaited horses has been brought to notice by the *Horse World.* For some time the problem of trainers has been how to shoe such horses to make them trot properly. The problem has apparently been solved by an Englishman, Mr. W. H. Lake. This gentleman, while at Memphis, studying American methods of training trotters, has been working out a series of experiments in this line, arriving at a most satisfactory result.

The shoe used is just an ordinary one with two small, square steel bars welded on the top surface, one placed from one to two inches back of the toe and the other the same distance from the heel, clear across the shoe. The relative position of these bars determines the effect on the horse's action, and experiments have shown that different horses need the bars in different positions. Many Memphis trainers have tried these shoes and in no case have they been known to fail. It is rather remarkable that an Englishman should have solved a trotting problem that has so long puzzled American trainers.

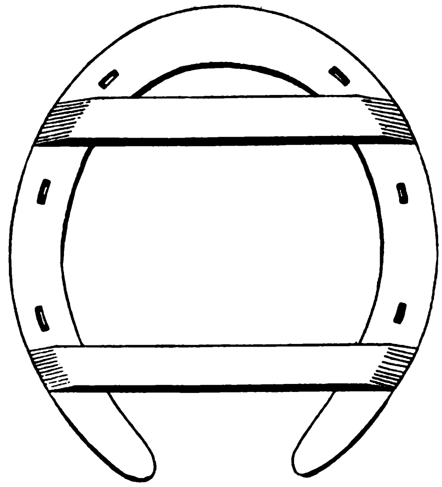
The accompanying illustration is from a reproduction of a sketch of the shoe that appeared in the *Horse Review.* The bars are here placed one and one-eighth inches respectively from the heel and the toe.

A Few Words About Hoof Lameness.

BY W. B. A.

"My horse has gone lame," is a familiar sentence to the horseshoer, and often enough the very tone in which it is spoken plainly says that of course no one but the shoer is to blame. There are many causes of lameness; for some of which the shoer is at fault, for others the driver, while in many cases the lameness is a result of pure accident. But of course the shoer generally comes in for the blame. As lameness is so constantly being met with and is caused by so many different things, a few words about it should interest my fellow-craftsmen. I shall not consider, however, the lameness connected with the various forms of hoof disease.

Lameness itself is a symptom of trouble somewhere. Lameness means pain to the animal, and pain is nature's warning which should never be neglected. Shoers should always bear in mind that lameness arising from wounds liable to infection, will, when neglected, almost invariably be followed by serious complications, often resulting in the loss of the animal. Hence, even the slightest evidences of lameness should be promptly and thoroughly investigated. The location of any soreness causing the animal to go lame is most quickly detected by slight pressure with the pincers in suspected locations, until



THE NEW "MEMPHIS" SHOE FOR TROTTERS.

the evident pain shown by the animal during the operation enables the extent and position of the sore and sensitive parts to be learned. This method applies also for locating soreness at any part or parts.

One common cause of lameness is an uneven pressure of any kind on the hoof, and this may come about in a variety of ways. When a foot is sound, the shoe should be fitted to an even bearing at all points, so that the weight will be uniformly distributed. If the shoe is fitted so that the weight is concentrated at any one point or points, the result will be a bruising of the sensitive sole, with resulting inflammation and lameness. In bringing the hoof to a perfectly level bearing, hot fitting is practiced, and while there is no objection to such method of fitting rightly done, it becomes very harmful when carried to excess, and defeats its very object. If the shoe is too hot or is allowed to remain in contact with the foot too long, injury to the sensitive parts, especially at the toe, is sure to result, with consequent great pain and lameness and perhaps separation of the sole from the quick. This injury is of course more liable to occur when the horn is thin or has been excessively pared. It is due solely to carelessness or ignorance on the part of the farrier, and its remedy should be preventative.

If any part of the foot is allowed to grow unduly long, the weight becomes improperly distributed, the bones and tendons of the foot are put under unnatural strains which is liable to cause soreness. The heel, toe or quarter which is too high receives the jar and first weight in landing and bruises or corns are in order. The shoer should constantly be on the lookout to get a level bearing and equal distribution of the weight on the foot as a horse travels.

Since excessive local pressure is apt to cause inflammation we may expect to find calks, and also improperly fitted clips giving trouble, and such is the case. In the case of calks, if a foot as it travels strikes the ground at but three or four points, the shock of landing will be transmitted to the foot immediately above and in the region of the calks, so that the entire wall does not share in taking the pressure as it should. It is just the same as if the foot were held stationary and struck with a weight equal to that portion of the horse's weight which that foot bears in travelling. The effect of the shock would be taken up by the portion of the wall in the region of the calk. It can easily be seen how injury and bruising can take place in this way.

When toe clips or side clips are badly formed there is pressure on the sensitive foot, and lameness often results. Direct wounds may even be caused when the clips are large and sharp and the shoe becomes loose. This brings us to consideration of cuts and wounds.

Pricking, as it is called, is not uncommon, and varies much in seriousness of effect. Of course, very often a nail may be driven so close to the sensitive parts, that while it does not penetrate them, it nevertheless sets up a pressure which shortly after shoeing causes lameness. When it is early detected and the offending nail removed, a short rest will generally restore normal conditions. Neglect may easily result in the formation of matter and serious injury.

Direct puncture of the sensitive foot often occurs, though now not so frequently as in the days of defective hand made nails, which are apt to split within the hoof. Pricking nowadays is chiefly due to thin walls, restless horses, lack of skill or improperly punched nail

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holes. When by chance, the farrier perceives he has driven the nail into the sensitive parts, it should at once be removed and the lameness will be slight. If the nail is not withdrawn serious lameness will soon set in. The wound exposes the sensitive tissue to infection, and in neglected cases the inflammation may be so extended that pus will break out at the coronet, and even produce lock jaw. Such cases of infection from wounds should be taken in hand at once, and a small opening made, so that the matter may be permitted to escape. The cavity should then be washed out and disinfected, for which purpose a ten per cent. solution of carbolic acid is excellent. The cavity should be filled with absorbent cotton or even oakum, which has been soaked in the carbolic acid solution, and the foot protected from dirt and reinfection. Such treatment should be given once or twice daily as long as lameness or the formation of matter continues.

The Early Experiences of one Blacksmith.

HENSON GOOD.

I tried to learn the trade when quite young, at the age of ten or twelve. My father at different times sent me with our horses to have them shod, and I became interested in the work so deeply that on several occasions, upon reaching home, I very nearly got whipped for staying so long. Nevertheless I figured out a plan to do a little work. I found an old-fashioned cord bedstead with a wide head-board. I took the board and shaped a bellows out of it. Next was the leather, so I found an old table-oilcloth which I used instead. This did very well. I swung the bellows just the same as a large one, but I sawed out a small hole on top. I had a hand bolt fastened on top. I lifted up the top and when bearing down I placed my other hand over the hole. This was my first experience in blacksmithing in my father's old smoke-house. The work consisted of making heel plates, husking pegs and a few main springs for guns, etc., for our neighbors' boys.

We then sold out and moved away. I hired as a helper in a carriage shop in Lima, Ohio, bought a few second-hand tools and thought I would do our own work. I drove a few shoes on our own horses. One day our neighbor came up the road with a large team of gray horses and stopped at my shop. I stood back, feeling a little nervous. I tried to excuse myself, but he told me to go ahead and do my best. The horses wore No. 6 shoes and had been shod but once before. I had really good luck, and from that time until the present, I drove 3,170 shoes, and did a few hundred dollars' worth of repairs.

QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

Value Received—I made a foot power hammer from the description given in Vol. 1, No. 2, by L. Van Horn. It is worth five years' subscription to the paper.
L. B. STIVERS.

Tempering Moldboards—What is the best way to temper moldboards that have been through the fire? Is there an acid or some other ingredient to take off the scale that forms on the surface? I am unable to find anything myself.
CARL NORDHAUDEN.

A Contracted Hoof—I should like to know how to shoe a five-year-old horse which had a snag run in the frog of his hind foot about a year ago. The horse is not lame but the hoof is growing small and contracted. J. W. GRIFFITH.

Tempering Rock Drills—In answer to Mr. Wm. Curry's inquiry for tempering rock drills I would say—heat slowly to a cherry red, dip in clear water, take out and watch temper run down to a straw color. Immerse under water until cooled off. This is the best I have ever found for hard rock. Try it. GEO. R. YORK.

Tempering Rock Drills—In tempering rock drills, first heat to a cherry red, stick into lukewarm rain water, and then draw the temper to a blue in the center and a little harder on each corner. The cross drills are generally made a trifle softer than the common drills. Always use the best of steel. J. W.

Babbitting a Journal—Will some one through these columns give me an easy and simple method to babbitt a journal, where the journal or axle is worn a little, say for instance a wind-mill journal, the bearing of which is twelve inches long? I have some trouble in this work, and should like to hear from some brother craftsmen. A. J. K.

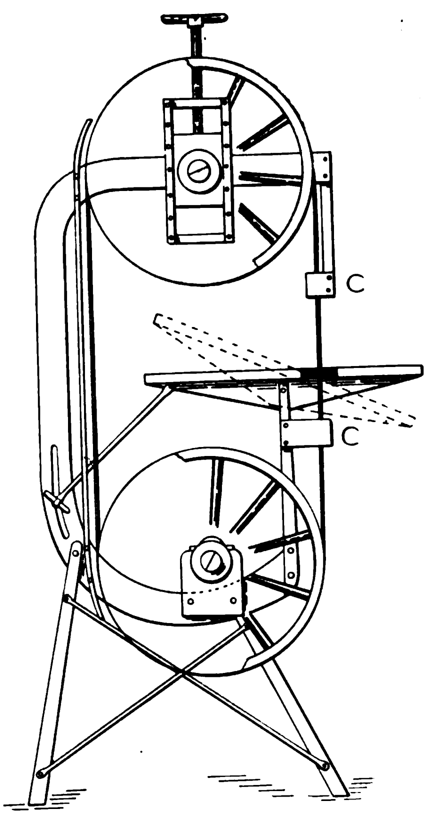
Square or Slanting Calks—I agree with Mr. D. Pekhat in what he says in the May paper about preferring the heel calk turned square under the shoe. I could never see the advantage of slanting them back, and if there is any I should like to know it. Perhaps somebody can give a reason. We may both be wrong. J. ALLEN.

Shoeing for Corns—I would advise Mr. W. H. Doty to watch and treat the corns very carefully; also to keep the feet moist and try to relieve the contraction, which probably has much to do with the trouble. Shoe the horse so as to take as much weight off the affected region as possible. B.

Tool for Taking Out Old Flues—Will some brother smith please tell me how to make a tool for taking out old flues from boilers, as I have a great deal of that work to do, and I have not found any way except by the use of a cold chisel and hammer. If there is a tool on the market for that class of work, I should like to know about the same. A. T. WRIGHT.

Errata—Referring to the article by Mr. Kenyon on page 158 of the May issue, Mr. Kenyon was wrongly made to say, for quarter cracks toe clips should be used, when in reality it should have been said that he favored toe tips. Also his article should be corrected to read that corns are never seen in a foot that is not contracted. This, too, was an error. THE EDITOR.]

Home-made Band Saw—I notice that Mr. Herman Schaffer desires instruction regarding a home-made band saw. I will give my experience in this line. I made a band saw, such as shown in the accompanying outline, using an old plow beam, a smooth one, for a back. The legs are



A VERY INGENIOUS HOME-MADE BAND SAW.

cultivator beams, the screw tightener was taken from an old Jones' binder and the two wheels are out of a press drill covered on the rim with rubber tires. The guides are simply made of brass with slots for ¼, ½ and 1-inch band, and they are cut in so that the saw will fit as shown at C. This saw of mine will cut up to 9-inch stock. The table of course should be so constructed as to tilt to allow a bevel to be cut. This makes a useful machine and an inexpensive one. WM. EXLINE.

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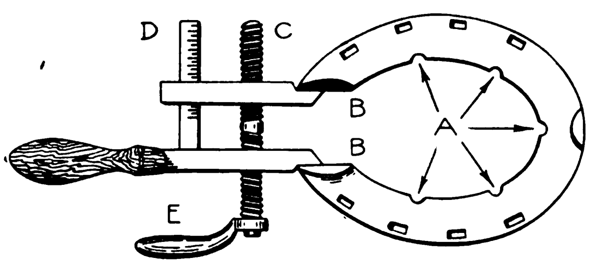
Tempering Mill Picks—I consider the hammering of a mill pick just as fine a job as tempering it. Never hammer the edge or corner but once, and that before you start to flatten, and after it is ready to temper, take a little cyanide of potash, heat to a dull red, rub on the potash, and then plunge in rain water not too cold. Draw the color to a light straw and your pick is ready for use. C. G. BURDICK.

Welding Springs—H. H. Whitten asks in the April issue how to weld buggy springs, I suggest the following method: Take one piece of spring, scarf it and weld on to it another piece of spring a little less than an inch longer. Now upset at the end and also upset the end of the other piece to be welded on. Then proceed to scarf and weld the spring carefully, and the job should stand. B. B.

Hardening Taps and Dies—Answering G. W. McCord's question about taps and dies that have been through the fire, would say that they can probably be hardened to get good service again by heating to a low cherry red, quenching in water and then drawing the color carefully to a dark straw color. This can be done by holding the tap over a piece of hot iron, turning it continuously and watching for the proper color before final cooling. A. B. C.

Building a Furnace—I have been a regular subscriber to THE AMERICAN BLACKSMITH since last November and can keep still no longer. I consider THE AMERICAN BLACKSMITH almost the acme of perfection for the craft in general. But what I want to know is, will some brother craftsman please tell me how to build a furnace for melting cast iron to make castings of one hundred pounds or less, as also the dimensions? A. E. FREEMAN.

Heel Expanding—Referring to the talk by Mr. R. C. Menzies in the April issue about heel expanding, perhaps my method will be of interest to him. I first make a shoe with small flanges at the heel. Referring to the illustration, AA are half round holes bored or filed out so that the shoe when expanded will not return to its old shape. BB show heel flanges which go in between the heel. The tool which is used for expanding is also shown, C being a screw threaded right and left handed, and D a flat piece marked off in eighth inches. E is the key. The hoof must be treated first, in order to soften it, after which it is to be levelled as much as possible and the flanges fitted between the heels. Every week by means of the expander, widen the hoof an eighth of an inch, keeping the hoof soft all the time. M. KOEPPLINGER.



A NEW DEVICE FOR HEEL EXPANDING.

Welding Toe Calks—In welding toe calks or in fact anything else that will not weld, I use the following remedy. Take for instance a toe calk that sticks on one end and not on the rest. Take a horse nail stub, cut it short, flatten the pointed end and drive between the loose end of the calk and the shoe, take another weld and see how easy it sticks. The same method can be used in welding springs, or stubs, or old sleigh shoes. C. G. BURDICK.

Steam Hammer Trouble—Replying to Mr. Carl A. Gillen in the May issue, I should say the first thing to be done is to get at the trouble which causes the piston to jar loose. If it is due to water in the cylinder, the steam piping and drains should be looked to. The piping should be covered, and should also be as short and straight as possible, avoiding bends and elbows, and especially dips or pockets where water can collect. The piston head itself should be carefully examined, and securely bolted and locked on the rod. This remedy should answer. B. B.

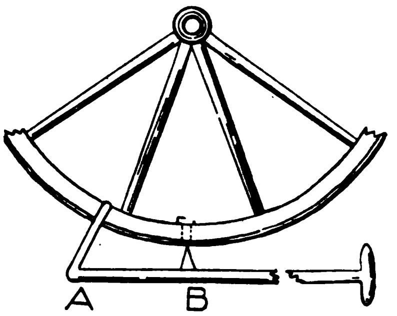
Relieving Strains—I see W. F. asks in the April AMERICAN BLACKSMITH if it does any good to heat a weld on which there is considerable strain, to a dark red and then to cool slowly. It is my experience that heating to a low heat and allowing to cool very slowly relieves strains which have been caused by sudden heating or cooling. This is especially true with steels, but if a weld in iron is allowed to cool slowly in the first place, I don't believe it helps any to heat again and allow it to cool. I should like to hear from some of the boys on this point. F. W. B.

Setting Wagon Skeins—I notice in the May issue of THE AMERICAN BLACKSMITH, Mr. Hopkins' explanation of how to set wagon skeins. I have set wagon skeins and made axles for twenty years and his theory will not work, or he did not explain it fully. If you take one-half the diameter of wheels, say four feet eight inches and three feet ten inches, the front axle and the hind will not be alike and if you stand them on plumb spokes the wheels will not track. Please explain this.
S. S. HERSHEY.

An Interesting Letter—We find THE AMERICAN BLACKSMITH of much help. We have power in our shop, and best of all powers is a water power. We do more woodwork than ironwork. Our forge, etc., are in a separate room, and we run everything by power except the fan, which would not pay as we do not use the fan all the time. We build a lot of heavy and also light single beam logging sleds. We also get out piazza posts, moldings, brackets, and in fact everything made of wood. As to iron we repair and make hammers but we do no horseshoeing. These are our principal lines. OTIS GODING & SON.

Lister Sharpening—In order to prevent warping in lister lays, turn the lay up side down, place the compass across the heels. Be sure to hang the compass up where it will not be moved. Now proceed to sharpen and set the lay, paying no attention to the warp until this is finished. Place the compass across the heel the same as at first and perhaps it will show $\frac{1}{4}$ or $\frac{3}{8}$ of an inch of warp. Put the lay upside down in the fire and heat to a cherry red across point of V and both throats alike. Place in the vise with the point up and be sure one jaw rests firmly on point of V and the other will touch the center of each throat. Press gently until lay opens to size shown by compass and you can guarantee it will fit the plow. I leave the lay in the vise until cool. I have used this method for ten years and have never had a failure. N. M.

An Improved Tire-bolt Holder—In looking over the AMERICAN BLACKSMITH of February, 1903, I find several useful tools of Mr. C. S. Simmons' invention. I notice the tire-bolt holder, which is very good. I shall endeavor to show one of my own make that I have used for twenty years,



A VERY USEFUL FORM OF TIRE BOLT HOLDER.

which I think has some advantages. In the first place, it is much more quickly applied. In the second, the point bearing on the bolt head is chisel-shaped and will hold the bolt until the nut twists off.

Take a piece of steel tire or sleigh shoe, 1 by $\frac{1}{4}$ inch by 2 feet and turn down at right angles, as at A, three inches of the end. Then bend the other way a rounding hook or loop. Two inches from the bend, A, weld on a steel nipple, B, one inch long, made of $\frac{3}{8}$-inch tool steel. Draw down to a sharp chisel edge, harden and temper. Draw the other end with a taper and turn a handle on the end, when the tool is complete. A bend on offset between A and B will bring the point under the bolt.

With the tool in place and the breast upon the end you can hold any bolt. Friend Simmons' grip or thumb screw has a short or center punch point which allows a bolt to turn easily. A light tap of the hammer will settle this tool in the bolt head and hold it securely. J. F. M.

Horseshoeing—When shoeing a horse, his foot should be pared on the bottom to a feather edge, after which run the rasp around the edge of the hoof to knock off the feather edge. Now fit the shoe perfectly. Do not fit the next shoe for the opposite foot by the shoe you have made, for the feet may not be the same shape. I have seen a great many horseshoers do this, and if the shoe should not fit the opposite foot they will rasp the foot to fit the shoe. The following is my way of shoeing: First remove the old shoes, pare all the feet and then fit each shoe to the foot. I always mark each shoe, so that I know which foot it goes on. By this method I don't have corns or contracted feet.

I have read a great deal also about interfering and I would say that I have been very successful along this line, and have never failed to stop the same after a second trial. The feet of most horses which interfere are out of balance. The way to stop this is by rasping the foot level, and with the paring knife cutting the foot a little. If the foot is low on the inside, don't pare that side more than level, and if there are any long points, rasp to natural shape. If this does not stop it, I use my judgment as to what kind of shoe to use, there being several kinds, according to the shape of the foot and the part the horse strikes with. These hints are from my own experience. L. R. GILL.

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THE
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Subscribers should notify us at once of non-receipt of paper or change of address. In latter case give both old and new address.

Correspondence on all blacksmithing subjects solicited. Invariably give name and address, which will be omitted in publishing if desired. Address all business communications to the "American Blacksmith Company." Matter for reading columns may be addressed to the Editor. Send all mail to P. O. Drawer 974.

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When You Change Your Address.

We wish to impress upon our readers the importance of promptly notifying us of any change of address, so that there may be no delay or mistake in receiving their paper. It is especially important also when sending the change of address to give the old address as well as the new, so that we can locate the reader's card in our subscription file. If our readers will bear this in mind, there will be less annoyance and trouble about non-receipt of copies of the paper.

The Coming World's Fair.

Many are the notes and circulars that come our way from St. Louis. The whole country is making ready for a big showing next year—the biggest one, 'tis said, that the world has ever seen.

It would seem almost impossible that anything new should be devised to interest and attract the public, yet many novel features have been planned. Things so new that we have never heard of them, and things so old that we have forgotten them, will be brought forward to instruct and interest the whole world.

A tour of the world can scarcely afford a wider view of human life and customs of different nations than a visit to St. Louis next year. A careful study of all the current magazines and books can scarcely afford a more minute knowledge of the times—that is, to the man who goes to St. Louis with eyes and ears open. Such a fair must prove a benefit to the rising generation from an educative standpoint.

The Addresses of Correspondents.

It has oftentimes been asked by the readers of THE AMERICAN BLACKSMITH why addresses are not given with the names which are published in these columns, especially in the "Queries, Answers, Notes" department. It is the endeavor of the publishers of THE AMERICAN BLACKSMITH to provide as interesting and valuable a journal for the craft as possible. To this end it is desired that all questions, answers and communications should be sent to us instead of to a correspondent direct. As a usual thing, a great many readers are interested in the questions asked and the answers which may be made. We are always glad to furnish names and addresses to those who wish to get into correspondence with any other members of the craft, but it is also our desire to give in the department referred to as many and complete answers as possible, so that all our readers may have the benefit of this exchange of views on various subjects.

If you can give an answer to any question, and know from experience that it is correct and practical, do not hesitate to send it in to us, simply because you think you cannot write as well as others. The Editor will gladly put your communication into shape for publishing.

Afterthoughts on our Conflagration.

In the July issue was inserted a brief notice of the fire which destroyed the offices of THE AMERICAN BLACKSMITH on the evening of June 19th. We took occasion at that time to thank our many friends for the expressions of sympathy extended to us, and while we have steadfastly resisted the temptation to say that we have risen "Phoenix-like from the ashes," still we are glad to tell our friends and readers that our equipment and facilities are immensely superior to our former ones, so that we feel sure by improved service of meriting their constant support.

Finding the temporary quarters in the Mutual Life Building almost too small to accommodate our growing needs, we have permanently located in Buffalo's finest and tallest office building, where we have secured ample room for the proper conduct of our business. Our friends when in Buffalo should not fail to call upon us at our new offices, Nos. 1338-1344 Prudential Building. The view to be had from our windows of Lake Erie, with Buffalo's unrivalled harbor and the longest break-water in the world, will repay a visit to our new quarters.

Advertising a Modern Necessity.

It becomes more and more apparent in these days that advertising is an absolute necessity for the successful conduct of modern business. Competition is becoming keener, so that the man who does not keep his name constantly before the buying public is quickly lost to sight and forgotten. It is a reasonable inference that he who does not advertise, does not desire trade, and the tide quickly turns to the man who aggressively seeks it.

Advertising is nothing more or less than bringing together two parties, one of whom is in need of goods, skill or labor, and the other of whom can supply the needed commodity. There are many different ways of advertising, and the progressive man never allows an opportunity to slip which will aid in extending his reputation. Many ways are open to the blacksmith and the mechanic of small shops. A standard reputation for honesty and fair dealings, coupled with skill as a mechanic, is one of the very best advertisements. The liberal use of printer's ink, using good papers is unexcelled. The whole idea is to keep one's name and business before the eyes of those who may need your service. In

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this issue of THE AMERICAN BLACKSMITH will be found an interesting article on the subject of advertising the smith

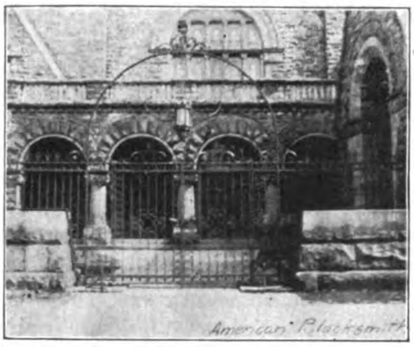

Fig. 1. MAIN ENTRANCE, FIRST PRESBYTERIAN CHURCH.

shop, being a continuance of an article on advertising appearing in our July issue.

The up-to-date man will realize that advertising should be considered as a necessary expenditure or investment, just as much as rent or material. In it lies the secret of making one's business grow.

The Value of Wrought Iron in Beautifying a City.

Buffalo is generally acknowledged to be a very beautiful city, both by nature and by art. Perhaps one of the prominent factors in the latter is the large amount of fine wrought iron to be seen on all sides. Wherever iron is used in structures, it is generally made to yield the highest degree of pleasure and satisfaction to the artistic eye. Walls, gates, grilles, hinges—in fact nearly every article made of iron, is a unique piece of art.

The accompanying group of engravings serves to illustrate a few pleasing instances of the uses to which iron is turned and the modes of embellishment in this city. The first three views are from photographs of portions of the First Presbyterian Church, The Circle. The remaining three are of handsome gates to different residences.

Talks to the Jobbing Shop Painter.—4.

M. C. HILLICK.

Unhanging and Hanging of Carriages.—Inspection of Work.—Unhanging Farm Wagons, Platform Wagons, Outside Platform.—Run-way, etc., etc.

The jobbing shop painter must be a master of emergencies, or, if you please, a many-sided man. Among other accomplishments he should be able to unhang a carriage alone. There are seasons of the year when business will not warrant extra help in the shop, and it becomes an important matter of information to know how, for example, to unhang either the single or double seated carriage.

The unhanging of a vehicle by a single painter can be done without an unusual outlay of strength or time, and the method is as follows: If a top job, unloose all the nuts that hold the top, but do not remove them. Then remove hanging bolts or other attachments connecting body to running parts. Next raise axle up and remove wheels, either front or rear wheels, according to the style of the body. Follow this operation by firmly grasping the axle free from its wheels and carrying it clear of the horse and lowering axle to the floor. Next set a shop "horse" or "jack" under the other axle, so that the remaining wheels swing clear and then remove the wheels, after which lower axle to the floor. Then

Fig. 2. SIDE ENTRANCE, FIRST PRESBYTERIAN CHURCH, THE CIRCLE, BUFFALO.

remove nuts holding top in place, and stepping into the body of the vehicle, take a firm hold of top and step out. Lastly, lift the body from its bearings, and the work is complete. In unhanging carriages preparatory to repainting, it is important to have an eye out for the future.

It is a good plan before unhanging a job to look it over and see if there are any parts which it will be difficult to attach after the job is newly painted. Many parts of a carriage can be easily removed before painting, with impunity. But when newly painted and varnished the parts cannot be so easily replaced because greater delicacy in handling must be exercised. Hence it should be a careful study to unhang the work so far as possible in a way that will permit easy and quick hanging off without injury to the paint and varnish. Along this same line, too, the work should be carefully inspected and if any defects or breakages exist they should be repaired before starting through the paint shop. Bruised or broken threads on bolts are particularly aggravating, especially if left for repair until after the job is finished.

The bolt that turns in taking out will do the same thing in putting in. Better have it fixed before painting the vehicle. In fact all of these minor repairs, insignificant in themselves, total up enormously, and, if not closely looked after before repainting, are likely now and then to absorb the entire profits of a job. In estimating the cost of painting carriages and wagons in these days when so many of them are fearfully and wonderfully made, a close examination should always be made of the style of hanging off. It will be necessary to add from 20 to 40 per cent for taking apart and putting together. Farm wagons, of course, are an easy proposition and all one has to do is to place a strong jack under each axle to permit removal of the wheels. On trucks, furniture vans, etc., it is simply a matter of removing pole or shafts, freeing the king bolt, raising the front end sufficiently to allow the front gear to be run out, and then setting a barrel in place of the gear.

Place a strong jack under rear axle, remove wheels from both front and rear axle, and then proceed with repainting operations.

Platform gears may be disconnected in the same way if plenty of room is at command and light repainting only is to be done. Such unhanging has the merit of reducing the labor of handling to an important extent, and in the line of

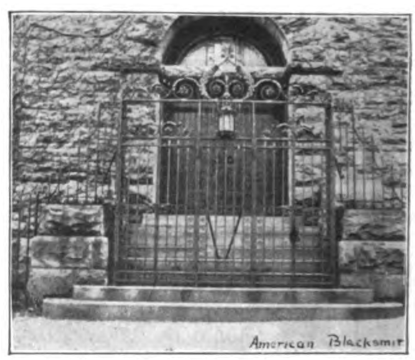

Fig. 3. SECOND SIDE ENTRANCE, FIRST PRESBYTERIAN CHURCH.

medium and heavy work this is a consideration of the first moment.

Completion has reduced the profits of painting to such a close margin that a keen survey of all the details connected with a carriage or wagon from the moment of its entrance into the paint shop

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to the hour of its exit therefrom becomes an absolute necessity.

One valuable convenience the small village or country paint shop should have, and for that matter the pretentious city shop will find itself better off with the same device, is a platform for the outdoor drying and working of the

Fig. 4. GATEWAY OF RESIDENCE ON DELAWARE AVENUE, BUFFALO, N. Y.

earlier or foundation coatings of paint. If the shop is reached by an outside run-way, at the top of the run-way locate the platform. Make it as large as possible and perfectly safe, with a good strong railing around it. Attached to the small shop, the run-way has a double value. In fair weather it furnishes a place to run jobs that are not at the time being worked upon. And at all times, barring rainstorms, it furnishes a place to unhang or hang off work, or do many other bits of labor not so handily done elsewhere. Coats of lead dry finely in a dry, out-door air. Many carriage painters claim that one day out of doors in good weather will dry a coat of paint more than three days indoors. This may be an over estimate, but at any rate pure outdoor air will dry paint much more rapidly than the impure air of the average paint shop.

The outside platform from which a run-way reaches to the ground should be provided with a windlass strong enough to haul an omnibus or a modern depot wagon to the platform. If it so happens that the platform is provided with a roof, so much the better, because work can be carried forward on the platform in inclement weather that would otherwise have to await a more convenient day or be done inside the shop. At all events, the windlass should be well sheltered from the weather. With respect to the run-way, avoid making the pitch too steep. The longer grade will cost a little more at the beginning but it will prove the cheapest eventually.

This platform and run-way will be found one of the most convenient fixtures any shop painter can invest in. There is nothing like pure, outdoor air for successful work in painting.

(To be continued.)

Pointers on Wheel-Making.—2.

JOHN MILLIGAN.
Teacher of Carriage Building, Durham University, Newcastle, England.

Method of Constructing a Hand-made Wheel.

In many carriage factories in England the spoke is fixed for dressing in what is termed a holding or dressing machine (shown in the figure), fixed to the bench, and resembling a lathe, though the system of holding the wood between the bench and the workman's breast, protected by a leather shield, is still practiced in many parts of the country.

The spoke is shaped with a draw knife and straightened with a plane, the neck being dressed out with a spokeshave. The plane leaves ridges and marks which it is necessary to remove, and this is done most effectively with a jarvis. The tenons are cut and checked with a tenon saw. For smoothing, a file is resorted to, after which the spoke undergoes a process of sandpapering.

Stocks or Naves.

The stocks of hand-made wheels are usually turned in a lathe. When the wood is sufficiently reduced with gauge or chisel, the length is marked off with a

Fig. 5. ENTRANCE TO RESIDENCE AT THE CIRCLE.

pair of compasses and two pairs of calipers,—one set to the diameter of the front hoop seat and the other to the back hoop seat are used for trying. A ⅝-inch chisel is required for forming the ogee moulding on the face, the bead being raised with a small chisel, say ½-inch, and rounded with a gouge. The shoulder is finished with a chisel from ½-inch to 1-inch, the gauge mark for the mortises is also scored while the nave is in the lathe. The

Fig. 6. ENTRANCE TO RESIDENCE ON NORTH STREET.

most difficult task the wheeler has to perform is the accurate mortising of the stock; the mortises are staggered or zigzagged, or in and out, the object being to brace the wheel and gain strength by leaving a quantity of solid wood between the mortises. The usual "dodge" or "stagger" is ½ inch, but beyond this the wheel is weakened, as a considerable strain is thrown on the tenons of the spoke when a carriage is loaded. To prevent the wood splitting in mortising a nave, an iron hoop is fixed on each end, which is securely held in a pit dog, or a German cramp. Holes are bored with an auger, then the tenon of the spoke is laid over the hole, and the size marked less 1/16 of an inch, so that in driving, the spoke may fit tightly; but if this allowance is exceeded the tenon will be crushed, and consequently spoiled. Though the wheeler has nothing but his eye to guide him in holding his buzz and cutting the mortise at the necessary inclination, correctness is ensured by trying the spoke in the mortise, placing the straight edge on the end of the nave, and finding the difference between this and the top and bottom of the spoke with a pair of compasses. It is an undecided question whether taking a small portion from each side of the mortise corners, to allow the shoulder of the spoke to sit firmly, or cutting the shoulder to suit the curve of the nave is preferable. If the spoke is so formed, the shoulders

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have a tendency to split upward; and if the nave is cut its diameter is reduced; but as it is always better to deduct a little from a strong part than a weaker one, cutting the nave is probably the better course.

Driving the Spokes.

This is done by sharp blows from a mallet or hammer, the weight of which should vary according to the strength of the spokes. A thin coat of glue is sometimes applied to the mortise and tenon, though a properly seasoned spoke requires no aid of this description. Driving should be performed in a wheel pit, where the workman has perfect control over both stock and spoke, and can do his work much more expeditiously than by having to follow the stock over the floor of the shop after each blow. Though pits are not so general as they might be, the cost and trouble of their erection is so trifling, compared with the convenience and time saved, that nothing should prevent their extended use.

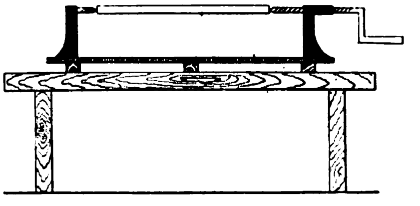
The wheel without the rim is laid horizontally on the bed of a tanging machine, which rounds the outer tenon of each spoke by means of a hollow auger, which can be adjusted to an extreme nicety. If this tenon is well and truly fitted, the wheel will be free from the common defects of loose spokes and split rims; but it should be borne in mind that a felloe or rim can be spoiled by driving too tightly.

Tanging by Hand.

This is accomplished by placing the wheel on a pivot stool and cutting the tang with a draw-knife, which must be carefully done in a true line with the spoke, and as the exact size cannot readily be obtained in this way, it is necessary to wedge up the rim, *i. e*, to drive a small wedge into the end of the spoke through the felloe to form a tight joint. If an adjustable hollow auger is used this defect is in a great measure remedied, as it can be set to cut a tenon of any size.

Felloes.

By carrying a straight line from the centre of the stock to the felloe the proper bevel for the ends is obtained, a little being cut away on each side of the line, so that when driven and wedged, the joints may be tight on the inside and slack on the outside, say from 1/16 inch to 1/8 inch being allowed, according to the size of wheel, which, being drawn up by the contraction of the tire, forms a perfectly close joint. They are now planed on their front or flat surfaces. This machine consists of a revolving disc, through which cutters project. The wood is laid on the table and moved up to these cutters, which give a smooth surface to each flat side. The machine for shaping the inside or circle has an upright cutter spindle. The wood is held on a carriage having a pivot, which can be regulated to any radius, the carriage being moved past the cutter, which dresses up the curve. The holes must now be bored in the ends of the felloes to receive a dowel, which serves as a tenon to connect them. The dowels should not exceed 2 inches in length, that is, 1 inch in each felloe, otherwise they weaken the felloe. The holes for outer spoke tenons must also be made. This is done at a boring machine, in which the wood is securely fixed; but the boring machine in its many forms is too well known to require any description. When formed by hand, the felloe is fixed in a block or frame, and hollowed or bellied out with an adze to the requisite sweep. Being tried on, they are bored to receive the spokes and dowels with a brace and bit, and are dressed with a plane, the inside curve be-



A FORM OF SPOKE-TENONING MACHINE.

ing finished with a compass plane or spokeshave. The pivot stool is again called into use for holding the wheel while the felloes are driven on. When bent rims are used it is customary to insert a screw in the rim on each side of the spoke to prevent splitting, the heads being filed level with the wood; but little advantage is gained in new wheels, though it is useful when repairing split rims not entirely spoiled. The wheel is sometimes placed in a large lathe, in which the outside or tread is trued up. Where steam power is not available this may be done by turning the wheel on a spindle, the edge running close to a hand rest, which allows it to be dressed with a chisel. In many shops it is considered an advantage to have the felloes made to a fainter sweep than the circumference of the wheel when completed, or, in other words sawn out to the exact circumference of a circle 1 inch or so longer than the ultimate size of the wheel. The effect of this plan is to make all the felloes stand high at the joints. When the tire is put on, it forces the felloes down at the joints, these being the weakest parts of the circumference. Hence, when the wheel is absolutely true before the tire is put on it will be slightly flattened at all the joints when tired; but by leaving the joints of the felloes a little high, as described, this flattening is counteracted, and the result is that the wheel when tired is perfectly circular.

A New Branch in the Repair Shop.

The repairman of the future may find among the jobs brought in, some to repaint or re-enamel the metal panels on the upper portions of automobiles. For the sake of lightness, many of the panels and finishings of a motor car are made of aluminum, and these must be kept painted to preserve them from the effect of the atmosphere. Although aluminum does not rust nor corrode in oxygen, it is acted upon by the damp ammonia in the air.

Painting these aluminum parts is quite different from gear painting, and requires special materials and special skill. There is a very marked tendency in paints and enamels to blister and peel off from the surface of aluminum.

The following is a good recipe for an enamel:

Three parts silicious sand.

One part chalk.

Three parts calcined borax (or else 3 parts broken crystal glass).

One-fourth part nitrate of potash.

One part diaphoretic antimony (well washed).

To make enamels permanent they must be baked in, for which purpose an oven about 6 feet by 6 feet by 3 feet will be required. Different fuels may be used, but gas gives the best results.

This new branch promises to open up a considerable field to the enterprising repairman.

Some Data on Hoisting Hooks.*

The following are some results obtained from experiments which had in view a comparison of the strengths of hooks bent out of round stock and hooks shaped according to Towne's formula, and also the effect of case hardening, or carbonizing, upon the strength of the above hooks. No attempt was made at mathematical analysis, the object being experimental data.

The general shape of the hooks tested is shown in the first figure. The eyes were welded, and pains were taken to have the lower curved parts of the hooks to be compared, alike as near as possible.

*Presented at the Saratoga meeting (June, 1903) of the American Society of Mechanical Engineers. JOHN L. BACON.

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One of the conclusions drawn from the experiments was, that if the hook was properly shaped between the points

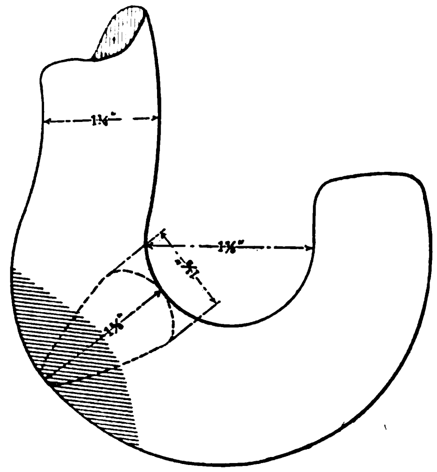


Fig. 1. GENERAL SHAPE OF HOOKS UNDER TEST.

A and B, in Figure 2, the shaping the rest of the hook had very little to do with the strength; the shaping of the rest of the hook having more to do with the "hang" than the strength. Of course the critical part for strength lies at about the point C, the shape of the lower part merely determining the point at which the load will be applied. All of the hooks tested failed, either by bending or breaking, at about C.

When testing, working conditions were reproduced as nearly as possible. The hook was suspended by a loop of round iron run through the eye, the ends of the loop being gripped in the upper jaws of the testing machine.

A long link of round iron was put over the hook and through the lower head of the machine and a round bar passed through the lower end of the link under the head. This arrangement left the hook free to adjust itself to the strain in all directions.

Some of the samples were case-hardened or carbonized. These were heated with granulated raw bone. The ⅝-inch hooks were hot for about 8 hours and the 1¼-inch hook for about 9 hours. The depth of penetration of carbon, or thickness of the carbonized coating of the mild steel was about ⅙ of an inch.

The ⅝-inch hooks were all made from one bar of mild steel and both 1¼-inch hooks were made from one bar.

In the following table the word "carbonized" is used to designate the hooks which were treated as described above. Those marked simply "carbonized" were allowed to cool in the box in which they were heated; those marked "annealed" were afterward annealed, and the ones marked "hardened" were hardened in the usual way.

Accompanying are the more important data from the experiments:

The first and third figures give the dimensions of the flattened hooks. These hooks were made to conform as nearly as practical to Towne's formulæ. The other hooks, bent into shape without any flattening, had the same inside curve as the flattened hooks.

The flattened hooks all gave way by compressing the metal shown by the shaded area. This was easily determined, as the scale at this point cracked off and was undisturbed on the other parts.

Mark.	Kind of Hook.	Size of Stock.	Bend St'rted at	Max. Load. Bent.	Max. Load. Broke.	Tensile Strength of Bar.
		Inches.				
4	Plain	⅝	2500	3000		62,150
5	Plain	⅝	2400	3300		62.150
3	Plain—Carbonized and Hardened	⅝	4000		4200	62,150
1A	Plain—Carbonized and Annealed	⅝	2750		2900	62,150
2A	Plain—Carbonized and Annealed	⅝	2600	3200		62,150
2A	2A—Bent into Shape and Hardened	⅝	5000		5200	62,150
X	Carbonized and Hardened—Towne's Shape, Fig. 2	⅝			3000	62,150
XX	Carbonized—Towne's Shape	⅝	2800		3200	62,150
-X	Towne's Shape—Untreated	⅝	3000	3500		62,150
C	Plain—Carbonized and Annealed	1¼	9000		13500	
T	Towne's Shape—Untreated	1¼	6000	13000		

All the hooks which failed by bending stood a much higher load after the bend started; or, in other words, the hooks would stand a heavier load after they were partially straightened out, due, probably, to the fact that as the hook straightened, the leverage of the load was decreased.

The above data would seem to indicate that a hook made from round iron and carbonized, is about as strong as the same shaped hook flattened according to Towne's formulæ, while a plain hook carbonized and hardened is from 40 per cent. to 50 per cent. stronger than either of the other two.

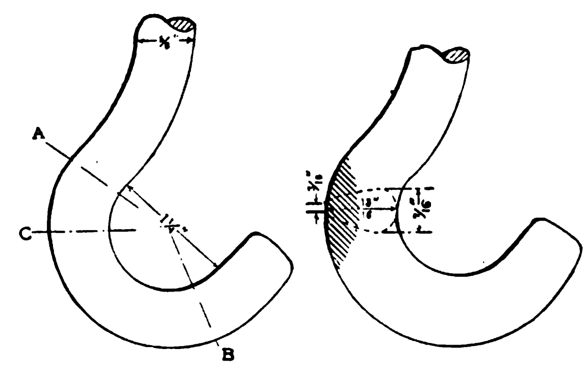
The following may prove interesting as showing that the untreated hooks stand greater strains after they start to open. The detail report of the test on hook T was as follows: Very slight opening at 6,000 pounds load; open scant $\frac{1}{32}$ of an inch at 8,000 pounds; strong $\frac{1}{32}$ of an inch at 9,000 pounds; ⅙ of an inch at 10,000 pounds; ⅛ of an inch at 11,000 pounds; would not sustain load of 12,000 pounds any length of time, and opened rapidly at 13,000 pounds.

After the above test, and without disturbing the hook in the testing machine a load of 13,000 pounds was applied. The hook carried this load without showing any signs of further opening for about 15 days. At the end of that time the load was increased and the hook straightened almost to a right angle, after which it held a load of 15,500 pounds.

Power for the Blacksmith.

The subject of power in the shop is a very important one in these days, when mechanics are realizing that it is no easy matter by hand alone to get ahead in these days of modern methods and keen competition. The great necessity of getting some means of doing work faster and also doing the heavier work which is beyond the unaided strength of the mechanic, has resulted in the development of small power units for the shop, and today almost every up-to-date mechanic is using some form of power to help him out in his daily work.

When this fact is recognized, the question which naturally follows is what sort of power is the best for the purpose. The object of course is to obtain the greatest power with the least expenditure of money. The first cost of the unit itself, together with its fuel expenditure are to be thought of. Four forms of power are to be considered—water power, electric power, steam power and oil or gas power as it may be termed. The writer will endeavor to give some ideas to aid the smith in selecting that form of power which will be of the greatest service to him.



Figs. 2 and 3. FLATTENED HOOKS WITH THEIR DIMENSIONS.

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The question of water power depends almost wholly on the location of one's shop. If a sufficient fall of water can be had without much expense for damming or building raceways, water wheels will prove the cheapest investment since after it is installed there is no fuel consumption or charge beyond simple maintenance and repairs. The chief objection lies in the fluctuation of water in different streams, which might in dry seasons mean that there would be no water to drive the wheel or turbine, which would result in a lack of power during such intervals.

In some sections electric current is available for fuel purposes, so that by putting in a motor, power may be very conveniently obtained. There is no more convenient power than an electric motor, since it may be started or stopped instantly, and if an electric current meter is installed the cost will be exactly in proportion with the amount of power used. One objection is the fact that the source of electric power may be subject to accident which would result in cutting off the supply or current at times when it may be most needed, but the chief objection to electric power is its high cost. There are very few localities in which electricity is not more expensive for power purposes in small shops than either of the other two forms of power which are yet to be described.

Steam engines and gas engines are perhaps the most popular form of power for shops, and the question at once arises whether to install a steam engine or a gas engine. Steam engines require a steam boiler in addition to the engine itself, which of course adds to the first cost of the equipment. They also require the services of an engineer to take care of both. A steam engine is of course a very satisfactory form of power, although of course when compared with the gas engine is open to two objections above named. Further than this, it is necessary always to build a fire and get steam before starting up, and after shutting down power much is apt to be wasted. These facts, together with the more careful attention which must be given to the boiler and engine, lead us to believe that for small shops and shops where small power units are required, the gas engine is much superior. This has led to the rapid development of small gas and gasoline engines. In larger shops the superior advantages of the gas engine are perhaps not so strongly marked, but under ordinary circumstances, gas power is more to be desired in small units than steam. Of course, where there is a source of steam supply already at hand, as the boiler of an adjacent factory, so that steam may be had at all times at low cost and no bother with a boiler, some of the above objections to steam power do not apply.

Gas engines have been much improved and perfected in recent years, and are made to operate either on natural or artificial gas, gasoline or kerosene. Such engines require no piping, being complete in themselves, and further than this require but a few minutes attention from time to time to keep them operating in good order. They are perfectly safe, and any one possessed with an ordinary amount of intelligence can run the standard makes of gas engines with little or no trouble at all. The labor of handling coal and ashes is entirely done away with, and there being no boiler there are fewer parts requiring attention. The fuel consumption starts and stops with the running of the engine, and in addition the engine can be started on a moment's notice. This is a great advantage in some shops where it will be found advantageous and economical to start and stop the engine several times during the day according to the way in which power is needed, and of course, when the engine stops the fuel expense stops also.

Owing to the high fuel value of natural gas combined with its comparative cheapness, this fuel is the best which can be used and is very much cheaper than gasoline. Gasoline power is also much cheaper than steam power, and in small engines of equal power conservative estimates make the cost of steam power run from two to three times as much as gasoline. Of course, fuel, water, attendance, oil and other items would all be included in both cases. Natural gas runs in price from twenty to forty cents per thousand cubic feet, artificial gas being much higher, costing anywhere from ninety cents to $1.25. The cost of operating a 2½ to 5-horsepower engine for a

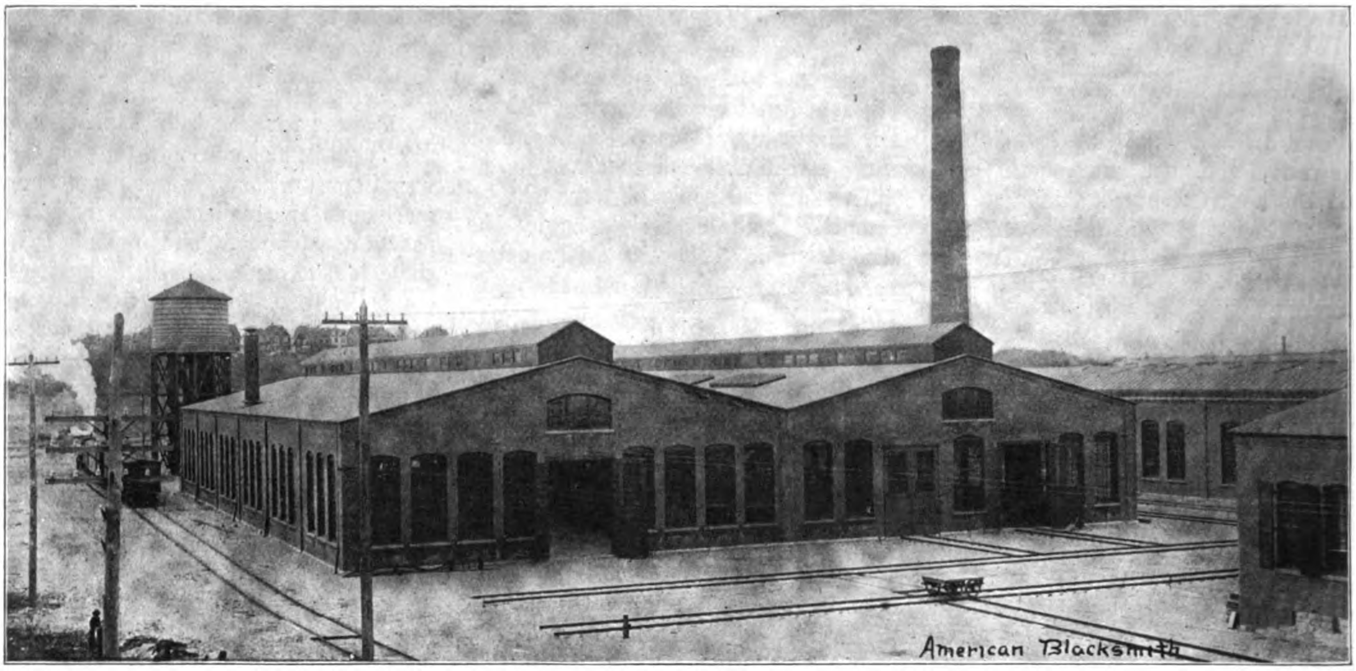

Fig. 1. THE FORGE SHOP OF THE NEW YORK, NEW HAVEN AND HARTFORD RAILROAD AT READVILLE, MASS.

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ten-hour day should not exceed ten or twenty cents for the entire day on natural gas, and from fifty cents to one dollar a day on artificial gas. This of course depends somewhat on the engine, on the fuel value of the gas and on the load which is put upon the engine. A 5-horsepower gasoline engine should not consume much more than from five to seven gallons of gasoline, running at full power for a day of ten hours.

The Forge Shop of the New York, New Haven & Hartford Railroad.

B. T. MURPHY.

The new car shops of this road at Readville, Mass., are practically completed, and to one interested in an ideal plant and equipment they are well worth a visit. All of the apparatus installed is modern and can profitably be used as a criterion for good engineering practice.

It is the purpose of this article to call particular attention to the forge shop equipment, as an example of the development and outgrowth from the old smoky, poorly-lighted smith shop of past years. The apparatus installed is essentially as follows: Three steam hammers, one forging machine, one bulldozer, two bolt headers, two heating furnaces (one eight feet long and one eleven feet long, inside dimensions) two combined punches and shears, twenty-six forges, twenty-six anvils, one blower and one exhauster placed upon an elevated platform, and motors for running the various power machines.

Fig. 1 shows an exterior view of the building. The over-all dimensions of the smith shop are 75 by 200 feet, and a machine shop of the same size is under the same roof, but separated by a 12-inch wall. From the general view in Fig 2, it will be noted that the forges are arranged along the outside wall and along the wall dividing the smith and machine shop in groups of four, back to back. The nearest fire is twelve feet from the wall. The groups are 18 feet apart, and each fire in the group is ten feet from the fire diagonally opposite. The forges are a unique and efficient type of the down draft forge, and especial attention should be called to some of its features. The fire pan is 48 inches in diameter, and is built of heavy steel plate. It is furnished with a down draft smoke exhaust hood of heavy cast iron, equipped with a worm gear for raising and lowering the hood, according to the smoke requirements and the convenience of the blacksmith. The anti-clinker dumping tuyere is also becoming an indispensable feature of the forge. Attached to the forge is a combined coal box and water tank. Altogether this forge is an excellent type for moderately heavy work. Fig. 3 illustrates the individual forge. On each side of the large steam hammer at convenient distances are placed two cast iron forges four feet square, with a depth of fire pit of twelve inches. These also have the down draft hood attachment. These forges will handle the heaviest class of work. All the parts exposed to the fire are heavily lined with fire clay and, in the case of the steel plate forges, filled with cinder, making a very stable and durable outfit.

And now a word as to what is not visible to the visitor; that is, the underground piping bringing blast to the fires and carrying off the smoke and gases. Two lines for blast are laid directly under the center of the forges. Salt glazed tile pipe is used, cemented air tight at the joints, and decreasing proportionately in diameter as each branch is taken off. These branches have an easy bend up to the floor line, where they connect with the cast-iron blast pipe of the forge. This blast pipe has a damper for regulating the amount of blast to a nicety. Down the center line of the groups of forges underground is laid the smoke exhaust pipe. This consists of a brick duct for the first fifty feet, which then runs into the tile pipe. Double "Y" branches and easy bends connect the main to the cast-iron pipes, which are in turn bolted to the exhaust hood. The blower and exhauster for operating these lines of pipe are placed on a platform with the motor, and black steel connections run to the underground pipe (See Fig. 4). The outlet of the exhauster blows directly through the roof by means of a stack projecting some thirteen feet above the roof, and equipped with suitable rain guards.

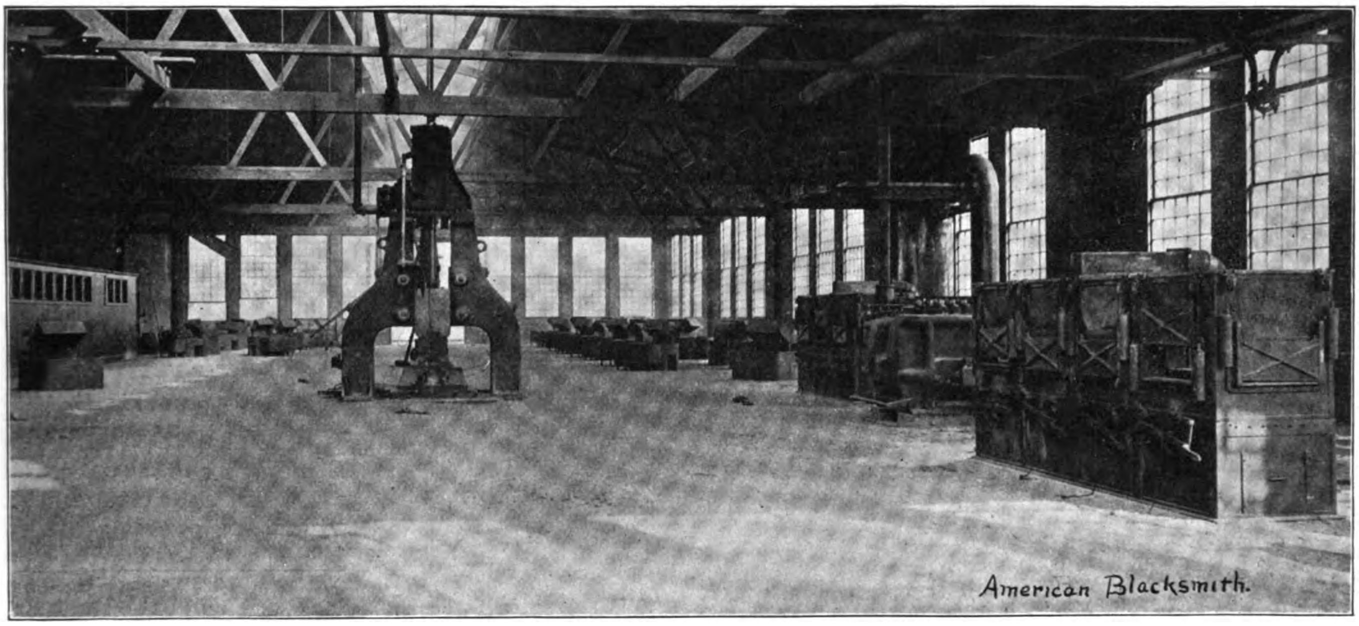

Fig. 2. INTERIOR VIEW. ARRANGEMENT OF FORGES IN GROUPS IN THE SHOP.

This same blower and exhauster also furnish air and remove the smoke from the eight and eleven-foot heating furnaces. As indicated in Fig. 5, these latter are made up in sections of cast-iron plates heavily lined with fire brick

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and equipped with a down draft exhaust hood. Air is blown into the wind box under the grates and up through the fire, and is kept from going into the ash pit by means of swinging doors of iron plate hinged at the back and operated by a chain and pulley. The heat and smoke are thus compelled by the exhaust to take a circuitous route to the down draft hood on top by a system of double arches. The hood is connected with the underground piping at the back of the furnaces. The charging doors are of heavy cast iron carefully counterbalanced. The grates are dumped by means of levers conveniently placed in front of the furnace, and ashes are removed from the ends of the ash pit through a sliding door. A characteristic feature of this type of furnace is its adaptability to future enlargements. Being built in sections of cast-iron plates, the furnace may at any time be lengthened by simply removing the end plates and putting on another section. The shops are built on old gravel pits, which gives a good floor surface, but which made foundations necessary for all the forges and machines, as well as the various underground air ducts. Each of the forges is on four foot square concrete foundation, neatly topped, as are the heating furnaces. It may be interesting to mention that the floor material furnished all the sand required for making the concrete.

Such an equipment cannot but appeal to the foreman who is in charge of the shop, the blacksmith who does the work, and even it may be added, to the casual visitor. No overhead pipe to corrode and rust away, to obscure the light or to be replaced every few years. An absolute removal of smoke, as it is carried off when generated and as fast as generated. The forges are cooler for the men to work at than the overhead canopy hood used in the shop of yesterday. In fact we might speak at length upon the advantages of the down draft system of smoke removal if such were the object of this paper. The writer has endeavored in the foregoing to give a bare outline description of the shop and not dwell on details, however many points of interest they may offer. Credit for the origin of this unique down draft system must be accorded the Buffalo Forge Company, Buffalo, N. Y., who have made a specialty of the development of the forge shop equipment to its present stage of perfection. This shop is an example of a thoroughly modern plant, and the equipment and arrangement are well worth study and imitation. It demonstrates more clearly than words the value of up-to-date apparatus.

Kinks and Conveniences in the Wagon-Shop.—4.

BY D. W. M.

Carriage Repairing.

The first thing to be done when a "job" is presented for repairs is to examine it carefully and minutely to see that there are not other damages than those seen at first. Frequently some iron part or woodwork is broken which is not easily visible, and sometimes even a new tire would be economy for the owner. Also the spokes must be closely examined to see if the tenons in the rim are worn and if the tenons in the hub are broken and the mortise firm, for if

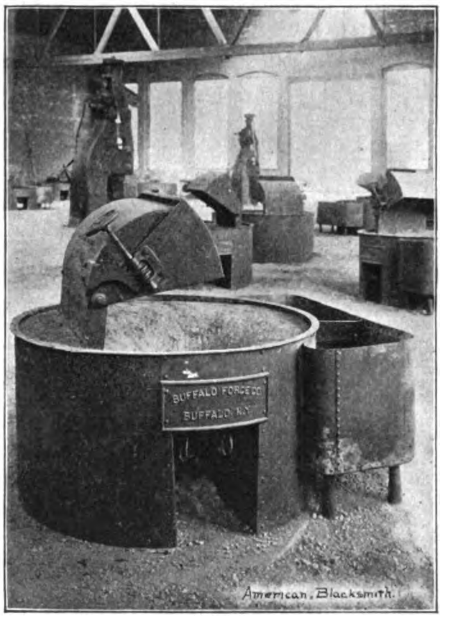

Fig. 8. VIEW OF INDIVIDUAL FORGE.

these are not in good condition, and the rim solid, setting the tire will be only a temporary make-shift, and most likely will do no good at all. Very likely it could not be set tight, and the work would prove a discredit to the man who did it. The customer must be convinced of these facts, unless you are mutually so well acquainted that you feel assured he has confidence in your judgment and honesty. If a repairman recommends doing certain repairs it must be on grounds that would appeal to the good sense, confidence and gratitude of the customer.

To make a reputation as a good workman requires something besides good work. Good judgment must be shown and one must have the courage to decline to do work in a discreditable manner. Let the cheap people who want their work done in a "slip shod" manner go elsewhere. You get a wound every time you do work their way. In the majority of cases one should make a price on putting the vehicle in good running order, or in complete repair, and if anything is omitted it is to his discredit. It pays to cultivate the trade of the kind of customers who want work done well. That not only requires shop conveniences but ability to do the manual work well. Work should always be secure against loss by fire. This requires a form of policy specially gotten up to cover vehicles in process of repair. Many people will not send their carriages to a shop where they are not protected from fire loss. In the case of parties having a large amount of repairing done every month, such as a transfer company or livery stable, they require a special policy issued in their name for an amount sufficient to cover any probable loss.

If a vehicle is to be repainted, the wood work must be carefully examined to see that there are no cracks in the panels, or at the joints; no parts where the glue has come loose or the water has entered. If any such appear they must be repaired, for to rely on putty to cover such defects is to spoil your work. If the wood work be damp, though not loose, it should be given time to dry out. Many of the best carriage houses will not touch a job of repainting without giving the vehicle a week to dry out. This necessitates of course a dry, warm shop. Often the wood is rotted so badly on the inside (though apparently sound outside) as to require the removal of a part. The rotted part can seldom be patched with success. The bottom boards should always be carefully inspected, for it is a matter of personal safety to the owner of the vehicle, and if the bottom board should break through after having his carriage supposedly thoroughly repaired at a shop, he would probably take his trade elsewhere. It is unusual to find a vehicle in use a year or more without some of the bottom boards around the screw holes or nail holes rotted, and holding by no more than a soft rotted end of the wood. Moreover, the rotting of the bottom board is extended to the sill or rocker, as the case may be, and a still greater damage created. If a little paint here or there will protect from the ravages of water, don't wait to be asked to paint the job, but apply the paint where needed. It may be only a speck of varnish chipped off, yet where the varnish is gone the water will eat through.

Every vehicle left for extensive repairs should be thoroughly washed and

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cleaned up before leaving the shop. It may not be absolutely necessary, but it makes an excellent impression and costs very little. Always examine the axles,

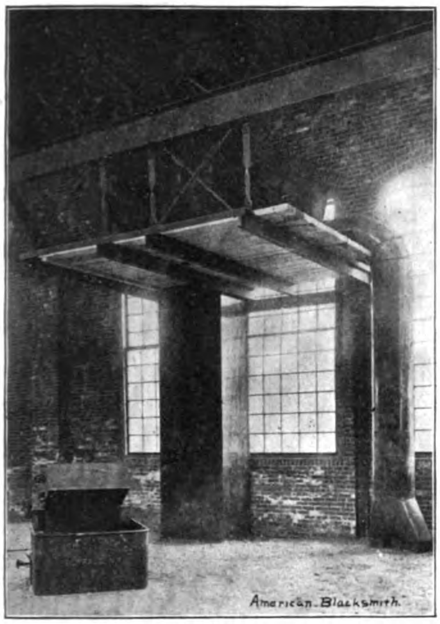

Fig. 4. VIEW OF BLOWER, EXHAUST FAN AND PIPE CONNECTIONS.

and oil and wash them if needed, using pure castor oil, after first wiping the box and spindle clean. A charge for this service is seldom resented, but in many cases it is best to do the work whether charged for or not.

Customers need educating, as a rule, in the case of vehicles, and it pays to have a little printed literature on the subject to hand to them now and then. They see that you understand your business and have respect for you accordingly.

In all regular repair work a bench near the entrance is of the utmost service, because a great deal of work can best be done there before going to the shop, and also much can be done there after the job has been through the shop, such as mountings or touching up, or small oversights can be rectified without disturbance to the workmen. In a previous article we described the axle-setting device and the hanging-off device. These may both be convenient to the bench and will be used in connection with all the work not requiring a specialist, and fitted up with appropriate tools.

In order to save handling of material, moving around of vehicles and for convenience in general, it is advisable to have the tire fire of the smith shop as near as possible to the entrance from the yard or room where the vehicles stand, so that a wheel requiring its tire reset can be taken off readily and run into the shop without disturbing men at their work. The tire setter has a small department to himself, equipped with a forge, a bench with vise, tool rack, wheel stand, a drilling machine for tire and (in some shops) another for countersinking and one for boring holes in the rim. But in most shops the same machine performs all three operations by a change of bits, or sometimes where there are two spindles on the machine, simply shifting the wheel a little. The tire drill bit may be made with a counter sink cutter at the head and is generally so made now. Machines have been made to drill all the holes in a tire at once, but we have never seen them successfully adapted to repair work. In the tire setter's department should be included a rack for storing new tires so that he will not have to waste time in going to some distant part of the shop to get his material. In many shops the tire is kept in the cellar, or in some dark out of the way place. A repair tire fire would not use so much tire as one putting on new tire only.

There should be a series of boxes or pigeon holes for bolts, arranged against the wall or post convenient for the tire bolter. These compartments should be made so that bolts will not easily fall out, nor yet be too small for the whole hand to reach in and get at easily what is wanted. The keeping of bolts in paper packages strewn along a window sill or back of a bench is disorderly. The bolt cabinet should have each compartment properly and plainly labeled with the size of bolt it contains. Every smith's fire needs a bench with the customary smith's vise, and the tire fire needs it as much as any other, although in some shops it is omitted.

For repairs, an open forge is necessary with the chimney-hood set well back out of the way so that a tire can be turned around in the fire. But where there is an electrical current and an electrical welding machine can be used, a forge can be dispensed with. If there is a forge, a power hammer for welding will be found an economizer, even if only a foot-power hammer. After the weld has been made, a heating furnace with the tire resting on revolving rolls to keep it turning will heat the tire evenly all around while other tires are being welded. Such a furnace is seldom seen in a repair shop, unless equipped with power, although but little is needed and a boy or a dog could turn the rolls. It will heat from a dozen to two dozen tires at once. Gas jets, coal, or wood may be used for heating. An open arrangement is sometimes used in which the tire lies flat, and gas jets are placed all around the tire. One tire at a time is commonly heated in this apparatus.

If a cold tire setter is used, the heating is generally dispensed with but some prefer to heat the tire, as the wheel need not be sprung so much out of position, and the cooling of the tire produces shortening enough to bring everything up tight, the cold tire machine simply making a neat fit, obviating the extreme nicety in measuring for length of tire when welding. But few repair shops are provided with these appliances and many people object to them, preferring the old careful handwork methods.

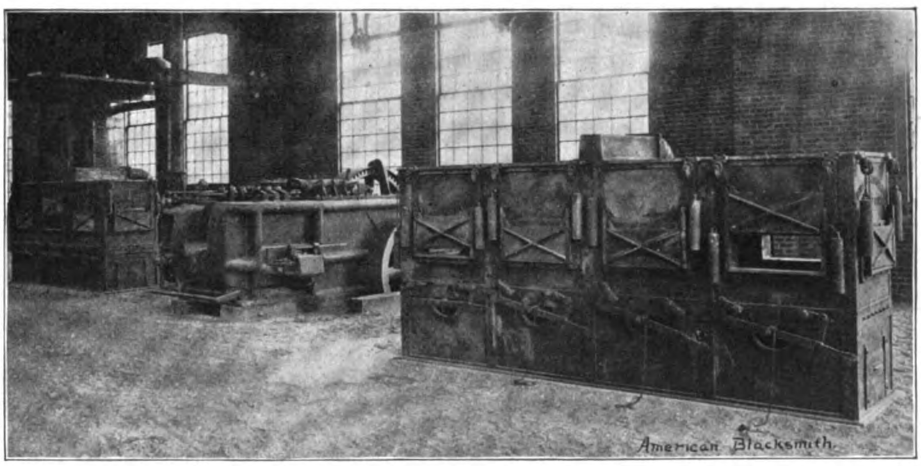

Fig. 5. HEATING FURNACES MADE OF SECTIONS OF CAST IRON.

Nevertheless in planning how to arrange a repair shop and how the work is to be handled, the needed room for their operation, with convenience of access must be considered, if they are to be used, and whether the expense of room, and investment will be justified. In most repair shops it will not. In thousands of such shops there is no separate tire forge. But we think it pays to have one, even if the same men work at the two.

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The All-Round Man.*

EDNA MANNERS.

He knows all the neighbors' horses, every
age and gait and trick,
He can find out what's the matter, and can
right it neat and quick.
Just a look, a nod, a hustle, and the work's
as good as done.
At the smithy fire you'll find him from the
dawn to set of sun.
Should a sudden break-down happen, he is
always on the spot
With his tools all in their places and his
forge fire clean and hot.
From the smallest to the biggest (he can
make and mend and plan)
There's no job on earth can daunt him. He's
a good, straight, all-round man.

O, 'tis quiet of an evening when at last his
work is done,
And he sits and cons his paper—turns its
pages one by one.
Then he visits every country near at hand
and far away,
As he reads of all the great folk and the do-
ings of the day.
From his lazy pipe ascending, each white,
dreamy ring escapes
Wreathing memories and fancies into rest-
ful, pleasing shapes.
So he sits, and, sitting, dozes, the past busy
day to scan,
With the peaceful satisfaction of the good,
straight, all-round man.

* Written expressly for the August issue of THE AMERICAN BLACKSMITH.

HEATS SPARKS WELDS

Have you had a good season of wagon work?

A Good side line for this present season is rubber tiring. Have you undertaken it?

August—the sleepy month of the year, when business is slack and nothing doing. What is the prospect in your neighborhood?

Two-thirds of a horse's weight is borne by the front feet, 'tis said, while the hind feet are the most active in every one of his exertions.

If you promise to finish a job at a certain time, do so, no matter what else may have to wait. The reliable man whose promises are good is the one people want.

The Memphis Shoe for trotters has been patented by its inventor. License to use this shoe may be had upon application to Mr. W. H. Lake, Driving Park, Memphis, Tenn.

Good openings for blacksmiths exist in plenty in Northern Michigan, according to C. E. Gould, Central Lake, Mich. Mr. Gould will be glad to give further information.

One good way of recording the progress of your business is to have photographs taken from time to time. By comparing these, a fair idea may be had, at small expense, of which way things are going.

The first steel ever made in Mexico was recently turned out by the new $10,000,000 steel plant at Monterey. This concern will make steel rails and structural steel of all kinds.

A Great mistake it is to keep the apprentice in the dark about the business and how it is going. Let him take part of the responsibility and he will feel a more personal interest in his work.

How about those old bills? If you have paid all of your own, you can go after collections with a better grace. Stale accounts lead often to bad accounts. Avoid them by collecting your money early.

With few exceptions men are naturally lazy. When an employer finds a man who is really and honestly willing to work hard he injures both himself and the employee by not acknowledging the man's superior worth.

A wise choice in selecting a trade is an important step towards success in this world; but having chosen unwisely the next wisest thing is to make the best of it and try to work up an interest in your work. Success will follow.

A little work in the shop during vacation will do a boy good, especially if he earns thereby something for pocket money. Children like to use their hands to accomplish something, and a taste for the craft may thus be acquired.

Carriage Painting may as well be made a work of art as not. It is a thing that is an advertisement in itself and one that appeals very strongly to the public. A stylish appearing vehicle is very striking, especially on a country road.

Understand your tools. If you have an engine, a power hammer, or any machine with complicated parts, try to know something about those parts and how they should fit together. It will save much trouble and expense.

The National Association of Wagon Manufacturers at a recent meeting, discussed the price question, and decided that, since the prices of all raw materials have advanced rapidly, an advance in the prices of wagons was a necessity. This is a step in the right direction.

A good workman who can do successful work with poor tools will do far better with first-class ones. But what of the poor workman or the inexperienced apprentice with poor tools? He will probably meet with utter failure and discouragement, and perhaps give up the trade.

A Strong Smith often overworks himself, just because he overestimates his own strength. It will all tell, in after years, perhaps in a complete breakdown. There is no reason why even a strong blacksmith should expect to do the work of a 5-horse-power engine. Yet many do.

To punish tardiness in men is a serious problem with many a smith. A new man should be admonished in a friendly way first and, afterwards, if he persists in breaking rules, he may be given a series of bad marks, and when these reach a certain limit, he may be fined, his wages lowered or he may be "laid off" for a time.

If you strike anything that you do not understand in our series on mechanical drawing don't hesitate to ask about it. In order to obtain a thorough working knowledge of the subject it is very necessary to fully understand every article in the series without any hazy doubts.

It's not education that ensures a man's success, and it's not wealth nor long years of experience. Look at some of the clever mechanics who have risen to eminence as inventors without any of these. It's simply using his head, and pressing forward in spite of everything, with unfailing faith in himself and his powers.

A large sum of money is laid out by Wilkins in getting up signs to advertise his shop. Peters, at the next village does not advertise. People see that Wilkins is alive and up-to-date and take their work to him, so that Peters' custom grows less and less. Who pays for the advertising, Wilkins or Peters? Here's a problem.

That high building of brown terra cotta on the corner of Pearl and Church Streets, Buffalo, is the Prudential Building, and a very fine structure it is. Take the elevator and ask for THE AMERICAN BLACKSMITH offices. Here we are at last permanently located and ready to welcome our friends who may be visiting the city.

The solid wheel of antiquity cut round from a block of wood has gradually developed into the modern light, rubber-tired affair with spokes and hub and dish all made according to scientific principles, maximum strength with minimum weight. There is so much to be learned about a wheel and how to make or repair it that hints in this direction can never come amiss.

In the copper country, Ontonagon County, Michigan, a new find has been made of several ancient tools evidently used by the Mound Builders in separating the copper from the gaugue. It is believed that the process was to build a large fire around the mass of copper and heat it very hot, then dash cold water upon it and pound out the metal with heavy stone hammers.

Trade education is well provided for in Hungary. In any community where there are fifty apprentices, the community must provide commercial instruction for them. Even should the number fall below fifty, if there is a chance of its again rising, the instruction must be kept up. The time spent in learning any trade is three years, of which ten months, at least, of every year must be devoted to instruction.

Nothing fancy for him, said Tom Tardy when we asked him about putting up a new shop sign. "Everybody knows I'm here." Advertise? No, not he, they all know where to find him and what he can do. We tried to point out that people like to know that a man is alive as well as being at his old stand. Besides, new people might be attracted by knowing that an up-to-date blacksmith was waiting to be of use to them.

Tom couldn't see it though. Neither can he understand why his neighbor smith down the street, new comer though the latter was, did a much bigger business than he himself, who had been in the same spot for years. Tom is by no means a good reasoner.

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American Association of Blacksmiths and Horseshoers.

The purpose of these brief words is to stir up enthusiasm among those craftsmen who have not yet taken any action towards getting together and securing the benefits of co-operation and organization. Now is the time to wake up and put forth the effort. Very little worth having is ever attained without striving for it. Talk up the subject with your neighbor blacksmiths. Make them see the advantages of forming an association to put prices at a proper level.

Do not let the summer slip by without having a better understanding among the smiths in your neighborhood. Take some action now while the roads are in good shape and all conditions favorable. Get the men of your town, or your neighboring towns or the whole county, to come together, talk it over and form an association. You can organize yourselves independently, or under the auspices of the American Association of Blacksmiths and Horseshoers. That association will gladly furnish all the aid possible, but by all means, organize. The American Association has the interest of the craft at heart, and wishes to see an organization of some kind in every locality because it knows the great benefits which organization means.

We are glad to report much good work being done in many quarters. The question is a live one, and every thinking craftsman will realize that something must be done, and done quickly. Hence it is that active work is being done, and associations formed in many localities. There is no reason why they may not be formed in every county. Will you be the one to make a start in your section? Write to the American Association of Blacksmiths and Horseshoers at Buffalo, N. Y., for plans for forming county associations.

The latest organization which has been formed is a flourishing association in Menard County, Illinois. The officers are: President, David Ziegler; vice-president, Fritz Tressler; secretary, Samuel Bryant; treasurer, William Faist. The following is a partial schedule of prices adopted:

Menard County Schedule.

Resetting four old shoes	$ 1.00
Four new shoes	1.80
Resetting four shoes on stallion	1.50
Four new shoes on stallion	2.50
Two new bar shoes	1.50
Sharpening plows	$ .25 and .30
New Share, 12-inch	3.50
" " 14-inch	3.75
" " 16-inch	4.00
Landside bar	1.00
Landside plate	1.25
Pointing plows	.75
Pointing shovels, per set	2.00
Sharpening shovels, per set	.50
Setting buggy axles	1.25
" " " cold	.50
New stubs, one-inch	6.00
" " 1⅛-inch	7.00
" " 1¼-inch	8.00
New T-iron in shaft	.50
Welding tongue brace	.35
Shaft shackles, per pair	1.00
Bradley shackles	1.75
Axle clips	$ .15 to .25
New buggy tires	6.00
New wagon tires	8.00
Fifth wheels	3.00
Wagon seat springs, each	.75
Bolster plates, per pair	1.00
Cast skeins, per set	6.00
Steel skeins, " "	8.00
Setting buggy tires	3.00
Setting wagon tires	2.00
Tongue cap	.50

Buggy and Surrey Parts.

Buggy or surrey pole	$ 2.50
Buggy or surrey shaft	1.50
Odd styles extra	
Pole circle	1.00
Shaft crossbar (Extra with wood brace)	1.00
Doubletree (old irons)	.75
Doubletree (new irons)	1.00 to 1.25
Singletree, sword end	.50
Singletree, round end (old irons)	.50
Singletree, round end (new irons)	.75
Axle caps, each	1.50
Head blocks	1.25
Spring bar, curved end	1.00
Spring bar, plain	.75
Straight double reaches, each	.75
Bent doubletrees, each	1.00
Single reach	1.25
End panel in piano body	1.25 to 1.50
Side panel in piano body	1.50 to 2.00
New seat only	2.00
New seat, panel back	3.00

Wagons.

Axles, each	$ 3.00
Bolsters, each	1.50
Sandboards	1.50
Tongues	2.50
Bent front hound, each	3.00
Hind hound, each	.75
Coupe poles	.75 to 1.00
Wheels filled, tire setting not included	$12.00
Wheels rimmed, tire setting not included	6.00
Wheels spoked, tire setting not included	6.00
Wheels cut down, per set, tire setting not included	6.00
Spokes, each	.25
Felloes, each	.30
New bottom, (old beams)	3.00
Beams, each put in with bottom	.50
Beams, each alone	.75
New plain end gate	1.00

National Railroad Master Blacksmiths' Convention.

The annual convention of the National Railroad Master Blacksmiths' Association will be held in Buffalo, New York, August 18th, 19th and 20th. Everything points to a splendid convention, and no master blacksmith who can possibly attend can afford to absent himself. Arrangements have been made with the Genesee Hotel at Main and Genesee streets, Buffalo, to furnish every accommodation for the visitors. A pleasant session hall connected with the hotel has been placed at the disposal of the Association for convention purposes. Every master blacksmith in the United States, Canada and Mexico has been invited to attend this meeting, which certainly offers the rarest kind of a chance for a highly profitable and enjoyable three days' outing. The present indications are that the meeting will be extremely well attended, and it seems to be an assured fact that a greater number of new members will be enrolled than at any previous meeting.

The following are the subjects for consideration during the convention.

Repairs of Steel and Iron Frames; Best Method.—John Coleman, Chairman.

Best Method of Preparing Scrap and Working Same to Make Good Iron for New and Repaired Locomotive Frames, Rods, Straps, etc.—S. Uren, Chairman.

Oil; Is It Successful as a Fuel for the Manufacture of Iron Axles, and Heating Iron Scrap for Axle Slabs?—Thomas McNeal, Chairman.

Piece Work; Is It Practical for Locomotive General Repairs?—Thomas Lace, Chairman.

Machine Forging; Its Advantages in Car and Locomotive Construction.—H. A. Folk, Chairman.

Tool Steel; Best Method of Forging and Hardening High Carbon Steel Cutters, Millers, Taps and Unequal Shapes.—G. F. Hinkens, Chairman.

Best Form of Oil Furnace for General Locomotive Shape Work, and Best Pattern of Oil Burner for Same.—W. P. Savage, Chairman.

Flue Welding, Iron and Steel; and Best Machines and Methods of Doing This Work.—G. Lindsay, Chairman.

Best Method of Forging Locomotive Rock Shafts and Valve Yokes.—H. Hinkens, Chairman.

Track Tools; Best Method of Making Same; Does It Pay to Make Track Tools Out of Old Locomotive Tires?—C. H. Corcoran, Chairman.

Best Kind of Tuyere Iron for Light and Heavy Work.—Robert Henderson, Chairman.

Case Hardening; Best Methods and Best Material to Do Good Work.—A. W. McCaslin, Chairman.

Frogs and Crossings; Does It Pay to Use Old Material for Repairs?—Thomas Rowland, Chairman.

Hammer Dies; What is the Best Material to Use for This Purpose for Hammers from 500 to 2,000 Pounds?—R. A. Mould, Chairman.

Best Method of Making Car and

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Locomotive Springs, and Best Bath for Hardening.—J. W. Smith, Chairman.

This present meeting will be the eleventh annual convention of this Association. The officers for the past year have been the following:

President—John McNally, C. & N. W. R. R., Chicago, Ill.

First Vice-President—George Lindsay, E. & T. H. R. R., Evansville, Ind.

Second Vice-President—T. F. Keane, Ramapo Iron Works, Hilburn, N. Y.

Secretary and Treasurer—A. L. Woodworth, C. H. & D. Ry., Lima, Ohio.

Chairman Executive Committee—Benjamin Burgess, C. & E. I. R. R., Danville, Ill.

Chemist—G. H. Williams, Box 2027, Boston, Mass.

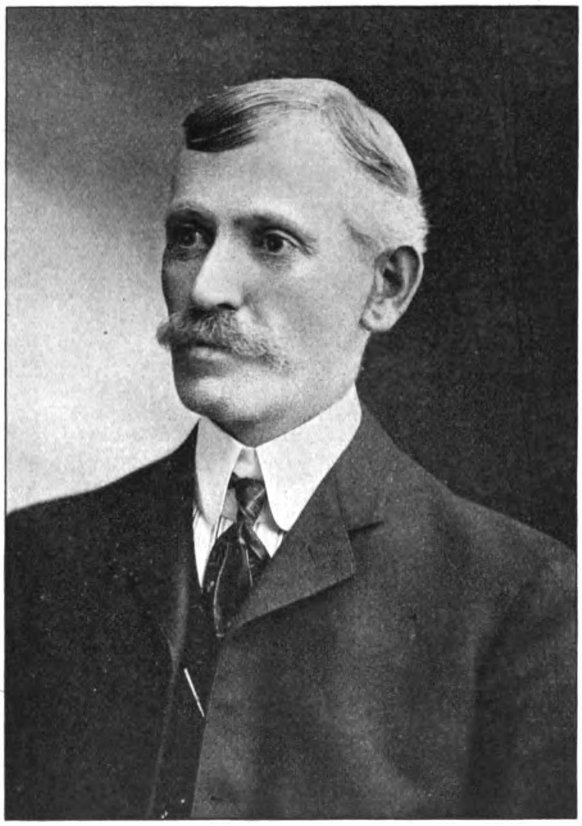
Foremen eligible to membership in this Association are those employed in railroad, car and locomotive shops, who are desirous of becoming more proficient in the blacksmith's art, and who, by the exchange of ideas expect to make themselves more valuable to their respective companies.

So far the success of the Association has been more than satisfactory and has gained for it an undisputed place among the mechanical associations of the country. The secretary is constantly receiving letters from leading mechanical experts throughout the United States and Canada, showing to what extent the work of the Association has been appreciated.

The increasing demand for greater skill on the part of foremen, especially in the use of tools for the economical production of forgings, should of itself be sufficient to induce all master smiths to avail themselves of the opportunity for self improvement that the association offers along this line.

The plan followed by the association is to hold meetings at least once a year, at which time the principles governing the treatment of iron and steel, as well as the changes which the metal undergoes, are studied. At these meetings papers are read and discussed with the view of arriving at the best and most economical methods of doing work. Men are not apt to improve with no other model than themselves to follow, but by coming together and exchanging ideas they learn from those more proficient in the art. Blackboard illustrations and the noon hour convention talks supplement what is presented by the papers. These talks are exceedingly instructive and give rise to many new devices and methods. A systematic and persistent study of this branch of mechanics is not only necessary, but it carries with it a certain amount of dignity and commercial value that no ambitious master blacksmith can afford to ignore.

The cost of membership is merely nominal. Applications for membership should be made to the secretary, who will furnish a blank and such other information as may be desired. The papers and transactions of the Association are printed in the Proceedings. Enough copies are issued to furnish each member two, one of which is intended for his master mechanic, master car builder or superintendent, as the case may be.



MR. JOHN MCNALLY,
PRESIDENT OF THE NATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.

The Association is to be complimented upon its splendid judgment in selecting as its leader for the past year, Mr. John McNally of Chicago. Mr. McNally commenced his railroad career as an apprentice with the C. & P. R. R. Co. After mastering his trade he made his way west, working in some of the principal railroad shops throughout the Middle States, and in 1874 took service with the C. & N. W. R. R. Co. Four years later he was made foreman and is now in charge of the Company's principal shops at Chicago. As a man of sound original ideas Mr. McNally has few equals. He is conspicuous as a leader, yet so modest and gentle that his methods in dealing with those in his employ have made him a valuable man for the position which he holds.

Mr. A. L. Woodworth began railroad work in 1876 with the P.C.C. & St. L. R. R. Co., at Logansport, Ind., from which place he went to the D. & R. G. R. R. at Denver, Colo. Returning East in 1880, he entered the service of the Pennsylvania Co., at Ft. Wayne, Ind., and in 1884 was made assistant foreman. Mr. Woodworth accepted the position he now holds as foreman of the main shops of the C. H. & D. R. R. Co., at Lima, Ohio, in 1890. At the Boston meeting in 1898, Mr. Woodworth was elected Secretary and Treasurer of the National Railroad Master Blacksmiths' Association, which position he has held with credit ever since. He is a mechanic of unquestioned ability, and an enthusiastic worker for the good of the craft and the welfare of the Association. It is largely through the efforts of this official that the Association has attained the position it now holds where its influence is felt and usefulness appreciated.

The Association is to be congratulated not only upon its flourishing condition and fine membership, but upon the splendid work it is doing in elevating the standard of the railroad blacksmith's craft knowledge.

Diseases of the Foot and Their Treatment.—16.

Osteoporosis.

E. MAYHEW MICHENER, V. M. D.

Osteoporosis is a disease of the horse which is characterized by certain alterations of the structure of the bones which undergo enlargement at the expense of their density and strength. In the living animal the enlargement may be so great as to be plainly visible to even ordinary observation. The increase in size of the bones is most readily observed in those bones of the skeleton which are not covered with muscle or much other soft tissue excepting the skin. The bones of the face, the lower jaw and those of the legs below the knee and hock joints are the points where the enlargement is most commonly observed.

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In some cases the spinous processes of the back bone are noticeably enlarged, especially at the top of the withers. On account of the very common enlargement of the bones of the face and jaws, the disease has received the common name of "big head," by which name it is well known in many sections of the United States. Osteoporosis has been known for many years in this country and in England, where it was described by a veterinarian as early as 1860. The earliest reports of the disease in the United States are somewhat later, and describe the disease among the animals of the Ohio valley. It is only within the last twenty years that the disease has been noted to any considerable extent in the Eastern or Atlantic States, where it now appears to be slowly but surely on the increase, especially in and about the large cities. The specific cause of osteoporosis is not known, yet enough facts concerning the disease are so well-known as to warrant the assertion that the disease is a contagious one. It is not observed in isolated stables, where there has been no chance of its introduction along with horses from an infected locality. There is abundant evidence that the disease can be transmitted from a diseased one, but it is not so clearly evident that a stable, in itself, may infect sound animals. While the evidence is quite conclusive that osteoporosis is due to a specific germ, as is the case with some better understood contagious diseases, yet the germ has thus far not been isolated.

The symptoms of osteoporosis vary in some particulars with the severity of the case as well as with the location of the most decided point of attack. The detection of the disease may be difficult in certain cases owing to the very slight alteration in size of the bones. Some cases show at first only a varying degree of defective movement, which one often hears described as a "tied up gait." The animal may show stiffness in movement of one leg only or may move with evident pain in almost every joint.

Lameness or stiffness of the hind limbs is rather more common than in front, but not rarely one front and one hind limb either on same or alternate sides are found stiff or lame. Another characteristic train of symptoms is lameness or stiffness first in one or more limbs followed in a few days or weeks by the same evidence of pain in one or more new localities. Acute attacks of lameness from no very clearly visible cause are another characteristic; these attacks may come on while at work, or the animal may be found severely lame after a prolonged rest in the stable. The acute symptoms frequently pass away after a variable time to return again, or in more rare instances there is a sudden

MR. A. L. WOODWORTH,
SECRETARY-TREASURER OF THE N. R. M. B. A.

fracture of some one of the bones or a tearing loose of the attachment of the tendons or ligaments, causing the most acute suffering and total disability.

Very commonly the appetite and general health of the animal are normal, this may be the case even where the enlargement of the bones is so great as to be decidedly noticeable. At the time of acute pain, however, the appetite becomes more or less depressed, and the animal may be found down in the stall the greater part of the time. In some cases the appetite is uncertain and varible, and pressure upon the bones of the jaws may give plain evidence of the tender condition of the bone. Where the appetite is much interfered with of course the body weight of the animal is seen to be failing. In very advanced osteoporosis of the bones of the jaws, the molar teeth may become decidedly loosened in their bony sockets, rendering mastication about impossible. In cases in which the animal spends much of its time in a recumbent position it is generally found resting flat on its side and not in the natural position as taken by the sound animal. Bed-sores frequently form from contact with the stable floor.

The diagnosis of osteoporosis requires very careful examination in mild cases, while in advanced cases the detection of the diseased condition is comparatively easy. Possibly the disease may be mistaken for an attack of rheumatism, which is a very rare disease of the horse. In the examination of the bones of the face and jaw the age of the horse must be well taken into consideration as the size of the bones of the animal varies directly with the age, the outline of the bones of the young head is decidedly more rounded than is the case with the aged animal. This is of particular importance in the examination of the lower jaw, which is normally thicker and more rounded in the young animal than in the aged one. The various enlargements due to direct injuries to the bones of the head or legs must not be confused with osteoporosis; diseased molar teeth as well as catarrhal inflammation of the sinuses or cavities beneath the bones of the face may produce enlargements somewhat resembling those produced by osteoporosis.

Diseased teeth may cause tenderness and impaired mastication, but should not be confounded with the tenderness produced by osteoporosis. Bed-sores and general wasted condition may at times be the result of laminitis or founder, but examination of the feet should be sufficient to determine if laminitis be present. History of a previous case of osteoporosis in the stable may be of certain value in arriving at an early diagnosis of another and later case. It should not be forgotten, however, that while the symptoms in a given case may be acute and the course of the disease rapid, yet the next case in the same stable may run a very slow and almost chronic course and the animal remain useful to greater or less degree for months or even years. Much depends upon the constitution of the animal.

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Treatment.

Curative treatment can scarcely be said to exist in this disease. The best results the writer has seen were obtained by turning the animal to pasture for a month or more, but this is far from being a benefit to all cases. The feeding of ground bone meal has been advised by some.

It is with prevention that the services of the veterinarian or other informed person can be of use in combating this disease. Some cases do seem to get well, but a large percentage suffer a relapse at a variable future time. It is better to consider even the apparently recovered cases as dangerous to stable with other horses, for it is not possible to determine their harmlessness except by trial, and it may prove expensive information. Such cases as are useful can be worked with safety if stabled entirely away from other horses or mules. Upon the removal of a diseased animal from the stable, it is best to disinfect the whole stable thoroughly. Thorough cleansing should always precede the disinfection of a stable, and all movable material should be included in the cleansing and disinfection. On account of the long period which commonly passes from the time of exposure of an animal to this disease until the symptoms are pronounced, it is not possible to determine, for possibly a year or more from the removal of the last case, whether or not one or more of the remaining animals are diseased. For such reason it is advisable wherever possible to not add new animals to a stable containing horses which have been exposed to the disease.

(To be continued.)

A Novel Grafting Iron.

B. E. PEASE.

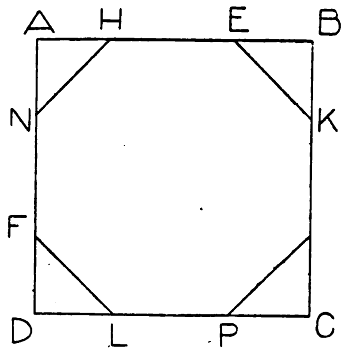
I have devised a grafting iron that is considered by orchardists as a good thing for cleft-grafting. The concaved knife makes a clean cut of the bark and sap of the stub instead of tearing it as with a straight knife.

It takes only a short time to make one, and they sell for 50 cents. The knife should be 1 inch wide by $\frac{1}{8}$ inch thick at the back and should be ground smooth. The wedge is $\frac{3}{8}$ inch square at the base and $1\frac{1}{2}$ inches long. Hammer the knife at a low heat and leave it without temper and it will stand.

To Lay Out an Octagon—Hack Saw Hints.

BY JOHN.

Suppose one desires to round up a piece of iron that is two inches square. The easiest way is to first make an octagon of it.



HOW TO LAY OUT AN OCTAGON.

To do this quickly, measure the distance between the opposite corners as AC and BD. If these are alike and the distance approximately 2 and 13-16 inches, it shows the piece to be square. Set a gauge one-half of this, 1 and 13-32 inches, and gauge on from all four corners, as from A to E and F, B to H and I, C to K and L, and from D to N and P. Now work to the lines, LF and EK, etc., and one will have an octagon which, in pieces of this size and less can be more easily and quickly drawn in this manner than any other, and this wrinkle has been of much service to me.

A word more as to that, to me, indispensable tool, the hack saw: I am now using saws with twenty teeth to the inch with the best of satisfaction. Before using a hack saw see that the body and feet are not in a cramped position but natural to the work. This saves misstrokes and saws. I also find that when the saw is run the full length of the blade, the soft teeth at the front end of the saw will sometimes catch and cause the saw to break. I touch these teeth to the emery wheel or they may be dulled with a file.

The Railroad Blacksmith Shop.—10.

Repairing a Valve Yoke.

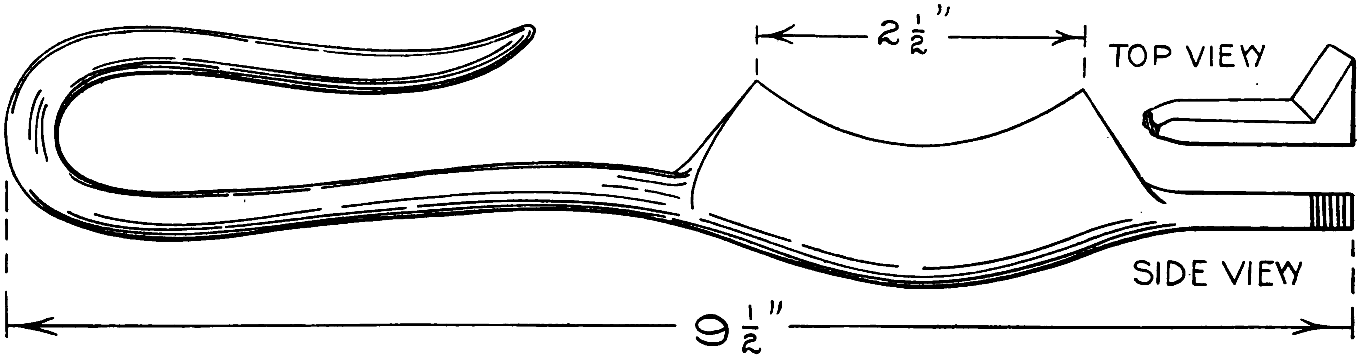
W. B. REID.

The reduction of the working diameter of the valve yoke stem makes its renewal an occasional necessity. The method of repair will generally be determined by the shape and condition of yoke at base of stem. A yoke too much reduced at this point may have to be replaced by a new one. But where the stock is of reasonable porportions, the substitution of a new stem is good economical practice.

In doing this work the blacksmith is often heavily handicapped by unfavorable conditions resulting from bad machine shop practice in extending the finish of stem unnecessarily far down towards the yoke back and terminating in a sharp corner instead of a safe fillet. In consequence, an attempt to upset the stock at base of old stem for the reception of the new one invariably results in a hopeless cold shut. With a good round fillet the part may often be successfully upset, and the new stem applied easily and inexpensively. As an alternative the stub of old stem can be used for working purposes, as shown in Fig. 41, A. and B. A is the best and safest method. The points of scarves lap securely over the sides of yoke, and thus avoid probable cold shuts at CC, Fig. 41. In both instances a deficiency of stock at base of new stem results.

Fig. 41, D, is a possible result likely to give much trouble in lining up stem for finish at machine.

Another method of welding new stem is shown in Fig. 42, A, which shows a



A VERY USEFUL AND ORIGINAL FORM OF ORCHARD KNIFE.

lap scarf deeply formed in yoke back, with a *bob* tool; the new stem scarfed to correspond.

An essential element of weakness in these methods, however, is the neces-

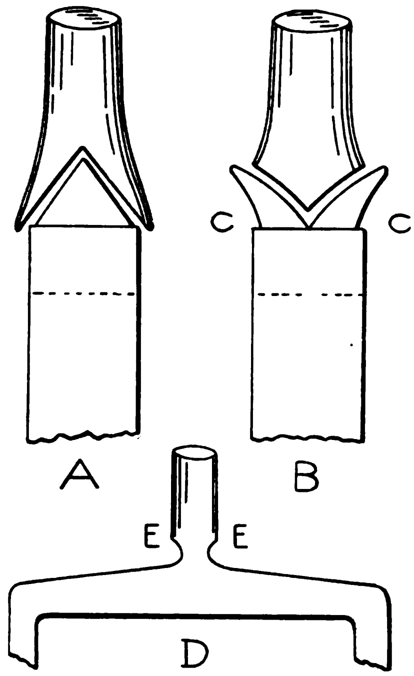


Fig. 41, *A B*.—METHODS OF REPAIRING YOKE AT BASE OF STEM. *D*.—RESULT LIKELY TO GIVE MUCH TROUBLE IN LINING UP STEM FOR FINISH AT MACHINE.

sary removal of so large a proportion of the surface of the welded parts in machining the stem to proper size. If left "black" these welds would prove strong and reliable; but since it is necessary to finish, the best way is to carry the point of weld safely beneath the operation of the machinist. This is the proper method, and is perfectly practicable and reliable in the hands of a competent workman. The other methods are, indeed, very often chosen by those of less confident ability, to whom the method we are about to describe seems of a more difficult and hazardous nature.

Fig. 42, B, shows clearly the method recommended. The cavity in yoke back should be made as deep as the stock will permit, and sufficiently wide to receive a large substantial scarf forged from the solid upon stem. The failure of a weld of this kind can only result from making the scarf too small and thin (Fig. 42, C.) The cavity in yoke back is made by first cutting out a small V piece, then working the stock backwards with a fuller. This enlarges the scarf sufficiently and augments surrounding stock for welding. To prevent the wasting and spreading of the yoke back do not heat the part beyond the possible point of welding; while the stem may be heated as high as can be safely done. In the process of welding use two narrow, round-edged set hammers; the helpers striking the tools simultaneously and regularly, together. Do not prolong operations until the iron is too cold, but return quickly to the fire and take two good side heats, welding smartly with hand hammers. With clean heats and effective manipulation, a first-class job is the unfailing result of this method. The liberal margin of stock secured at base of stem also renders subsequent lining up and finishing at machine an easy result. The whole operation takes place at anvil into which a plate of suitable size, to preserve the contour of yoke, is keyed (Fig. 42, D).

In repairs of this kind the accurate adjustment of the new and old parts is often a difficult matter to those unfamiliar with the job. This may be easily avoided by carefully measuring and noting the exact position of the old centers in yoke and stem before commencing operations at forge; then afterwards restoring the new and old parts to same relative positions.

An attempt has been made upon some roads to overcome the wear of valve yokes by fitting a hardened steel sleeve over the stem; held in place by nuts, tightened against rod connection. Whatever advantage a device of this kind might possess would, however, be largely neutralized by a lack of that immobility highly essential in a part so important as the valve yoke.

Jones as an Advertiser.

BILLY BUNTZ.

Advertising, like smithing, has its kinks. To bring trade it must be handled in a logical way. There is just as much art in soliciting trade as there is in handling customers nicely at the shop.

Aside from calling attention to a certain class of work at the right time, is the knack of directing special attention to the advertisement itself. This is best done by illustrations. Some folk "run over" plain advertisements—even news items, in a dreamy sort of way, and when asked whether they read anything of interest, simply yawn a muffled "No-o-o," or answer, "The same old rigmarole." Perhaps the editor was dilatory in getting news, possibly the advertisements were worded listlessly. No wonder the reader was tired!

Good illustrations wake folk up. They lead them to read an ad, and to think about it. In fact, the illustration is to the ad what a parade is to a circus. Very few folk can refrain from seeing the show after witnessing a grand parade. "It was just fine!" is the testimonial that brings out the "stay-at-homes." Likewise, the progressive smith advertises at a certain time to do just such work as folk want done, and illustrates his ad. with suitable cut, so as to draw particular attention to what he has to say. The picture gives emphasis to the reading. Folk read such ads. because they appeal to them.

One Jones, who was a diligent advertiser, had his name on every tongue. "Jones' advertisements are always interesting." "Jones says he sharpens lawn mowers; tell him to call for ours." "I must take my scythe down to Jones; he advertises to grind one for a quarter." "Last week Jones advertised to clip horses, but I have none to be clipped, while this week he says he sharpens shears, and ours are so confounded dull I'm going to take them down."

In fact, it has become well-known that Jones does this, Jones does that, Jones does thus, Jones does so—Jones, *Jones, Jones!* Indeed, Jones *is* advertising. *Who is he?* A year ago he had a wee shop like the one up the street which folk frequently pass on their way to Jones'. He has added improved

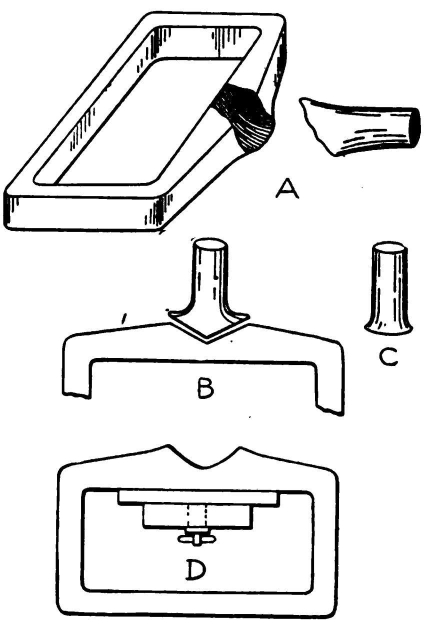


Fig. 42, *A B*.—TWO METHODS OF WELDING NEW STEM. *D*—PRESERVING THE CONTOUR OF YOKE.

tools and new machinery, as well as extended his shop back to the alley, which gives him two entrances, so he can do the heavy work in the rear. Instead of having only one helper, he has a first-class smith who used to work in the shop up the street, two helpers and three

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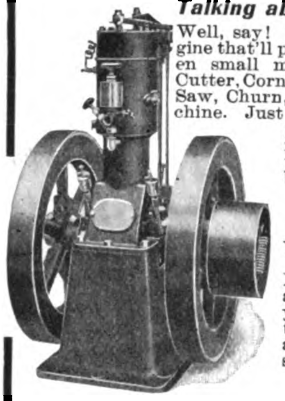
apprentices. He also has a delivery wagon.

"I had to do it," Jones would say, if

Come In and See It Run!

Talking about Power,



Well, say! Here's an engine that'll pull half a dozen small machines—Feed Cutter, Corn Sheller, Wood Saw, Churn, Washing Machine. Just the trick for pumping, as it runs "whether the wind blows or not."

USES LITTLE OIL

Your boy can run it. I am the agent and can tell you all about the good points and different sizes of the engine.

JOE BRADLEY
BLACKSMITH
TWO DOORS SOUTH OF POST-OFFICE

questioned about enlarging his shop. "Work just poured in on me; in fact, I surprised myself. Advertising did it." He knew how to go after the trade.

Plain advertisements serve well only when inserted amongst reading where they will be conspicuous, hence the local news column and the want column are about the only places they will be noticed. Even a plain advertisement receives more attention when preceded by an index, thus:

☛**Plows sharpened and repaired promptly.—JONES.**

Should this ad. be placed in the advertising column, the index, as well as the type, should be larger.

☛**PLOWS SHARPENED AND REPAIRED PROMPTLY.—JONES.**

A word from the smith to the editor about these matters is sufficient. He is wise, albeit he doesn't know much about smithing and needs to be told the "talking points" which will appeal to the smith's customers and bring him trade.

Where the smith does several kinds of work, like Jones, he should not confine his advertising to the local news column or write only squibs; moreover, he should not generalize or simply say, "Prepared to do repairing," but rather he should state emphatically just what he repairs, specifying one or two things and dwelling upon them until he has said all that is necessary to appeal to his customers, regardless of whether the ad. takes up one inch of space or ten inches. Folk, nowadays, want to know exactly what can be done for them. If *plows* are what they have to bring, talk *plows* to them at length, mentioning other lines only secondarily, or in another ad. or better still, save them to feed customers at another time. Where a dozen classes of work are mentioned in an ad. folk are apt to turn over the leaf to see if somebody else isn't saying something interesting about the particular thing they have for repair. The ad. that talks to the point catches the trade.

Supposing that at first Jones merely did shoeing, and not much of that, as he might have been a new smith or folk didn't know him. Among the reading in the local column he might introduce himself, thus:

Next week is Fair Week.
Strawberries at Marton's, 10 cents.

1318

Guess what that number means?
Fresh Fish Friday.—Schwartz.
Eggs, 10 cents.—Johnson.
To that number bring your horse to be shod. Shoes of all kinds and sizes. I never injure the foot nor give a bad fit. Special tools for measuring, paring and shaping the hoof.—Jones, 1318 Main St.

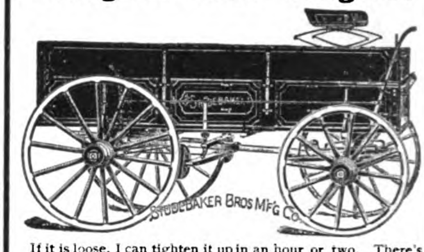
These sample ads. are such as any smith may use. Jones says it's as easy as letting one hand wash the other. Although he used to be a slender man, the waist-band of his pants is now like the bottom of a woman's skirt.

The sample advertisements on these pages are some of the kind that Jones and brother smiths use and profit by. Cuts can always be secured from the manufacturers at practically no cost.

Steel and How to Treat It—3.
Heating Arrangements—Coke Furnaces.
JOSEPH V. WOODWORTH.

In order to heat and cool steel properly it is first necessary that we have proper facilities; and while a plain ordinary forge may prove good enough for the heating of rough tools and parts, it will not answer for fine ones. When one considers that an accurate cutting tool or a die forging which has been properly forged, annealed, machined, hardened and tempered, will accomplish many times more work than an imperfectly treated one, the expense incurred in installing suitable facilities is not to be thought of.

Bring In Your Wagon!



If it is loose, I can tighten it up in an hour or two. There's no need of using a rattle box. Even a general overhauling, a new tire, a few new spokes, new whiffletree, would take me only a couple of days, as my shop is equipped with tools for handling work quickly. Can sell you a new wagon if yours is ready to scrap. I take old wagons in trade. ***JONES.***

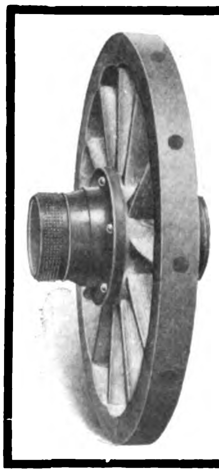
Although proper facilities are necessary and come first, they alone are not enough; it is also necessary to hire a mechanic who understands the treatment of steel. When this combination has been effected and a supply of good steel procured, satisfaction with the tools and parts treated will be an assured fact; if there should be any trouble, carelessness alone will be to blame.

There is only one way to heat steel properly, and that is not to expose it to the action of air when hot, as the air will decarbonize the surface considerably. To ensure success, remember the following: Heat the steel by means

I'LL CLIP HIM While You Wait.

Bring in your horse. Will make him sleek, stylish and proud. Renders currying unnecessary. No matter how good-looking the horse, I can improve his appearance. Can even make an old plug look smart.

JONES.



Do You Want a Guarantee?

You'll get it in that wheel. It speaks for itself, in fact there's no better made. That's why I recommend it. I have all sizes and kinds and can equip your wagon quickly. Can furnish axles or a complete wagon if that's what you want. Drop in and I'll tell you who is using these wheels, and why.
BOB EVANS,
Blacks'th & Wheelwright

Does It Look as Though It Would Break?

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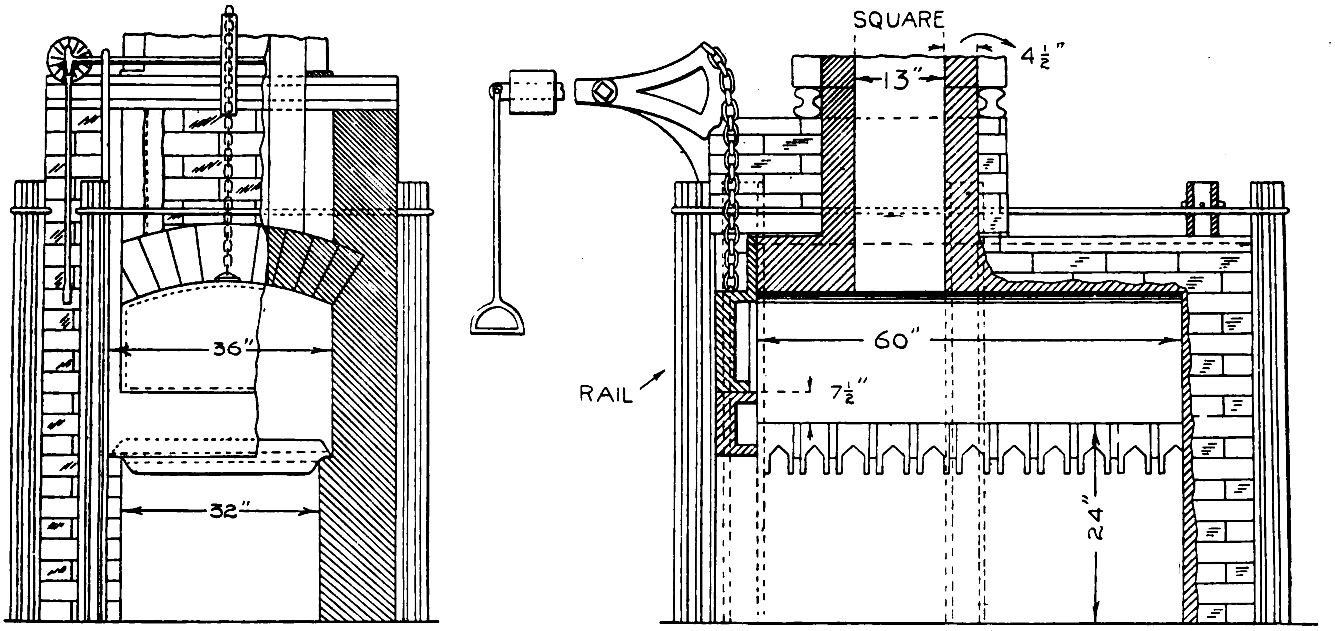
which will ensure an even degree of heat and in a furnace from which all air is excluded. Never heat steel which is to be annealed above a bright red. Never heat to forge above the faintest scintillating point. Never heat a piece to be hardened above the lowest heat at which it will harden. The larger the piece the more time required to heat it. The heat will have to be higher for a larger than for a smaller piece of the same steel, because of the fact that a large piece of steel will require more time to cool than a smaller piece. For this reason, when a tool, forging or any similar piece is very large it should be hardened in a tank into which a stream of cold water is kept constantly running, adapted for heating steel, and particularly for heating steel for hardening. These furnaces have been recommended by the Crucible Steel Company of America, who use them in their own works. The furnace is very simple and the sketches are self explanatory. All that is necessary is ten lengths of old rail about six feet long. One end of the rails is set into the ground, the tops are tied by ¾-inch rods, and a piece of 3 by ¾-inch iron is run around near the top and flushed with the bricks.

There are two principal features in a furnace of this kind, the fire bed and a good damper in the stack. In an experience of many years with furnaces of this construction the above named com- this kind is clean, hard coke. As is well-known the clear gas of a clean coke fire allows of viewing the whole interior of a furnace, thus allowing of every piece within it being carefully watched and evenly heated. Fill the furnace up to the fore plate—even a little higher will be better—with pieces of coke not larger than one's fist. With such fuel when beating for forging purposes the damper may be left high enough to run the heat as high as required, even a welding heat being obtainable with ease. On the contrary, when heating for hardening the furnace should be brought to the proper heat before putting the steel into it. Then put the steel in and drop the damper down tight.



FRONT AND SIDE SECTIONAL VIEWS OF A COKE FURNACE FOR HEATING STEEL.

otherwise the red hot steel will heat the water to such a degree as to prevent the steel from hardening.

With regard to the proper heating arrangements, the nature of the work to be done, the amount of it, the size of the shop, the kind of shop, and other things will determine this. Thus the small or medium sized blacksmith shop will be able to get along very well with a couple of forges, a small heating oven and a supply of good coke for fuel; the blacksmith shop in which considerable heating other than for forging is done, will require a specially constructed furnace; while the large manufacturing shop, in which a supply of good gas is handy, may require a number of gas furnaces.

As to the best furnace for use in the general blacksmith shop, jobbing shop or tool shop, I know of no better one than that shown in the sketches. It is a cheap and handy furnace, especially pany has found that the Tupper grate-bars with the ½-inch openings are the best. When these bars are set in as shown in the sketches a level and permanent bed is made, and an evenly distributed supply of draught to the fuel is ensured. In such a furnace one set of bars will last many years and will remain level. Although some are not aware of it, the satisfactory and safe working of a furnace of this type will be entirely prevented when square wrought iron bars or ordinary straight cast-iron bars are used, as such bars always warp, are pushed out of place and allow an excess of air to enter at one point and none at another. Thus hot and cold places in the furnace are caused and uneven heating of the steel results when heating for hardening. These are the chief causes of unsatisfactory heating in annealing, cracking in hardening, and burning in forging.

The only proper fuel for a furnace of

In this furnace the door is 12 inches high and 24 inches wide, and should be nicely balanced by a lever and weight, with a rod handy for the workman, so that he may pull it up with ease and turn over or shift his pieces in order to get a perfectly uniform heat.

Every medium or large size shop should have a furnace of the construction shown herein, as in the hands of a careful operator it will pay for itself twice over in less than a year. It will consume but little coke at a time, and when not in use the damper may be let down, when it will stay hot for a long time with but small waste of fuel.

I wish to impress one thing upon the minds of AMERICAN BLACKSMITH readers, which years of personal experience in steel treatment have demonstrated: *a smith at his anvil should never be required to heat for annealing, hardening or tempering his work in the forge fire.* This is

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being done in hundreds of shops throughout the country today, and it is a most foolish and wasteful system. The smith's fire is not fit to heat for any process except that of forging, as this process—through hammering alone—restores to steel the qualities which have disappeared in the fire.

A furnace as is herein described will cost not over one hundred and fifty dollars, and may be used to successfully anneal, forge and harden all such tools as taps, large rolls, shear knives, rotary shear knives, dies and all pieces not over five feet long.

When a furnace of the proper sort is used for heating steel for hardening and tempering, the steel will be hardened and tempered best and will thus be the finest in grain and the strongest. A good quick way to find out the proper heat and to test for grain and strength is to hammer out a piece of steel about one foot long to 1¼x⅛ inch and harden it at a heat which you consider right for such a piece. Then temper it to a high blue color, and when cold break off a piece with the hand hammer. If the grain is fine and silky, the steel has been heated properly and quenched correctly; the hammer will show whether the tempering has caused the steel to toughen, and the file whether it has given the steel the proper degree of hardness for the purpose desired. Not much practice will be necessary to become skilled in this line, and it will not be long before the mechanic will be able to heat a piece to the proper heat for hardening and temper it for any desired purpose.

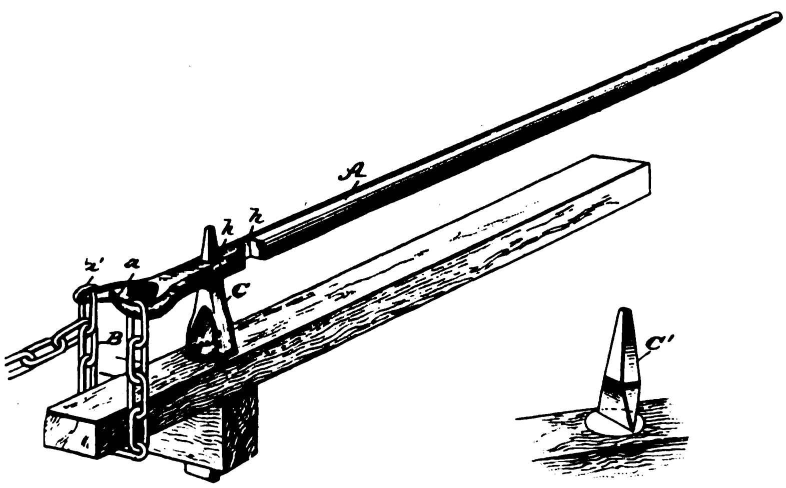
Lastly, in the use of a coke fire or furnace, never try to heat steel however fine in dirty fires, as you will decarbonize the surface and the sulphurous oxides, which are the greatest enemies of steel, will form on it and destroy all its good qualities.

In the next chapter I will deal with the use of gas blast furnaces and forges for heating.

(To be continued.)

A Unique Bolt Holder.

There are bolt holders and bolt holders, of many kinds and degrees, but one of the most noteworthy that has come to our attention for some time is the patented invention of Mr. Herman Stade, Flandreau, S. D., shown in the accompanying illustration. This holder is made adjustable by the chain attachment, and may be fitted with different lengths of handle and different shapes of bits as C and C1, for various kinds of work. The inventor tells us that it will hold any size or length of round and flat bolts from turning, and will readily hold plow bolts in the shear and mould board. According to the familiar principle of the lever, the force applied on the handle is multiplied a great many times at the bolt. The inventor claims that with this tool a half-inch bolt can be so securely held that it will twist off before it will turn.



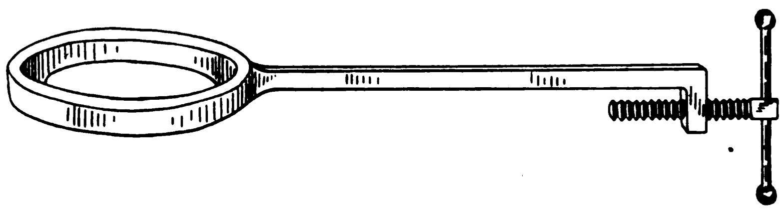
THE NEW BOLT HOLDER DEVISED BY MR. HERMAN STADE.

A Useful Tool for Wheel Repairing.

JOHN DOWSWELL.

The following tool will be found most useful in the wheel repair season. The tool which is illustrated and described on this page will be found a very convenient one for bringing up rims where any part stands off.

I take a piece of one-inch by ½-inch iron, and bend it to a circle about ten inches in diameter. To the ends of this piece I weld another piece of ¾-inch square iron, punch a hole in the far end, and bend down two inches, after which I cut a thread and place a screw of ½-inch iron six inches long in the hole.



SOMETHING NEW AND INTERESTING IN THE WHEED REPAIRING LINE.

This length will answer for any ordinary wheel. Put a handle in the end of the bolt, the same as a vise screw. This tool will give all kinds of satisfaction. It is operated by simply putting the loop over the hub and screwing up.

Note.

Owing to the great number of other important articles requiring to be published in this issue, we are obliged to hold over until September our next article on Mechanical Drawing. Henceforth, we hope, the series will continue without interruption.

The Editor.

Economy of Scientific Methods.

Many of the recipes in common use are very good in the hands of a man who understands them. However, it is only his experience that enables him to handle them satisfactorily. For instance, an old blacksmith may have a recipe for tempering that has been handed down to him from his great-grandfather. He knows from long experience just when the right shade of color is reached. He can guess the composition of the bath and he knows in the same way how long to leave the steel in it. However good his results, he cannot be certain of obtaining exactly the same every time, and another man, to whom he would try to explain his process might fail utterly. After wasting much time and material in unsatisfactory trials, he may make the recipe work to his satisfaction, but even then, since his own judgment alone serves him as guide and gauge, he is never sure how things will turn out.

The modern way is to employ scientific recipes or formulas instead of these guess-work methods. The study of the chemistry and nature of substances has enabled scientists to work out mathematically correct recipes, definitely

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stating time, degree of heat and composition. By employing such, the intelligent novice can procure the same results as the expert.

The economy of such methods must be apparent to any blacksmith. Even when employing old recipes the thoughtful man will try to get to the bottom of the thing and work according to common-sense principles, on a scientific basis. The results will pay for the extra thought expended.

QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

Shoeing for Shoulder Joint Lameness—I should like to have some brother smith tell me how to shoe a horse which has shoulder joint lameness. I should like to know what kind of shoe to put on to stop the lameness. PETER LEGAULT.

Horse Liniment—I would say to Mr. Thomas Robberts that the best liniment or hoof remedy is Morrison's English Liniment. I have tried several but find this to be the best. It is prepared by James W. Foster, Bath, N. H. L. C. DREW.

Blacksmith Coal—I should like to know the names of dealers in Piedmont and Rex coal. Also other kinds of blacksmith coal. Will some brother smiths discuss the different kinds of coke and coal and their individual properties? A. E. HIESTER.

Blacksmith Coal — Seeing William Foley's question with regard to blacksmith coal, would say that any coal dealer can get Cumberland White Ash coal which is bright and very free from dirt and stone. I think he will find this coal all right. I certainly do. L. C. DREW.

Drilling a Chilled Moldboard—I should like to obtain some information as to how to drill through a chilled moldboard of a plow. I have followed some of the receipts which have been already given, but they have all failed to give the desired results. I tried sulphur three times without success. Please let me know of one. G. H. BOURNER.

Interfering—With regard to the question on interfering by Jno. P. Winters, would say, use a Perkins Side Weight shoe, light pattern, with long toe calk with spur inserted in first inside nail hole, shoe fitted perfectly to the foot, outside heel calk well under, inside a little higher. This will do good in some instances. L. C. DREW.

Pacing to Trotting—In treating the horse mentioned by J. Archibald, it will depend a great deal on the driving which the horse has. I would first shoe with a heavy toe weight shoe with long toes on the front feet and light behind with long toes. If that does not work, shoe as light in front as you can (no calks), and place a fifteen or twenty-ounce side weight on behind with no calks and short toes. E. W. MATTHEWS.

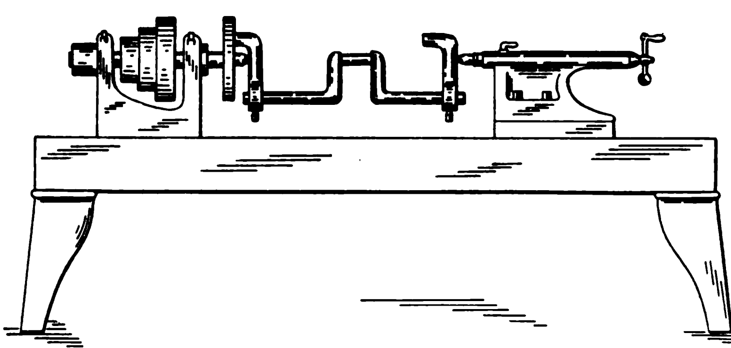
Tempering Mill Picks—In reply to J. F. Tramor, as to tempering mill picks or axes, would say that if he will take a half barrel of rain water, a half bushel of salt, a quarter pound of salt petre, and draw the temper to pigeon blue and cool in the same water, I think he will have no trouble in tempering axes, mill picks, butcher knives, and so forth. IRA A. MUNSON.

Interfering in Front Feet—I should like to hear from some of my brother smiths regarding a horse interfering in his front feet. The horse in question is one which I shoe. He strikes his front right ankle with his left foot, and I have never been able to shoe him to prevent it. His left leg bone seems to be turned. I should greatly appreciate hearing from my brothers of the craft. HENRY L. SWINDELL.

The Shrinkage of Green Wood—I am making wheels for a house moving truck out of green cottonwood. The wheels are twelve inches wide and twenty-one in diameter. I am boring 5⅝-inch holes in the center and wish to ask whether these holes will be smaller or larger after the wood is dried. I have asked every one that comes in the shop and half say one way and half the other. The man I am making them for is afraid that the boxes of five-inch gas pipe if put in the wheels will burst them, but I do not think that they will. I should like to know what others think about this. There are different opinions. JOHN TIEKING.

Tempering Steel—I should like to get a good receipt for tempering steel. I am sharpening drills for a mining company. As the rock is very hard, I am bothered with the bits splitting and breaking off. The receipt which I am now using is a solution of prussiate of potash, borax, and salt, but it is not satisfactory. I use Crescent and Canton steel. B. I. DAVIS.

Turning Small Crank Shaft—In reply to Mr. M. H. Matthiesen's inquiry

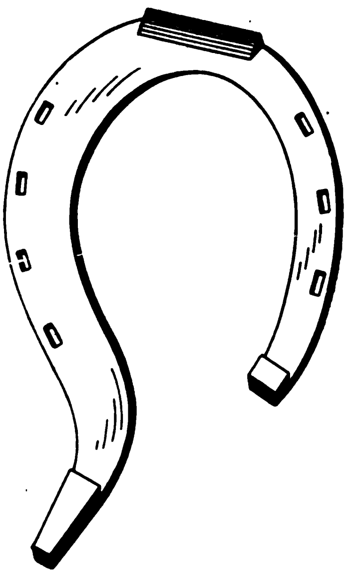


A WELL-TRIED METHOD OF TURNING SMALL CRANK SHAFTS.

how to turn a small crank shaft, would say that the sketch herewith shows how the crank is hung by placing two strong lathe dogs, one on each end of the shaft, and center, punching each one in line with the center of the crank. E. B. JONES.

Welding Toes to Wear Sharp—In answer to E. D. Hayden's question, would say that I use sickle sections, if I can get them, and make my toe calk out of Norway iron, welding them on. I then split the calk, welding in the steel with borax, as sand will not preserve the life of the steel. It will pay any one to use Norway iron for steel plug work, as it does not break off when split. When the calk is split, it should not be too thick, as the iron will not wear away to leave the steel sharp. I split the heel before I turn it, put in the steel, draw the iron over the steel, weld and turn the heel in the vise, and I have no cold shut in a thousand shoes which cannot be avoided in turning the heel first. I split two heels at a time and weld in the same way. Try this method. E. W. MATTHEWS.

Shoe for Interfering—The accompanying sketch shows a very good shoe for



A GOOD FORM OF SHOE FOR INTERFERING.

interfering. Dress the foot level and make the shoe about as heavy on the outside as it is on the inside, and let the end trail out backward to a fair length, as shown. Use a long heel calk and place the toe calk a little to the inside of the center. To me this is a very satisfactory shoe. C. H. W. RELYEA.

Interfering—In answer to John P. Winter's question on interfering in the June issue, would say the best treatment I know, if it comes from weakness, is ground feed, and then they can carry their own feet. Other horses do it when they get a little tired. Now first make the foot level and see which side of the shoe she wears off first. If she wears off either side, you must use some method to make her break over straight. Use a side weight on the left foot and see that it doesn't cross the center in front. Also use weight on the outside, as sometimes the weight is not heavy enough to throw the foot away from the other. If she breaks over in the middle, it is all right. Weld the toe on straight. If she breaks over on the inside use No. 1 shoe, or if on the outside put the toe on the other way like No. 2 shoe. L. E. MORRIS.

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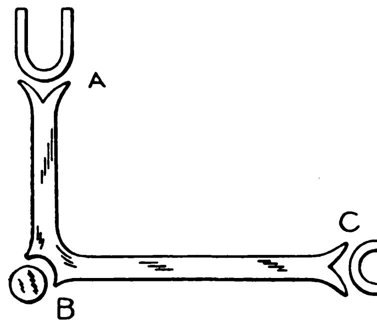
Diseased Feet—I have ten mules in a bunch that I am shoeing, having diseased feet. The foot becomes decayed on the inside of the wall about one-half around the foot from one quarter around the toe to the other quarter. I can run a thin piece of iron around under the wall of the foot almost up to the hair. When the disease first starts the decayed part that I take out resembles dry putty. Will some one tell me what is the matter with them and how to treat them? O. C. DOWNING.

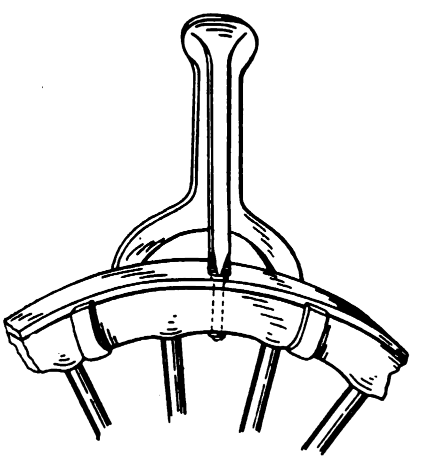
Engine Repair Work—I enclose a drawing, showing a piece of work which I did some time ago of wrought iron to replace a broken casting for a reversible engine. Take a piece of ⅜ by 1½-inch iron and bend it edgeways in the elbow, cut it a little with a chisel while hot, and fuller it out. Next cut a piece of iron 1½ inches in diameter and three inches long, and weld in at B. Now



METHOD OF REPLACING CASTING FOR ENGINE REPAIR.

split each end at the right length. Take a piece of 1½ by ½, bend it in the center and weld it in, which will make a strong fork. To make a split fork, after it is forged out, I drill the holes in their proper places, as in the old casting. The places to be welded are at A, B, C. W. D. BOETTLER.

Tire Bolt Holder—I was much interested in A. D. McShane's tire bolt holder described in the June issue. I have one similar, which however, is made out of a top brace. I took a brace and welded a piece of 1-inch by 5/16-inch soft steel on the end, split and opened it up, then bent it so that it would fit over the felloe. I next welded a piece of tool steel on the other end, drew it down smaller than the head of a 5/16-inch bolt, cross filed it to four sharp points and


ANOTHER INGENIOUS TIRE BOLT HOLDER.

tempered it. I have a tire bolt holder which I think can not be beaten. I can spring it onto the felloe and it's always there when I want it. A. M. BURT.

Weak Feet—In answer to B. W. [illegible], would say that when a horse is in any way weak in the foot, you must find out the weak part and relieve the strain on that part. A rubber shoe or else a shoe with heels and toes on is all right, as you must use a shoe that does not have so much surface. These racing plates or toe weights jar the feet too much, as they come down too flat on hard roads. Or to make it still easier on the feet, sharpen the heels and calks. You can use almost any kind of a shoe if you put heels and toe calks on. Scientific Horse, Mule and Ox Shoeing, as advertised by THE AMERICAN BLACKSMITH will tell you all about it. L. E. MORRIS.

Interfering—In answer to Mr. John P. Winter's question in the June number, would say that it is hard to treat a horse, not knowing the conformation. I always build up the inside. If it takes six months to get the foot extremely high, use a common shoe with the toes set to the inside web, and do not fit any closer or shorter than the outside. When I take the wing off the inside, I get off just as much from the outside, especially at the outside toe. I build up the inside with sole leather to get them extra high. With chronic hitters, I make an extra heavy side weight bevel of the outside from center of toe to the heel and put a side calk on the inside web where they hit, and the heavy web on the outside. I am of the opinion that this mare has a small foot with which she hits, which is often the case with a one-foot hitter. E. W. MATTHEWS.

Ornamental Iron Work and Power in the Shop—I should like to ask some brother to tell me of a good book of designs for scroll and other bent ornamental iron work. I have made several pieces of this kind of work, such as flower stands, hat trees, etc., and find the work very interesting. I should especially like a design for andirons.

I wish to say a word for the Lambert Gasoline Engine made by the Lambert Gas & Gasoline Engine Company, Anderson, Ind. The engine is a three-horsepower one and I have had it for three years without paying one cent for repairs. I am also using the same battery that came with the engine. With it I run a band saw, two emery wheels, a hack saw and drilling machine.

I have taken THE AMERICAN BLACKSMITH since the first issue and have every copy to date, and they are not for sale at any price. M. F. LENFEST.

A Letter of Unusual Interest—Please find $1.00 enclosed for which please send me THE AMERICAN BLACKSMITH for another year, as I like your paper and think it is a great help to the craft. The effort which you are making to protect the blacksmiths and secure better prices receives my hearty co-operation, and if we would all put our shoulder to the wheel and help, we could accomplish a great deal. I wish we could get a bill passed, prohibiting any one from running a shop without a license.

With regard to power, I would say that I think Mr. Scofield is wise in putting in steam power, as I think it is less expensive and less trouble than gasoline. The reason why I say this is because I have tried both. At present I have a two-horsepower Fairbanks Morse Gasoline Engine, which is about the best engine made and is all right, but by the time you take keeping them up and consider the leakage and evaporation of oil, I consider steam the cheapest. Water power is the best, however. I have water power, but our stream has been up so much this spring, that I put in a gasoline engine.

Will some brother smith please tell me what power hammer is the best for general work? I want to put one in and would like to get the best.

With regard to removing spokes from a hub, the easiest way I have ever found is to bore a hole [illegible] the center of the broken spoke, and drive a chisel under each half and then with two chisels one above and the other below, work them out very easily. Will some one please tell me about the Concord hub. Is it better than the old-fashioned hub?

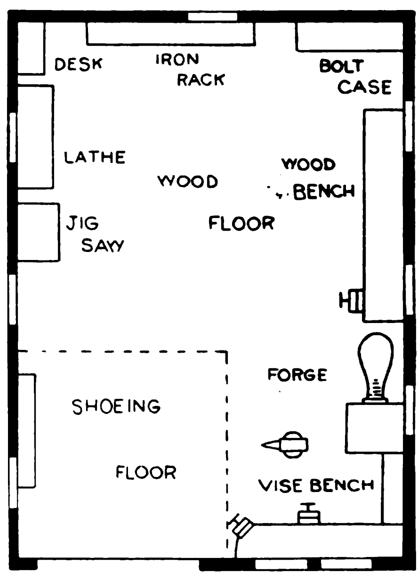
I will give some of our prices:

Horseshoeing, with steel	$1.00
" plain	.80
Plow pointing	.35
Plow sharpening	.10 to .20
New tires	3.00
Old buggy tires	3.00
New buggy tires	4.00
Stubs, each	1.00
Filling wheels	3.00 and 3.50

I hear a great deal about stub welding. That is about as easy a job as I have. Scarf down and take the cleaver and cut a place or two in each piece, and with my welding compound, I never have any trouble. Instead of striking straight down I tilt my hammer handle and strike, and by this means keep it from slipping. I will give my welding composition:

Equal parts, English rosin, copperas, and red oxide of iron, pulverized and mixed with plenty of sand and salt. W. W. HERRING.

An Interesting Letter—I am living in a small town of about three hundred inhabitants with farming country surrounding. There are three other shops here and competition is sharp. I purchased the shop about two and a half years ago and do general blacksmithing, horseshoeing and wagon work. The following is a partial list of my prices. Some of the other smiths have lower ones.



VERY CONVENIENT ARRANGEMENT OF SHOP INTERIOR.

4 calked shoes	$1.00
Sharpening (4 shoes)	1.50
Resetting, each	.10
Toeing and setting, per set	.60
Setting tires	$ .30 to .50
New buggy tires ⅞-inch	4.00
New buggy tires, one inch	4.50
Spring wagon tires	4.50 to 6.00
Heavy wagon tires	8.00
New rims, per set	3.75 to 6.50

We have a co-operative butter factory here, also a milk shipping station which gives me a good business rebuilding milk wagons. I enclose sketch of the arrangement of my shop, which I think very handy. I have received many valuable hints from THE AMERICAN BLACKSMITH. I intend to build a foot power hammer, as described by L. VanDorin in the August, 1902, number. Every paper is worth a dollar to me or any other intelligent blacksmith. E. S. POTTER.

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THE AMERICAN BLACKSMITH

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Steam Versus Gas as Power.

A great many comments have appeared in these columns from time to time referring to the relative advantages of steam engines and gas engines as power units for the blacksmith. This is a very interesting topic, and one which vitally concerns all craftsmen who are thinking of putting any form of power into their shops for improving their conditions. We should like to hear from any of our readers who have had experience of either side of the question, or better still, from any who may have used both kinds of power.

In the Interests of Subscribers.

When a paper claims to be published for a particular class of readers, it should, of course, have the interests of those readers at heart, and should furnish them with such information and reading matter as they desire and pay for. Too many trade journals make the advertiser instead of the subscriber their primary consideration. This is often shown by palming off as something new and interesting descriptions of machines which have been on the market for ten years, thus catering to the advertiser in place of the subscriber.

The publishers of THE AMERICAN BLACKSMITH desire to put out a paper in *the interests* of blacksmiths and wagon makers of all classes, a paper which they can value for its high standard of printing and reading excellence. Suggestions for improvements are always highly appreciated. How can THE AMERICAN BLACKSMITH be bettered and made of greater value to you?

A Realistic Poem by One of Our Folk.

The poem on page 230 of this issue was sent in to us by a subscriber who has seen service in many different branches of blacksmithing work. We publish it because it is so true to the conditions existing in many places. How often we hear of blacksmiths selling out and quitting the business because of poor prices or slow pay. There would be fewer skilled workmen giving up the business if they were able to collect their pay for all the work they did. The farmer mentioned in the poem is a familiar customer to every village blacksmith.

And yet there may have been other reasons influencing the smith in the poem to give up the trade in despair. In the first place, no smith can expect to achieve any great measure of success in his daily work if he is so ignorant of his letters that he cannot spell common words of one syllable correctly. In these days of our splendid public school systems, no smith, especially of the younger generation, has any excuses for such gross illiteracy. Success at smithing demands that the man be able to read and keep up to date as well as to command and hold a position of respect in his community. Fortunately, however, such smiths as he of our poem, are rare, and growing scarcer each day.

Another point is that this smith was perhaps too easily discouraged. The man who is ready to give up at the first obstacle, never wins success in any station of life. Perseverance and persistence are two of the finest words in the English language. Blacksmithing is one of the oldest and best of callings; it is today affording thousands and thousands of craftsmen a good honest living and more. It is with sincere regret that we hear of many cases where smiths have "quit the business." This is not the fault of the trade, but more often lies with the man himself. Many unfavorable conditions can often be corrected. The trouble with slow payers and bad debtors can be largely avoided by care and tact on the part of the craftsman, combined with discretion as to whom he trusts and for how much. It is far better to do less work and get paid for it all, than to do much and lose a considerable proportion of the pay. A good workman with a good head need never despair of blacksmithing bringing its proper returns. In the duel between the Shannon and Chesapeake, Lawrence said, "Don't give up the ship." In life's struggle the smith's motto might well be, "Don't give up the craft."

The Man Who Gets Rich.

Nine out of ten of the workmen of today are so busy with schemes to "make dollars out of wind," that they have no time to look after their trade. Their craft is merely a drudgery and a convenience whereby they may live from day to day until they strike a lucky "invention," patent it and become millionaires.

The man who is a blacksmith today, tomorrow, maybe, behind a grocery counter and next week working on a farm, can never hope to make a success of anything. Flitting from task to task, he grumbles that he never gets a chance, that Fate is against him and that there is no justice in the world.

What the world wants is earnest, expert workers, men who toil patiently for the love of the thing they are doing and for the sake of accomplishing something worthy. For such there is always a place and a good living. There is a dignity in first-class work that raises the worker to the rank of experts, however humble his calling, but the botch-worker is the tramp of any trade.

The men who have made millions have

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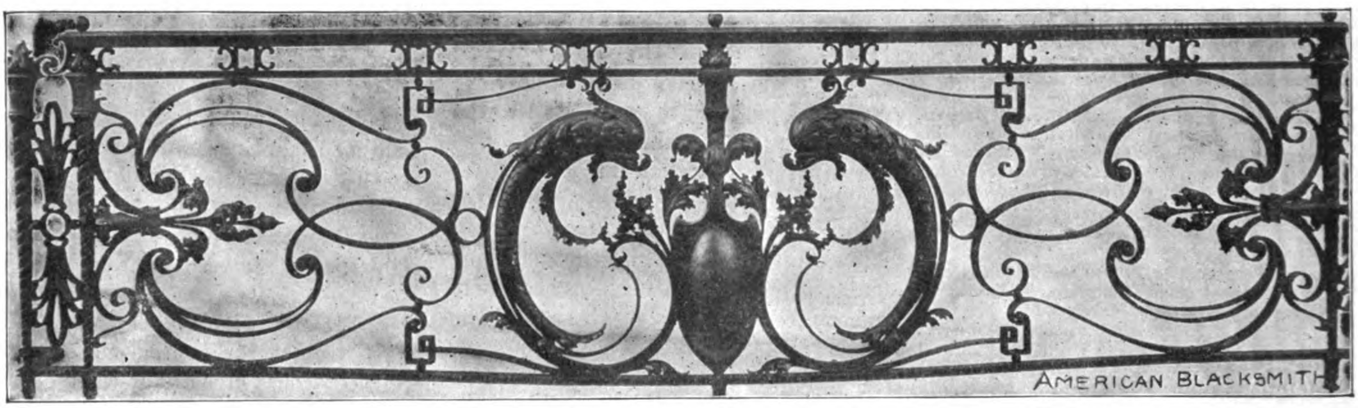
been men who had brains and used them in working out their own original ideas in the every-day affairs of life. Perhaps the millions came at a stroke. The world calls it a "windfall," taking no account of the earnest, concentrated effort that made the stroke a master-stroke and a final one. The money-making genius is invariably the man who is capable of first-class things.

Dragons in Ornamental Pieces.

Exceptionally fine is the design in wrought iron reproduced herewith. The scroll appears in combination with geometrical forms and foliage effects, but the motif of the design lies in the grotesque dragon-like monsters supporting the central shield. These dragons may be adapted to so many designs in iron work, and give such good results in this sombre metal that it is worth the while of the amateur designer to do some studying in this line.

The first engraving is of a cast iron railing on a balcony at residence No. 15, East 38th Street, New York City, of which Cyrus L. W. Eidlitz is the architect. The second shows the design in detail. This piece is the work of Richey, Browne & Donald, Architectural Iron Workers, Long Island City, N. Y.



PART OF A RICHEY, BROWNE AND DONALD BALUSTRADE, COMPRISING AN EFFECTIVE DRAGON DESIGN IN WROUGHT IRON.

Kinks and Conveniences in the Wagon-Shop.—5.

BY D. W. M.

A tire bending machine and an upsetting machine are tools that are absolutely necessary to a tire fire. These are frequently combined in one machine, but we prefer to have them separate as being more effective. But where shop room is limited, economy of space is necessary. Where power is employed a machine that will bend four tires at once is preferable to any other. The rollers should be arranged to grip the tire on entering and let the further roller do the bending. This will obviate kinks, unavoidable by all tire benders in which the top roller does the bending, and particularly if the tire is drilled or punched before bending.

A wheel plate, or "template," or "trueing plate" is something not found in every shop, but a very useful tool. It is large enough to lay any wheel on. The center of the plate is open, and under it is a basin for water. The plate may rest on a raised platform convenient for the workmen to put the left foot or hand on the wheel and hammer the tire with the hammer in the right hand, so as to get the tire snug all around against the rim. The plate being perfectly true will show whether the wheel is twisted or not. When the tire is in place it is turned up on edge and the tire cooled in the central basin. Where there is no such trueing plate, the wheel is laid on trestles when putting tire on and the tire is cooled in the usual water tub, or sometimes an oblong rectangular basin is made in the floor for that purpose.

We will not speak of the other forges, if any, because their equipment will vary with the work required.

The boxing machine is commonly found in the wood shop, because usually operated by a wood worker. But it is a great convenience to have it in the smith shop near the tire fire. But this means the use of such a wheel boxer as will avoid the use of a wood worker's tools, and has a bit capable of cutting out a hub to fit any box. Such machines are made and can be operated either by hand or power, moreover the box will drive in true and require no wedging with such a machine. There are cases, however, where the wheel must go to the wood workers.

The connection between the smith and wood shops is so close and the passing of work back and forth between them so frequent that wherever practicable, the woodshop should adjoin the smith shop and be connected by a door-way large enough to permit of the passage of a vehicle. In small shops the wood shop and smith shop often occupy the same room, one at either end of the room if large enough. But it is an advantage to have the wood shop capable of separation by a partition and sliding door. In a repair shop convenience in getting at a vehicle without moving it is a matter to be studied. At the same time if it must be moved, as often happens to the wood shop or other department, it must be done with as little trouble and disarrangement of the shop as possible. The plan of the shop and the method of entering each department from the central receiving room, elevator or runway has important bearings. A shop should have conveniences for receiving and shipping new work as well as for looking after repair work, so that a repair job when finished will have a place to stand and harden, and be kept clean and sightly. In the case of an old job taken for a new one, and which must be rebuilt and then sold, a decent wareroom is necessary.

Adjacent to this wareroom should be a wash platform on which a vehicle from any department may be run and cleansed. Otherwise the painter is called from his work with a bucket of water and sponge to wash a carriage. Even if the painter should be the only man in the shop who knows how to wash a carriage properly, there should be a platform with water trough, hydrant or pump, and drain.

How to Start a Gas Engine.

BILLY BUNTZ.

To the uninitiated, the starting of a gas engine is quite a trick, while not a few who have engines are sometimes troubled by the engine "balking" like an unruly horse. Should this occur while the smith has company or is endeavoring to show a patron or

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prospective customer the merits of a gas engine, it naturally gives a wrong impression to the visitor, who may remark, "I don't want one of those things around me!"

The starting of a gas engine is a very simple matter when it is done the right way, while to try to start one without first having read the instructions or without any previous experience with engines of this class, not infrequently causes the smith to say words derogatory to the builder of "so infernal a machine." In fact, instead of using adjectives of meritorious praise he may become so agitated as to employ those of strong denunciation. Should he be agent for the engine, as well as operator of it, the effect on customers or future trade can readily be imagined. "Condemned by the agent," they will say, which has the same effect as giving a dog a bad name, and necessitates an endless amount of persuasion on the part of those who understand the operation of gas engines to assure a customer that the engine in question is as good as any, were it handled properly.

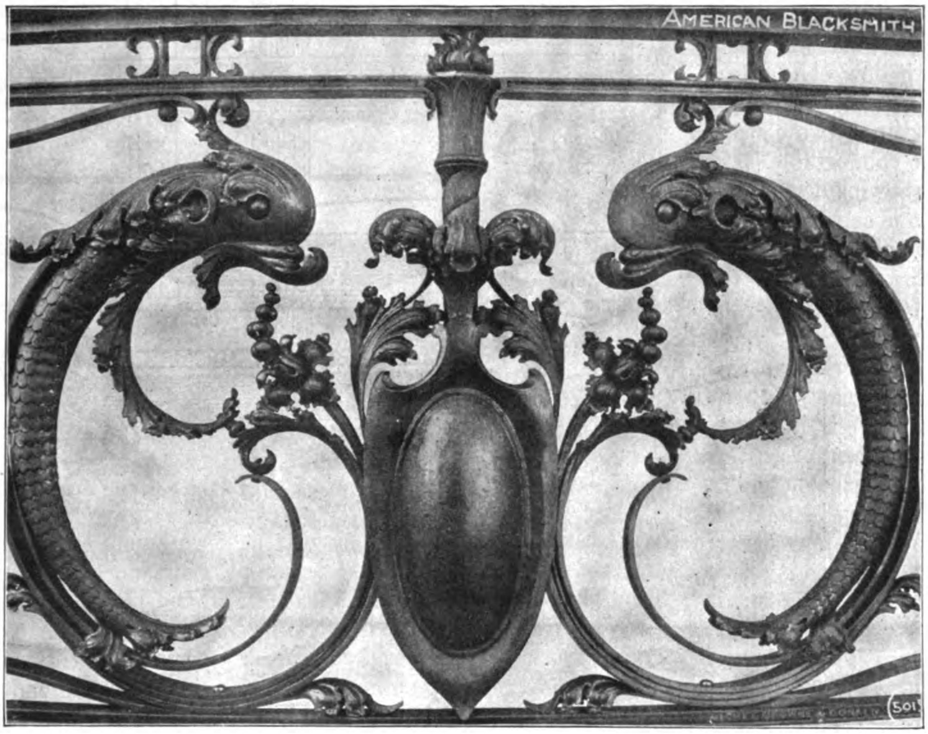

Fig. 2. DETAIL OF DESIGN IN WROUGHT IRON.

"Simply give the balance wheel a turn," is a common direction, and really that's all that's necessary, yet the builder assumes that the operator will take at least sufficient interest in his engine to look into the fundamental principles which cause the wheel to turn and transmit power, as it is only by understanding these that the smith can handle his engine easily should it "balk"; otherwise he may have unnecessary trouble and create an endless amount of hard-feeling should he be denunciatory. In this connection, the experience of one Dorkins is cited:

"I got an engine to run my shop," he explained, "and tried to start it in every way I could think of, although it appeared to be so simple, I didn't read the instructions, as I knew instinctively that it was simply a matter of turning the balance wheel. That's about all I did know, however, and after turning until I was nearly exhausted, I was mad, and wrote for the agent.

" 'What seems to be your trouble?' says he, without even giving the engine a look.

"I told him; then he took my ten year old boy over to the engine, and said:

" 'Turn on the gasoline, Johnny,' pointing to the valve—at the same time asking me how trade was and saying he thought I had a nice line of tools for catching custom; while I thought he ought to worry a little about getting the engine started. But he didn't.

" 'See any gasoline in there?" he asked.

" 'Don't 'pear to be any,' said Johnny, who had the throttle wide open.

" 'Have to take off the feed pipe,' he continued, 'and run this wire through it,' and Johnny poked out a straw an inch long, and the gasoline just spurted.

" 'You must strain your gasoline,' he warned me, then said to Johnny: 'Give the balance wheel a turn'—and do you know, that engine started as easily as a boy rolling off a log. I felt mighty ashamed, while the agent simply said I should read the instructions and 'use my head,' remarking as he left, 'That kid of yours is a bright boy.' "

For use in starting the balance wheels many small gas engines have cranks similar to those on grindstones, although it may be removed when the engine has been started. On an engine of medium size, the balance wheel is sufficiently large to allow the operator to grasp the spokes. To start an engine with a fair-size balance wheel, turn the wheel ahead or to the right until the connecting rod is at the end of its stroke, likewise the piston; then quickly reverse the wheel, *i. e.*, turn it back to the left—thus compressing the gas which had been drawn into the cylinder by the outward stroke of the piston, and when the crank is at or near the inner dead center, trip the igniter by hand, thus igniting the compressed gas and forcing the piston forward on its power stroke. A self-starter is used on engines of considerable power—say 15 or 20 horse. It is simply a little pump attached to the cylinder and operated like a bicycle pump, having volume sufficient for supplying the cylinder with a charge which, when ignited, will force the piston forward.

Little trouble is ever experienced in starting a gas engine where the operator has sufficient judgment to "look beyond the balance wheel," as there's where the trouble is sure to be—usually some trivial thing, such as the feed pipe being clogged.

Talks to the Jobbing Shop Painter.—6.

M. C. HILLICK.

Movable Body Rack and Seat Rack.—Shop Truck.—Rubbing Deck.—Gear Suspending Device.

By permission of Ware Bros. Company, publishers of the esteemed *Carriage Monthly*, the writer is able to show two interesting and almost indispensable labor-saving devices for the carriage paint shop, namely, movable seat rack (See Fig. 13) and movable body rack as shown in Fig. 14.

In the shop where much moving of work is necessary, these utensils cannot well be omitted from the list of shop tools. The illustrations tell their own story and explain concisely how the

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devices are constructed. No well-regulated paint shop is quite complete without a truck for conveying carriage bodies, and, if necessary, running parts, from one part of the shop to another. Such a truck may be converted to a variety of uses, and, to enable our readers to form an opinion along the line of constructing such a truck, attention is called to the one herewith shown (Fig. 13). Much has been said and written in connection with paint shop conveniences relative to rubbing decks. Not a few illustrations have shown the rubbing deck made with the canal and drainage existing in the centre of the deck, the slant beginning at both sides and converging to the centre. With this style deck it is practically necessary for the workman to labor more or less in the hollow of the deck where water is quite sure to accumulate. He is forced to work upon two distinct grades, which is not comfortable. In Fig. 16, herewith, is shown a deck of one grade with the drainage canal at the extreme outer edge of the deck, and the drainage pipe running back under the deck and thence leading out of the building. This, on the whole, is the most convenient deck to work upon, and insures a good clean drainage with no water accumulating where it is necessary to work. While a cement or asphalt deck is best, a good, serviceable one fit to wear for a long time may be made of hard wood. Proportion length and width to size of shop. Locate it where plenty of good light is to be had, equip it

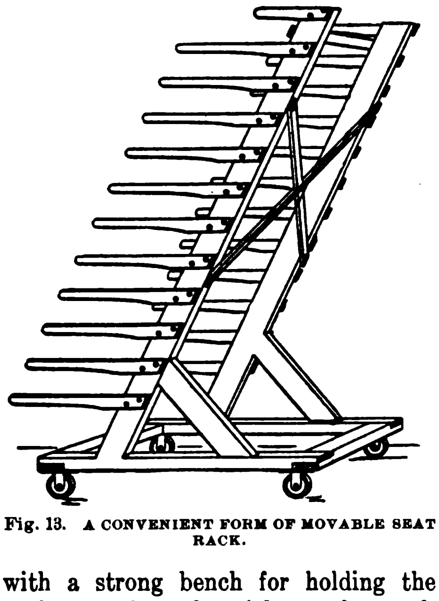

Fig. 13. A CONVENIENT FORM OF MOVABLE SEAT RACK.

with a strong bench for holding the various tools and articles to be used, and provide a couple of barrels cut and devised as shown in a former paper of this series.

Another device for utilizing space in a small paint shop where, at certain seasons of the year, room is at a premium, is the double floor or platform. The construction of such a platform depends, of course, upon the height of the ceiling, but where the ceiling is of fairly good height and there is plenty of light in the apartment, the platform will be found

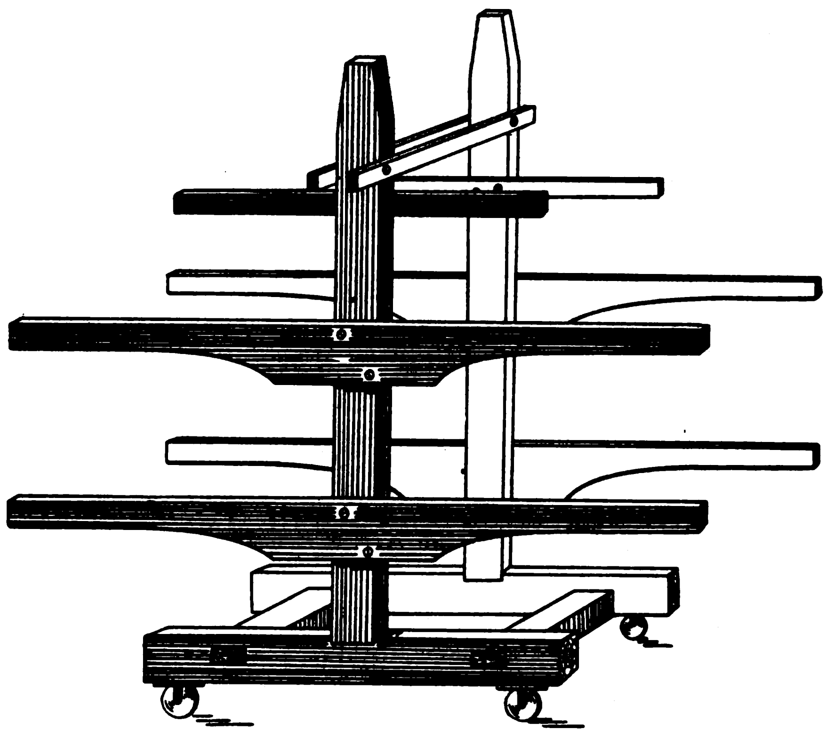

Fig. 14. A MOVABLE BODY RACK FOR THE PAINT SHOP.

invaluable. Construct the staging or platform so that the workman can walk upright and work handily underneath it. If any contraction of space is necessary, arrange to have it between the platform and the room ceiling. On such a platform or double floor, wheels and shafts may be stored, and during the busy season sanding and leading of wheels, etc., may be carried on.

The writer for some time worked in a Central New York carriage factory, where a platform of this kind was used, and a great mass of wheels were painted and stored thereon, and the quarters were not at all bad for temporary working purposes. A good many crowded country paint shops could be made more easy to work in, and have their capacity for getting out work considerably increased by the installation of a second floor in the paint room.

Another device for economizing space in the shop, and more especially in the varnish room, is the axle loop shown in Fig. 17, by the use of which one carriage gear may be suspended below another until the space from floor to ceiling is filled. In the ceiling joists insert screw eyes of large size and fasten them by simply screwing them into the wood or by running them through the timbers and attaching washer and nut. Then into each of four screw eyes placed at proper spaces to suit the regulation size of gear, hook on the axle loop, and when the gear is freshly varnished let two workmen, one standing on each side of gear and grasping an axle arm in each hand, lift the gear up and swing axle arms into the loops. These loops should be provided of various lengths in order that side springs or end springs or other style of gear may be suspended with equal facility. By the use of this device the gears may be compactly stored as fast as they are varnished, and so placed that they are exposed to the minimum quantity of dust and foreign matter circulating in the room. The importance of this advantage will be readily understood by all carriage painters and finishers.

Steel and How to Treat It.—4.

JOSEPH V. WOODWORTH.

Gas Blast Heating Machines and Furnaces.

The great development which gas blast heating machines and furnaces have had during the past few years has been such as to make them adaptable for a variety of uses well-nigh innumerable; so that such machines have almost completely superseded the old methods and furnaces in the majority of establishments—large and small—where a supply of gas can be had at rates which make

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its use for heating allowable. In all processes of steel treatment gas furnaces are now being used in securing the highest possible efficiency, as the steel or articles treated in them can be subjected to the proper degree of heat uniformly.

To-day, gas blast furnaces and heating machines are being constructed for the economical use of gas as fuel in forges, hardening and tempering machines, crucible furnaces, annealing, enamelling and case-hardening ovens, and drying and baking kilns, the heat being generated by injecting under positive pressure a properly proportioned mixture of air and gas, through burners especially adapted to each of the different kinds of gas in common use.

To the steel worker, the one advantage to be gained by the use of gas as a fuel for steel treatment, is derived from the fact that perfect adjustment of temperatures may be obtained to suit any special requirement which may arise in either heating for forging, annealing, hardening, tempering, or case hardening. This is impossible with either liquid or solid fuel. Another and by far the greatest advantage to be gained by the use of gas is the ease with which any desired degree of heat can be obtained by the simple adjustment of two valves—the air and the gas valves. The uniformity of the distribution of the heat within given space, the partial or complete absence of oxidation, and generally the perfect uniform conditions under which any heating process necessary in steel treatment may be performed, are other advantages which the steel worker may derive from the use of gas as fuel in a furnace that has been practically designed and properly constructed.

Among the arguments used by those who are somewhat biased in favor of the

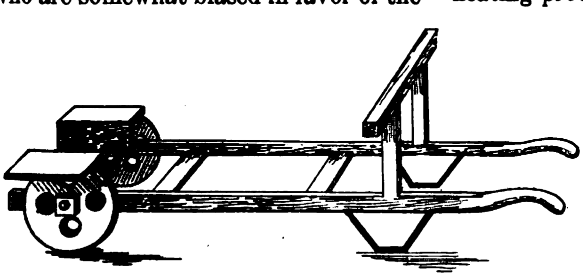

Fig. 15. USEFUL FORM OF SHOP TRUCK.

old methods, that of "cost of gas as compared with other fuel," is the favorite. Now, while this may be an important factor in determining the adoption of gas blast furnaces for the cruder processes of melting or rough forging, it deserves absolutely no consideration from the steel worker with reference to furnaces for hardening, tempering, annealing, or case hardening large quantities of work, or small quantities of accurately finished parts. The reason for this latter contention is that no approximately equal amount of *perfect* work can be obtained by the use of any other fuel than gas.

As an illustration of the difference in the work heated in gas furnaces and that heated with other fuel, we will say that a number of accurately finished cutting tools are to be hardened. Half of the lot we heat in a coke, soft coal or charcoal fire, taking the utmost care to bring each and every one to the same uniform heat. Then we quench the tools and temper them. Upon using the tools for cutting we find that some stand up well while others do not, but instead, crumble away. This state of affairs comes about through the uneven heating of the steel in the open fire; the

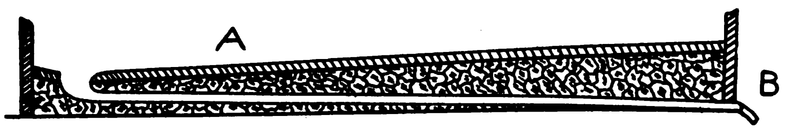

Fig. 16. A—FLOOR RUBBING DECK. B—DRAINAGE PIPE.

process tending to prevent the toughening of the grain of the steel while still allowing of its being hardened sufficiently when quenched. On the contrary take the other half of the lot and heat them to the proper degree in a gas furnace in which they *will* be heated evenly and uniformly. Then quench them in the bath and draw the temper. With these tools it will be found that they will be very hard and that the edges will hold a long time, because for the given degree of hardness resulting from quenching the same degree of toughness has been imparted to the steel during the heating process, resulting from an even degree of heat imparted uniformly in a chamber from which the products of combustion have been excluded.

With regard to gas blast furnaces for forging it may be stated that they will heat the work quickly, uniformly, and with little or no scale, and that, besides being always ready for use, they develop the required degree of heat in a few minutes. Gas forges are now in use in the majority of machine shops for tool dressing and forging, and in other establishments and shops in the production of large varieties and quantities of small forgings, such as cutlery; while for drop forgings they are used almost universally. The great advantage of the use of gas forges for forging lies in overcoming the tendency to overheat the metal; a non-

Fig. 17. AXLE LOOP FOR USE IN SMALL PAINT SHOP.

oxidizing atmosphere reducing the scale to the minimum; thus supplying properly heated stock as fast as it can be handled.

While offering decided advantages, no single gas forge will replace the ordinary coal forge in everything, because to be thoroughly effective, as well as economical in gas consumption, the gas forge must be made for a definite range of work, and its heating area limited so as to conform to the size and shape of the work, allowing, of course, for a fair amount of clearance space.

For general shop work a combination gas furnace is the best, as it combines on one base the three most useful furnaces for general shop and tool work—muffle, forge and crucible. The muffle can be heated to a good hardening heat in from ten to twelve minutes, when it can be kept at the desired temperature indefinitely. In the forge a piece of 1-inch round steel can be heated to forging heat in about three minutes, starting with the furnace cold; while for lead hardening the crucible full of lead can be heated to a cherry red in about one-half hour.

A furnace of the type above described may be purchased for about $125. It will occupy very little room; will not require to be connected to chimney; can be placed anywhere most convenient; is always ready for use; and will cover such a wide range of work as to make it practically indispensable when once used. All sorts of hardening and tool-dressing as well as small forging can be accomplished by the use of the forge section, while in the muffle accurately made small tools, such as dies, cutters, reamers, punches, taps, drills, springs, cutlery, etc., can be heated under the best possible conditions without the possibility of scaling.

In concluding this chapter I wish to impress upon the steel worker, or

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manufacturer whose product involves the heating of metals, the necessity of having modern apparatus for systematically applying heat; the quality of the mechanic's work and the product of the manufacturer's plant depends quite as much on this as on any one other condition. Hence to get good results, use good steel and heat it properly, and the satisfactory hardening, annealing or forging of it will be assured.

The steel worker who expects good results without using the best materials and modern apparatus is invariably doomed to disappointment.

(To be continued.)

Blacksmithing at the Carlisle Indian School.

The Carlisle Indian School was established in 1879 by Captain (now Colonel) R. H. Pratt for the purpose of providing such training for the Indian youth of the United States as would enable him to meet the demands of civilized life. Colonel Pratt wisely foresaw that the Indian's extinction could be averted only by his learning to do something that civilized people wanted done, the profits from which would yield him a proper livelihood. Consequently, Carlisle was made and has ever since been maintained as an industrial school. Blacksmithing takes a high rank among the trades taught at the institution because it is attractive to the boys and places them in a position of independence, since the course of instruction undertakes to prepare them to conduct a general blacksmithing and horseshoeing business.

During the first year, instruction is given in the construction of forges, names and uses of tools together with their care, fuel and fire building, the simpler exercises in forging, etc. In the second year, welding, bending, twisting, tempering, annealing, etc., are considered, with the action and uses of the various fluxes and the use of the drill press. The third and last year is devoted to advanced work in welding, tempering, brazing, polishing, etc. Careful attention is paid to horse and mule shoeing, including a study of the anatomy of the foot and the treatment of faulty feet.

Care is taken to leave out all frills and confine the boy's attention to the essentials of the trade. The instructor is expected to give frequent talks on such subjects as the distribution of iron ore and its conversion into the iron and steel that comes into the shop; the blacksmith's fuel; names, uses and care of tools; anatomy and treatment of the horse's foot; the blacksmith's place in the business world; and other topics pertaining to the trade.

The first engraving shows a portion of the shop where several young Indians are at work upon wagon-bodies and parts. The second shows a further view of the wagon shop and horseshoeing department.

CARLISLE BOYS AT WORK IN THE BODY DEPARTMENT OF THE WAGON SHOP.

The wisdom of providing for instruction in blacksmithing is completely proved by the gratifying number of young men from the school who are now filling responsible places in this important industry. The blacksmith is a substantial member of society, and the Indian makes a substantial blacksmith.

The name Carlisle is interwoven with history, first of Colonial days, secondly of the Revolutionary War, and lastly of the Civil War. Benjamin Franklin made a treaty with the Indians at this place in 1753, about two years after it had been separated from Penn's vast acres and called Carlisle. The Hessians captured at Trenton during the Revolution were held as prisoners here. At the south entrance to the grounds still remains an

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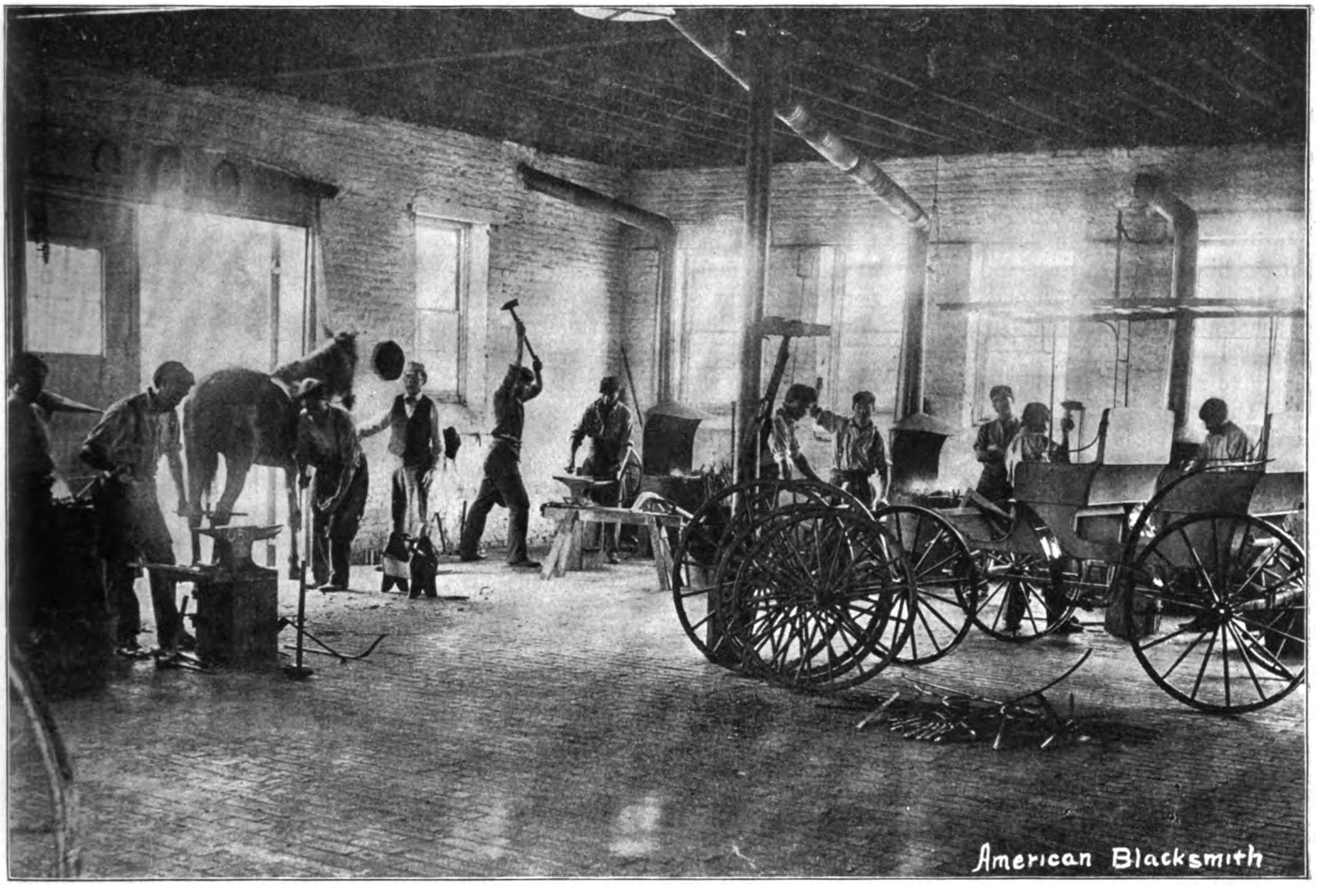
evidence of their labor in a stone building erected by them. Again, in July, 1863, when the Southern army made its great venture north of the Mason and Dixon line, which culminated in defeat at Gettysburg, Fitzhugh Lee stopped to shell Carlisle, and burned the buildings at the post. These, however, were rebuilt in 1865. For years, the place had been used for a school to train cavalry to fight Indians—a peculiar fact since the children of these Indians were afterwards brought here to learn the arts of peace.

The first Indians arrived at the school at midnight, October, 1879, a party of eighty-two untaught Sioux boys and girls from the Rosebud and Pine Ridge agencies of Dakota. They were in native dress, with blanket, long hair and painted faces, and adorned with beads and other ornaments.

Indians from more than seventy different tribes have been brought together at Carlisle, where they are taught to consider themselves, not as rival tribesmen but as American citizens. The first principle of the school is to enable the Indian youth to live useful, happy lives after the ways of civilization.

The blacksmithing craft is peculiarly adapted for instilling into the young Indian the lessons of thriftiness and diligence. And these are the qualities most necessary to be cultivated in the race.



SOME OF THE WORK GOING ON IN THE BLACKSMITH SHOP AT CARLISLE.

Notes on the Care of Unshod Feet.

W. B. ALLEN.

In my experience, I have found that it is a very good idea for the horseshoer to be well posted upon every possible detail connected with the care of horses. Not only does it put him in the way of earning an occasional extra dollar, but his knowledge and sound advice about things "horsey," will attract the custom of a great many horse owners. I do not mean to advocate that a horseshoer should try to take the place of a veterinarian, but he will find that no accurate knowledge about the horse, his parts and care, will ever go amiss.

The care of unshod feet is a matter of considerable importance. The shoer of course sees frequent examples of harm resulting from lack of attention to shod feet, when the shoe is allowed to remain on the foot too long. Great injury often comes from want of attention to unshod feet. In his natural state, with entire freedom of large pasture land areas, the horse needs little care, for growth of horn is balanced by natural wear. When he is restricted in his movement by being confined in stable or small enclosures, excessive growth of horn will result in injury if not properly attended to. Undue growth of horn in this way soon throws the foot out of proportion, alters the bearing, brings strains upon parts which should not take them, and the joints and tendons are soon affected. Overgrowth of horn not only harms the foot but the leg also. Further than this, the excessive growth at the heels, if not removed, will prevent the horn from coming into contact with the ground and exercising its proper function. Contraction may follow. Of course the horn may grow excessively long in front, behind, or on either side of the foot, but in any case an unnatural and harmful condition is set up which should not exist and which should of course always be prevented.

Young horses, whose parts are still plastic and growing, are more apt to be injuriously affected than horses whose growth is complete and conformation fixed. Many a horse has been permanently injured by lack of attention to his feet while young, and it is a sure way of lowering his value when grown, to allow him as a colt to run in pasture without inspection of his feet.

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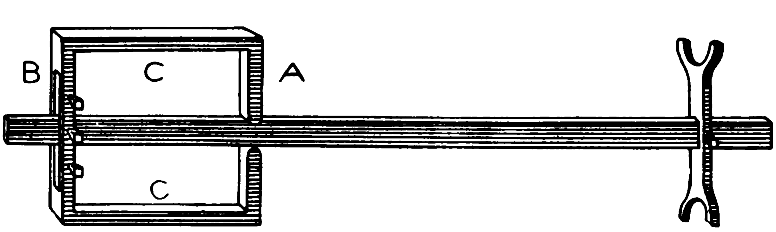
Hence it will be agreed, that when the natural wear of horn is not sufficient to preserve normal conditions, regular attention to the feet is necessary to preserve healthy feet and a good conformation. Especially is this true of young growing horses or those confined. Cutting or paring of frog and sole is not necessary unless the growth has been allowed to become abnormal. A frequent and judicious use of the rasp is all that is necessary. In this way are natural conditions most nearly approached, and the horn preserved at a proper height on all sides of the hoof.

Timely Talks on Carriage Repair Work.

A. J. YEAGER.

The prosperity of our country has created a demand for carriages and buggies beyond the comprehension of man. They are produced in such large quantities in all parts of our country, that the business of carriage and buggy repairing has become a vast one. Having spent a quarter of a century at that business I thought I might be of some benefit to the many readers of your paper and more so to the younger men starting in the business, if I should give them a few pointers as to how to repair some of the more difficult parts when such are needed.

I shall first explain how to set an axle so that it will run right, hold the oil and wear well. Now in order that the axle may do this, it must have the proper gather and pitch, and to get this result a mechanic must know how to go about his work. An axle properly set means more than some smiths think. First set your axle so that your wheels will set $\frac{1}{4}$ inch under plumb spoke when the vehicle is not loaded and wheels have from $\frac{3}{8}$ to $\frac{1}{2}$ inch dish sitting on a level floor. Now give the axle enough gather so that your wheels are $\frac{1}{4}$ inch closer together at the front than at the back side, measuring at height of axle. This will cause the wheel to run towards the collar of the axle, and should you take the axle nut off, the wheels would run on a straight road for miles and not come off the vehicle.



AN EXCELLENT HOME-MADE AXLE-SETTING TOOL.

Now some men will say that I am right about this axle setting, but we are not all fixed with the necessary tools to do this work so that it will be the same every time. I will give a sketch of an axle-setting tool that I made myself some fifteen years ago, and I am still using it. I have seen all the fancy-priced and complicated axle sets that are on the market, and I would rather have the one I use than anything that I have ever seen. Any good workman can make it in less than half a day and it will always be in tune and never wear out. The long part is made out of 1 by $\frac{1}{4}$-inch steel tire or anything that will hold itself in shape. The square head is made out of Norway iron forged so that it will spring at A, and runs through the head at B, held with set screws so that you can set it any desired pitch or gather you may want. The distance across at A is about 8 inches, and the length at C is about $8\frac{1}{2}$ inches. The outer faces of the places marked C are finished to a perfect straight edge, and are made of steel $\frac{1}{4}$ by $\frac{1}{2}$ inch. The small end is made the same length as the head forked at the ends so as to rest on the axle at opposite end from head when in use. This should be forged with slot in centre and slide on long piece, held with a set screw to make it adjustable for any length of axle. One side of the tool I use for gather and the other side for pitch. For convenience I paint one side red and the other side black so to be sure and make no mistake when setting an axle.

(To be continued.)

A Good Way of Making Small Socket Wrenches.

Mr. S. H. Hoover, already known in these columns for his handy wrenches, gives us the following description of his method of making wrenches of, say, from $\frac{1}{2}$ inch to 1 inch diameter.

He takes a piece of solid stock, B, of required thickness and draws out one end as shown in the accompanying sketch. This end he places in a heading tool C, down to the shoulder. The next step is to punch a hole in the stock with a hammer-tool as shown at A. The hole may be punched round, and then formed to the required shape over a mandrel.

This makes a very useful wrench, and is very simply and economically made.

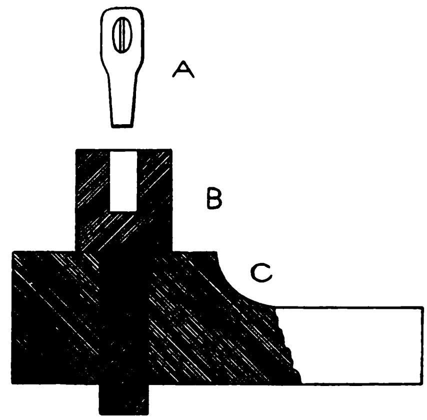
The Elementary Principles of Mechanical Drawing.—4.

Different Kinds of Drawings.

There are many ways of representing objects on paper, each way having its peculiar advantages. These different modes of representation are called different kinds of drawings.

Perspective.

Perspective is that form of drawing which represents objects as they *appear*,



A VERY GOOD METHOD OF MAKING A SMALL SOCKET WRENCH.

picture fashion. Whenever we look at a view or object, we see it in perspective. One property of perspective drawing is that those parts near the eye appear larger, and those more remote appear smaller. This characteristic, whereby sizes and distances appear smaller and smaller, the further they get from the eye, is termed "foreshortening." The fact that the more remote appears smaller makes it difficult to form a true idea of the relative size of parts. Only a portion of each object is visible, moreover, and the part not seen must be imagined. It often happens that the object to be illustrated has not been made, and so must be drawn from imagination, or it may be so placed that it cannot be photographed. In these cases a perspective drawing may be made. Otherwise, the camera gives the best and cheapest perspective.

All parallel lines which recede from the eye appear to converge or come nearer and nearer together, when viewed in perspective, until, if continued far enough, they seem to meet in a point. A certain horizontal line on a level with the eye and at right angles to the line of vision is called the horizon. Towards this all *horizontal* parallel lines converge, those above the level of the eye slanting downward and those below the level of the eye slanting

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upward. All horizontal lines which are parallel to each other seem to converge toward a point in the horizon called a vanishing point, and each different set of parallel lines has a different vanishing point. Follow with the eye, the course of a receding railway track and notice how the rails seem to draw gradually

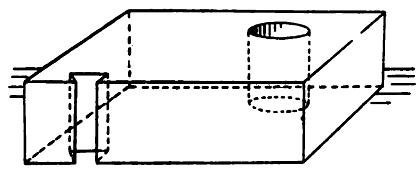

Fig. 1. AN EXAMPLE OF PERSPECTIVE, SHOWING A SOLID BLOCK WITH CYLINDRICAL HOLE AND MORTISE.

nearer until at last they appear to meet. This point where they meet is the vanishing point for those lines. The track being horizontal, this point will be seen to lie at the horizon. Many familiar instances will be recalled.

Perspective may be used to advantage when the object to be drawn is small, simple or of common occurrence, so that the unseen parts may be easily supplied in the mind. In this case the dimensions may be placed upon the drawing. It is also of especial advantage in drawing scenic and architectural subjects, or when it is desired to represent an object as it appears to the eye. Fig. 1 gives a perspective view of a rectangular block with a mortise and a cylindrical hole in it.

Working Drawings.

Perspective drawings, as has been explained, show objects as they *appear*. Since appearances cannot be relied upon for accuracy, another form of drawing must be used when it is desired to show

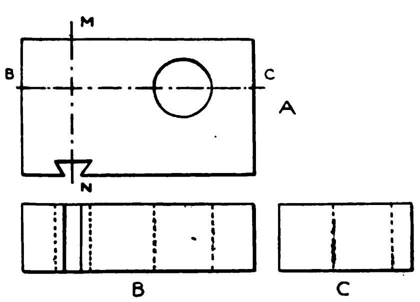

Fig. 2. TOP PLAN, SIDE ELEVATION AND END ELEVATION OF BLOCK.

things exactly as they are, as must be done, for instance, when we wish to build or reproduce an object from its drawing. A working drawing or projection is used for this purpose. In this kind of drawing, the object is shown as it actually is, and not as it appears. Hence, the parts farthest from the eye will appear of their true size compared with those nearest. In ordinary cases, a side view (called a side elevation), an end view or end elevation and a top or bottom view or plan, are the only projections necessary to explain an object. But sometimes when the parts are complicated, a separate projection is required of both the front and rear views and the right and left ends as well as top and bottom.

A general view of an object shows the parts assembled. A detail drawing gives one or more of the parts separately and in detail. A sufficient number of views must be given to show the principal faces and allow the observer to form an idea of the general contour of the object, but of course it is always desirable to present it in as few views as possible. Fig. 2 gives a side elevation, end elevation, and plan of the block shown in Fig. 1. By means of dimension lines (not shown here), the exact length of any particular line of the block can be found from one or another of the three views.

It is sometimes convenient to show the interior construction of an object. A boiler, for instance, may be drawn to illustrate the arrangement of its flues. In this case, a view would be given as if it had been cut in half and a drawing made of the cut surface, showing the inner parts. Such a drawing is called a section. Fig. 3, A, is a section on the line BC of Fig. 2, that is, as if the block had been cut in half on the line. A section may be taken through any part of an object. Fig. 3, B, is a section on the line MN, Fig. 2. Sometimes, even, a drawing may be shown partly in section and partly in elevation as Fig. 3, C.

A working drawing from which a tool or article is to be made must show an exact picture of each separate piece, i. e., a projection of each principal surface. In the construction of a locomotive, for instance, every part is shown in the drawings (even the bolt holes being indicated) and these being all made, may be put together easily and quickly in the shop.

Isometric Drawing.

A special kind of projection, which, however, is little used for practical purposes, is isometric drawing. This kind of drawing combines the advantages of perspective (viz.: showing three views in one) with those of the ordinary working drawing, which gives the true proportions of lines. The object is supposed to be tilted into such a position that the intersection lines of the three parallel faces, the axes MN, MO, MP, Fig. 4, make angles of 120° with each other on the drawing. It is usual in practice to make all lines which are parallel to one of the three axes, represent the true length of the line itself. For instance, if we were drawing the block full size and the longest edge were two inches, the lines MO and NQ would be made two inches long. If the drawing were half size, it would be drawn one

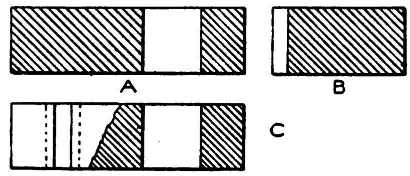

Fig. 3. A—LENGTHWISE SECTION DRAWING OF BLOCK. B—TRANSVERSE SECTION. C—SECTION AND ELEVATION IN COMBINATION.

inch long. As mentioned, an isometric drawing gives a simple method of showing three faces of an object in one view, at the same time allowing the lines to be represented in their true lengths, or to an accurate scale. It is specially adapted for showing small objects in which the principal lines are at right angles with each other, as in the drawing here given.

In making small articles, the drawings may sometimes be applied to the wood or metal to get the shape, but when the surfaces are irregular this is not convenient. A method often used is to employ templets or patterns. In order to secure the correct proportions, all working drawings must be drawn to scale, i. e., an inch on the drawing must represent a definite measure upon the thing to be made.

The succeeding chapter will be de-

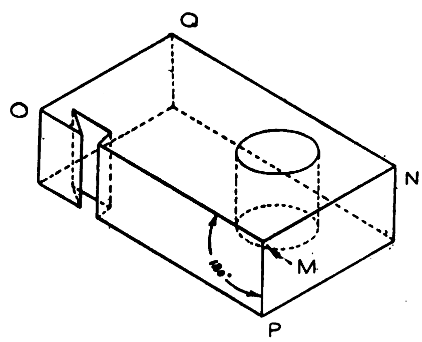

Fig. 4. ISOMETRIC DRAWING OF BLOCK, SHOWING CYLINDRICAL HOLE AND MORTISE.

voted to a discussion of working drawings. The remaining articles of the series will comprise a complete and thorough course in mechanical drawing as required by the blacksmith. How to read drawings and to calculate the amount of stock with allowance for finish will be a very important topic under discussion later on. Examples will also be given of technical drawings of special mechanical contrivances, as nuts, bolts, etc.

(To be continued.)

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The Country Blacksmith.

BY A SUBSCRIBER.

Under the worn and leaky roof
  The country blacksmith stands,
Clasping a kicking horse's hoof
  In large and brawny hands;
An ugly brute, that will not stand,
  Despite his stern commands.

He wonders as he works away,
  How long 'twill be before
He'll get his customers to pay,
  That old, unsettled score;
And yet he really dare not say,
  "Your credit's good no more."

His task is done at last, and then
  The farmer says, "That looks
A right good job. If you don't mind,—
  Just put it on the books."
The blacksmith longs to land him one
  Of Corbett's fierce left hooks.

Then to the post-office he goes,
  To get his morning's mail.
The city jobber, whom he owes,
  Is camping on his trail,
And says that he must settle up
  In two weeks without fail.

That night when all the village folk
  Were wrapped in slumber deep,
He nailed a sign upon his shop,
  Ere he returned to sleep,
  It was a large and glaring sign,
  And read

HEATS SPARKS WELDS

How many smiths are there in your vicinity? Are you taking the lead?

What about the fall trade? Are you ready for any job that may come along?

Reach out for new work. Let no opportunity slip for widening your field.

The threshing engine season is now on. Have you learned any new kinks since last year?

September—another volume completed. Compare the last issue of this volume with the first of the former one. Any suggestions?

Is the shop large enough—light enough for your needs? If not, put in a few days before the busy time commences, and get it into shape. You will be glad before winter is well set in.

Small country shops furnish many an apprentice to the machine blacksmith shops of the city. The young or mentally growing smith will find it pays to read about every branch of his craft.

A new metal, called "guldiner," has been made in Bergen, Norway. It looks very like gold, is hard as steel and pliable as tin. Foreign demand has already been created, and a factory has been erected to supply the needs.

Experience, like anything else, may be long without being broad. It is the man of broad experience whose opinions have weight and whose work is reliable. Fifty years at the anvil may fail to give a man the most valuable experience.

If it's a good thing, recommend it to somebody else who may need it. If you like The American Blacksmith, tell your neighbor about it and let him benefit by it, while you benefit by the subscription commission. You will help one another.

In hardware circles prosperity still continues. The establishments are employed to their fullest extent, new ones are being installed, and the demand keeps pace with the supply. This shows that "something is doing" in mechanical circles as well.

He knows it all.—That's what the narrow-minded blacksmith will tell you. As a matter of fact nobody living "knows it all." Any man, with a head capable of learning, can learn from good craft literature. Don't get the idea that you know it all.

Always ready—always prepared for an emergency—that's what a blacksmith should advertise. In some of our large cities certain machine shops advertise "Lathe work night and day," which, in these days of constant running of machinery is in itself a recommendation to the energetic tradesman.

Ever hear of a horse going up stairs to get out of the wet? Down in Western Pennsylvania, in a flood, a horse broke his halter and ascended to the loft of the barn. When the water went down, he could not be coaxed to descend until an inclined runway had been built. Wasn't this intelligence? Or what was it?

The man who cannot, with honest effort, make a fair living at his trade is decidedly in the wrong sphere, for any craft will yield a comfortable livelihood to the able craftsman. The fault or misfortune of failure lies in the individual man, and he should strive to make a change of some kind. Investigate first, though.

Many are the ways of meeting an emergency. One man will sit down and think about it, another will start right in to do it on experiment, while a third will not attempt it at all. Undoubtedly the best way is to have the necessary tools and materials always ready, and then when an extraordinary job is presented, to think about it and set to work in a rational way, determined to "do or die."

A nail-less horseshoe is the latest thing in its line, says the Teamster. One has been invented by Mr. Josiah Serfass, of Hazelton, Pa. The shoe is provided with metallic straps which rise to a common point near the top of the hoof. These straps are hinged to the shoe, and connected at the ends by a threaded bolt, which can be turned with a small wrench to clamp the straps over the hoof.

An interesting fact to the rubber-tire man, is that a new plant has been discovered in the Congo, whose long fibres contain a considerable quantity of rubber. The unscientific methods employed in obtaining rubber have worked havoc with the rubber plantations, resulting in the high prices of the present time. This new discovery, it is hoped, will tend to lower the prices on raw material.

Don't you think it would be a good plan (writes a subscriber) for THE AMERICAN BLACKSMITH to conduct an experimental shop? I have read in farm papers of experimental farms run for the benefit of readers, and as THE AMERICAN BLACKSMITH asks for suggestions, the idea of an experimental shop occurred to me. In it we could have tests of different kinds made for our information. I think it would be a good thing.

Much good experience is lost, because, for some reason or another, the average blacksmith does not want to impart it to the craft. Having won knowledge by hard work he wants to keep it for his own especial benefit, so he guards it carefully instead of spreading it abroad. This is a mistake, for a good thing is none the less good because it is useful to many, and every man owes it to the world at large to raise the standard of his craft as high as possible.

Two years gone and not one complaint from a reader about a humbug advertisement! A record we are proud of. Much advertising appearing in other journals has been denied appearance in THE AMERICAN BLACKSMITH. Columns open only to honorable business houses of unquestionable standing. All others debarred. The offer constantly holds good to reimburse subscribers for losses resulting from AMERICAN BLACKSMITH advertisers who may chance to prove unscrupulous.

Thinking of advancement in scientific knowledge, consider that (according to a contemporary) in 1740 one Christian Polhem, a noted Swedish steel worker, wrote, "It is well known that steel is made from iron, like brass from copper, but the exact method is not well understood. As long as the iron retains its natural sulphur it remains soft, but when this is extracted it becomes hard, and is called steel. The whole art lies in the extraction of the sulphur." If some of the present-day theories are as logical as this one was in 1740, a lot we have still to learn!

Tom Tardy was diligently wrapping a piece of wire around the broken handle of his sledge, when we dropped in the other day to ask him what was on his mind. "It does beat all," said he, "how my mail piles up—seems like I can't ever get all my letters answered." Tom went over to the dry goods box which answered for a desk, and took out four very much soiled letters. "This one," showing us a courteous business letter which asked for the favor of a reply by return mail, "This one I must answer right away." It was four months old then, but Tom carefully laid it away again to think about it a few more months. Walking away, we couldn't help but think that if our worthy friend took as long to die as he did to do everything else, he would come to be a very old man. Most people in present-day America, however, prefer not to live quite as slowly as Tom does.

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American Association of Blacksmiths and Horseshoers.

The numerous inquiries received from various sections of the country show that the question of organization for mutual benefit is occupying the minds of a great many thinking craftsmen. The purpose of this Association is to further the interests of the craft in every possible way, by assisting in the formation of associations and by furthering beneficial legislation as far as possible.

We wish to strongly urge blacksmiths in every locality to give the matter of organizing their attention. We will gladly furnish plans and instructions for forming such associations, and aid in every possible way. Do not wait for winter to come on and make the roads bad, but take up the question with your neighbor smiths now while meetings can be conveniently held. Send to the American Association of Blacksmiths and Horseshoers, Box 974, Buffalo, N. Y., for plans and advice.

Do you feel the need of a Lien Law in your State to adequately protect you from losses by bad debts? Will you interest your brother craftsmen and aid in getting such a law passed? Let us hear from you.

Thomas Blanchard.*

DWIGHT GODDARD.

Thomas Blanchard started out in life under very discouraging circumstances. His father was a New England farmer, of Huguenot descent, who added to his income by doing blacksmith work for his neighbors.

Thomas was born in 1788, at Sutton, Mass., the fifth of six sons. As a boy he was far from promising, stuttering badly and counted by some to be half foolish. He took little interest in farming or study, and spent his time whittling shingles, making windmills and miniature water wheels. As he grew older he became interested in iron work, and as his father refused him the use of his forge, he saved up all the charcoal he could gather and hid it behind a wall. Then he built a rude forge and used an old wedge driven into a log for an anvil, waited until his parents were absent and tried his hand at working iron.

At thirteen he heard of an apple-paring machine, and after patient experimenting and repeated trials succeeded in making a machine that would pare more apples than a dozen girls at the winter "bees."

*THE AMERICAN BLACKSMITH is indebted to Messrs. Wyman & Gordon, Worcester, Mass., for the above most interesting sketch of the success of a man whose earliest efforts were along a blacksmithing line.

This success deepened his inventive interest and made him of less use on the farm, so when eighteen his father sent him to work for an elder brother who made tacks at the neighboring town of West Millbury. Here he was put at the monotonous work of heading the tacks by hand. The points were first cut from strips, and then had to be picked up by the thumb and finger, gripped in a vise, and headed by a blow. He was given a certain number to be made each day. One of the first things he made here, was a counting machine that would ring a bell when the required number was complete. His brother forbade him spending any time in these idle projects, but his inventive genius could not be suppressed. He began to consider a machine to cut and head the tacks at one operation. The idea came to him long before he had the skill or means to construct. For six long years he worked at the idea, expending everything he could earn to buy materials, throwing away the old as new improvements suggested themselves, carrying the models about with him from place to place, persisting in spite of every discouragement. He became so poor that his own brother refused to trust him for groceries, even when his family was actually suffering.

At last it was a success; it made much better tacks than could be made by hand at the rate of five hundred a minute. It was sold for $5,000, which placed Blanchard in comfortable circumstances. The tacks were all sold, for some years at least, to one house, who kept the source of supply secret and realized handsomely on the sales.

At this time the attempt was being made by the Government to manufacture its muskets in this country; one of the shops making the attempt was located at Millbury. The barrels had been made by hand, but the process had been so far improved that the straight part of the barrel was then being turned in a lathe. There was an irregular enlargement at the butt where it was joined to the stock that still had to be finished by hand at considerable expense. Blanchard's inventive powers becoming recognized, he was sent for and asked if he could get up a machine that would do this. He said he would try, and it was not long before he suggested the addition of a certain cam motion to the lathe that would permit turning the cylindrical part and the flat and oval end at the same operation.

The knowledge of this coming to the attention of the Government, he was sent for to introduce it at the Springfield Armory. While the workmen were gathered around to witness its operations one said to another, "Well, John, he has spoiled your job." Still another exclaimed that "he could not spoil his, for he could not turn a gun stock." Blanchard overhearing the remark answered, "I am not so sure of that, but I will think of it a while." On his way home soon after, the whole principle for turning irregular forms came to him. In a short time Blanchard had built a wooden model of his idea, and, sure enough, it turned a miniature gun stock with perfect accuracy.

The principle is this: A pattern and block to be turned are fitted on a common shaft, that is so hung in a frame that is adapted to vibrate toward or away from a second shaft that carries a guide wheel opposite and pressing against the pattern, and a revolving cutter wheel of the same diameter opposite the block to be turned. During the revolution of the pattern the block is brought near to or away from the cutting wheel, reproducing exactly the form of the pattern.

The beauty of the invention is that by varying the relative sizes of the guide wheel and cutting wheel, any variation in size relative to the model can be secured, and by reversing the transverse motion of the cutting wheel, a perfect right and left can be made from the same pattern. Then by varying the transverse speed of the cutting wheel in relation to the guide wheel, the object is made either longer or shorter than the model.

Blanchard immediately secured a patent and was paid by the Government to set one up at the Harper's Ferry Armory, and later at the Springfield Armory. The introduction of this machine opened up the way to others. Blanchard was placed in charge of stocking muskets at the Springfield Armory, and during the next five years introduced no less than thirteen machines for the better manufacture of muskets. The most important of these was a machine for making the irregular recesses in the stock for the barrel, lock, etc. The idea for this machine came to him, it is said, from watching the labors of a wood-boring insect.

Being thus occupied in Government work, opportunity was open to infringers of the patent to apply it in other ways. During the first term of the patent no less than fifty machines were put in operation for various purposes, turning

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shoe lasts, wheel spokes, tackle blocks and hat forms, from which he derived no benefit. The patent was originally granted about 1820, and was twice renewed, a very unusual proceeding.

In the early history of this invention the question of reality of invention was contested by one of his neighbors. A hearing was granted, to be held on the village green. The neighbor, who was a brass worker by trade, presented a beautifully made model in brass, while Blanchard's model was a crude wooden affair, but the evidence was altogether in his favor, and little was heard afterward of this contestant for the honor of inventing the lathe for irregular forms.

Blanchard had many troubles in defending his patent, and even to the end realized but a comparatively small amount directly from the invention.

By this time Blanchard came to considerable repute as a mechanical expert, and was frequently employed henceforth in lawsuits and investigations in that capacity.

In 1825 Blanchard became much interested in the subject of steam road wagons. While still at the Springfield Armory he made a working model that was very successful and for which he received a patent. He had ideas also about rails and turnouts, but his efforts to organize a company or secure capital, first in Boston, and later in New York, having failed, he apparently abandoned the idea.

In 1826 an effort was made to improve the navigation of the Connecticut River. At first steamboats were tried, but the rapids were so great that it was a failure. Then a canal was built around the worst rapids, and Blanchard was asked to design a steamboat, which he did, but it was also unsuccessful. This failure deepened his interest, and he made an elaborate study of the whole question, the result of which was an important improvement. The improvement consisted in locating the paddle wheel at a particular distance beyond the stern, where the water set in with the greatest velocity. Hitherto the wheel had been located close up to the stern or at the sides. By Blanchard's discovery the maximum resistance to the paddles was secured, and a steamboat could be driven up rivers whose rapids had hitherto prevented steam navigation. He also built boats with two engines driving the wheel shaft by cranks set at 180 degrees on the ends, which secured the more constant power needed to ascend strong rapids. The result of his efforts was to move the head of navigation from Hartford to Springfield, and double the travel and transportation between the two places. He even navigated the rapids 150 miles beyond Springfield.

Proving that small rivers could be successfully navigated by steamboats, brought Mr. Blanchard many applications for assistance. By 1830 he had boats running on the Allegheny and other tributaries of the Ohio, and so established his method of construction that it came into general use.

Mr. Blanchard made many other inventions; in all he secured twenty-four patents, one of which was the process of steaming wood for bending. Hitherto when bent sticks were required for ship construction and other purposes, the woods were searched for satisfactory timbers. The U. S. Government paid Blanchard $50,000 for the use of this patent in ship construction, and other uses, such as for slate frames and bent furniture, also rewarded him.

He also made inventions in woollen and other machinery.

Although he started in life under such unfavorable conditions, he won out in the end. He overcame his stuttering, improved his personal appearance, made up by observation and experience for his lack of education, and by his inventions changed his early poverty for comparative wealth. He was able before he died to fulfill an assertion made to the villagers of West Millbury, when in extreme poverty and youthful awkwardness he was railed against for his shiftlessness, that he would yet "drive up through here in a coach and four."

He died in 1864, leaving a widow, whom he had married only ten months before. She still survives him, bringing closely home to us the recentness of the origin of things mechanical that now seem as though they always had been.

The Manufacture of a Well Known Blacksmith Tool.

The name of Peter Wright & Sons of Dudley, England, is so extensively known as manufacturers of blacksmith's anvils and vises that our readers are probably already well acquainted with it. It may therefore be of interest to give a brief description of the process of manufacture, as these works are carefully kept up to date, and the methods employed are such as look to the production of superior quality. Nearly 200 years ago Peter Wright started the works at Dudley, which have ever since steadily developed, and are today turning out anvils of finer quality than ever before and worthily maintaining the traditions of the firm. Today in almost every corner of the globe these tools are to be met with.

In the old days all anvils were "built up," *i. e.*, made by welding together a number of separate pieces onto a central block of common iron. Each of these vertical butt welds was of course a grave source of weakness and such anvils frequently broke up. Under the firm's patent, which was the invention of Peter Wright (the great grandson of the founder), all their anvils are made from only two forgings which are called the "top" and the "bottom" respectively, and require only the one weld at the waist, even this being in addition carefully "tied in."

The finest wrought iron scrap is carefully picked over by hand at the forges, and then passed into large furnaces where it is either balled or piled and then thoroughly worked under powerful steam hammers into blooms. After going through reheating furnaces, these are forged with great care under heavy steam hammers so as to form the tops and bottoms from which the anvils will be made.

These forgings are now paired together, and owing to their design the greatest strength and working surface is secured for each anvil according to its weight. These are then handed over to the anvil makers who have been trained to their respective duties all their lives, and have therefore become specialists at their work. This trade is very largely hereditary, and many of the men are representatives of families that have worked for Peter Wright and Sons for generations. These forgings now undergo a further process of hammering and trimming which contributes great toughness and soundness. They are then welded together at the waist under powerful hammers, which ensures that absolute homogeneity of the whole anvil, which is of such vital importance.

The next step is to weld on the steel for the face, and this as may be imagined is a delicate and most important process. The steel employed is of the finest grade, combining all the different qualities necessary for the heavy work that an anvil face has to stand. The firm is constantly experimenting by means of chemical and physical tests, in order to secure the very best material for their purpose. The face of the wrought iron body is heated up to welding point in a large smith's hearth and the

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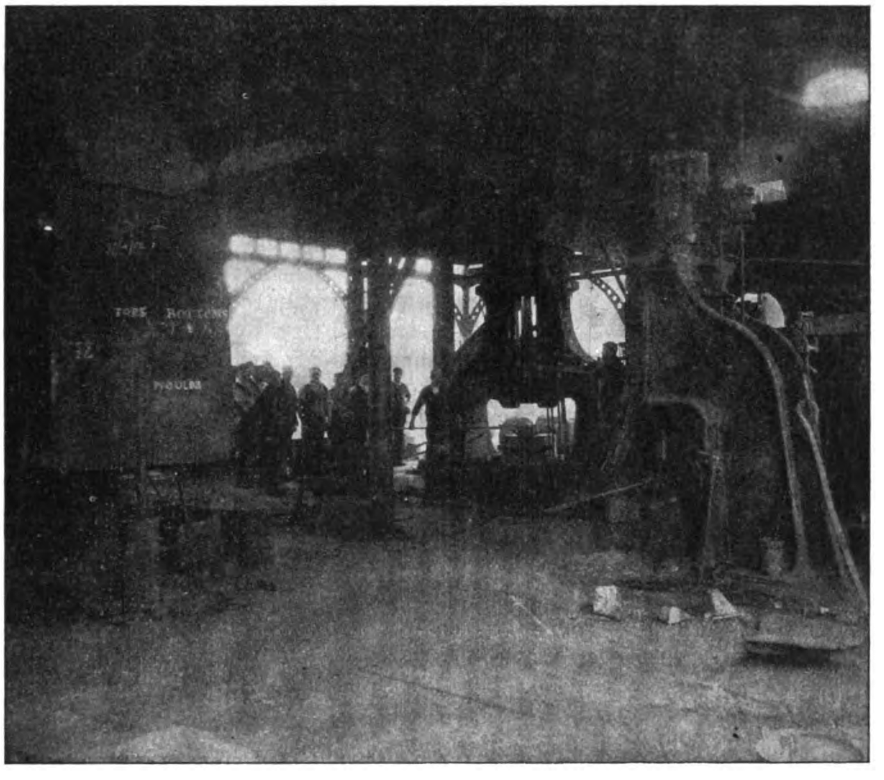
steel slab in another special hearth, both being in charge of foremen who always superintend this process. Specially pure washed fuel is used and a true weld is made without the aid of any patent compounds or mixtures. To make a sound weld of the face of an anvil of say 700 pounds is, of course, a really fine piece of work, requiring the most careful methods and highest degree of skill.

The anvil now has the bick and table trued up, the holes put in and the finishing touches made, after which it is heated to the correct temperature and plunged into great hardening tanks, where streams of water give it the final temper. Long experience has determined the degree of hardness which proves the best and safest to ensure good, all-round wear. The final process is to grind the steel face, which is done on huge grindstones, and the anvil after being polished is passed on to the warehouse. Throughout this time the anvil has to undergo various exhaustive tests at the hands of one of the principals, for hardness, squareness, and freedom from any flaws. Constant practice enables a trained ear to detect even small defects by the ring given out, and it is all this care which causes a Peter Wright Patent Solid Wrought Anvil to ring like a bell. After approval the trade marks are stamped on every anvil, these consisting of the words *Peter Wright Patent* and also *Solid Wrought* (the latter being in the form of a circle). In addition to these the green label is affixed, this also being duly registered. The manufacturers state that large orders are constantly being shipped to all parts of the world in face of tariffs and high freights.

The last advices are that a change has just taken place in the ownership of the above firm, Mr. Isaac Nash of Belbroughton, the well-known manufacturer of Walden Scythes, having purchased the business outright. The manufacture of the anvil, however, will be carried on at Dudley, precisely as before by the new proprietors, who have had long experience in the same trade, and whose anvils have attained a high reputation in England and on the Continent. The two businesses of this latter firm will, of course, be conducted independently.



INTERIOR VIEW OF SHOP WHERE THE PETER WRIGHT ANVIL IS MADE.

Hints Preliminary to Shoeing.

BY M. E. M.

In successfully shoeing a horse, much depends upon the preliminary steps taken by a shoer. If every smith would use a little tact in this direction, especially with young horses, perhaps there would be fewer vicious and nervous animals to be shod.

It is a great mistake to suddenly grasp a horse's foot, or to grasp it with both hands. Some horses are naturally high-spirited and the shock they may experience by such treatment cannot be realized by a human being. The horse should be gradually prepared for what is to come. First, see that he stands in such a position that, when one foot is lifted, he will be properly balanced upon the other three. If the animal does not voluntarily take an easy position, gently move him with the hands until it is secured and his feet are well under his body.

When the left forefoot is to be raised, the shoer stands on the left side, facing the animal. He should speak gently to the horse, and place the palm of his right hand flat upon his shoulder. At the same time he should, with the left hand, stroke the limb downward toward the cannon and seize the cannon in front. Then, with the other hand, he gently presses the horse towards the opposite side, thus relieving the leg of weight, when he lifts it from the ground. The right hand now grasps the pastern from inside and the left from the outside. The shoer next turns partly towards the right and supports the horse's leg upon his own left leg, standing as quietly and firmly as possible the while. In holding the hoof, never raise it higher than the elbow-joint, and never too far back of the elbow. Indeed, a little lower than this is better if possible.

When the left hind foot is to be shod, gently stroke the animal back as far as the angle of the hip. Place the left hand here for support, while the right hand strokes the limb down to the middle of the cannon, and grasps it from behind. The left hand presses the animal's weight over towards the right side, the right hand loosens the foot and carries it forward and outward from the body, so that the limb is bent at the hock. Now bring the left leg against the anterior surface of the fetlock-joint and carry the foot backward. His left arm passes over the horse's croup and above and to the inner side of the hock. The long pastern should then be seized with both hands.

In shoeing the right feet, follow the same methods, only reversing every process.

Never cause unnecessary discomfort or pain by raising the feet too high or in wrong positions. Do not pinch or squeeze the limb. Always be as quiet and rapid as possible, and avoid all unnecessary noise. These points are well worth attention, as the horse is very sensitive to every sound and motion.

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When a young horse is to be shod, it is not wise to keep the foot raised too long. Give him a rest between whiles, most especially in this case, be quiet and gentle and never display irritation or temper. It is the memories of these early shoeings that govern the horse's attitude at the forge in later years.

In shoeing an old and stiff horse, raise the foot gradually, and not too high—especially in the beginning of the operation.

Some horses are vicious, whether by

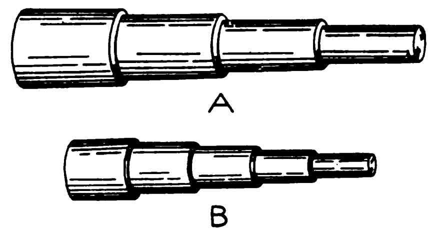

Fig. 43. CONVENIENT FORMS OF MANDRELS.

nature or accident, and a shoer is often compelled to use severity. The ears and eyes are the best index to the horse's mood. The shoer should watch these closely. Every indication of temper should be promptly punished by a jerk of the halter or a few words. If the horse is backed several times over a piece of soft ground, it often quiets him. Various devices have been employed to hold such horses and prevent their kicking, and where every other method fails, the animal may be placed in the stocks. But the shoer should always strive by gentleness to inspire confidence before resorting to severe measures.

Horses that are merely irritable and high-strung are often best handled by firm boldness. To such horses, light touches are much more annoying than energetic handling.

The successful shoer must be able to read horse nature—if it may be so expressed. Methods that succeed with one animal may fail utterly with another. No man should attempt to shoe a horse, who has not full control of his own nerves and temper.

The Railroad Blacksmith Shop.—11.

The Systematic Maintenance and Use of Tools.

W. B. REID.

The creation and maintenance of tools is a constant and necessary factor of economic production in the blacksmith shop. Apart from expensive forging machines, not generally available, the smith, as his own tool maker, can always have at command a variety of inexpensive devices for increasing his output, limited only by his own ingenuity and resourcefulness.

To have such tools is an important point; the systematic use and maintenance of them is a matter equally important, the full appreciation of which will add intrinsically to their efficiency and value. A few words upon this subject may be of interest.

The most common and useful, and, at the same time, most abused of tools are the round spring swages for use at the steam hammer. No shop of any pretensions can afford to be without a complete set of these from ½ inch upwards, according to requirements. They may be fashioned as elaborately or as roughly and inexpensively as desired. The essential point is to maintain the swaging surfaces in a smooth working condition and at proper standard sizes. To do this satisfactorily it is necessary to have a permanent set of soft steel mandrels, finished to the different sizes of swages kept. To avoid too great a multiplicity of parts each mandrel may contain any convenient number of sizes, Fig. 43, A and B. Made and kept in this way, these mandrels will prove of constant value in making new swages and in restoring worn ones to standard sizes by simply heating the parts and running the proper mandrel through them under the steam hammer. Each mandrel should, of course, be finished slightly larger that the accurate size of swage, proportionate to the shrinkage of the swage in cooling.

Next to a set of round swages a well equipped blacksmith shop should have forging swages for various sizes of balls, bell clappers, collar bolts, brake posts, crosshead pins, knuckle joint pins, pop valve spindles, eye bolts, hand-hammers, and many other standard forgings, according to requirement. These tools may also be made as elaborately or inexpensively as circumstances permit, but, as in the first instance, their value and usefulness will be greatly enhanced by a similar method and system of maintenance and use. To make these swages accurately, finished soft steel patterns or originals are necessary. These should be kept carefully under surveillance of the foreman, to be used as occasion requires in replacing broken tools, in restoring shape and proportion of worn ones, or as a sample to the workman of the article required. Each of these patterns should be legibly stamped with a number or mark; the swage in which it is made being identified by the same number or mark, and having, in addition, stamped upon it the size of iron required to make the forging. Arranged systematically in this way no time is lost by the workman in selecting the proper tool, nor in experimenting to determine the size of iron necessary for the purpose.

The following may illustrate this point and show, at the same time, a useful adaptation of the ball forging. Fig. 44 represents an ash pan shaker, lever end. To make this we use the ball, Fig. 45, A. The tool for this, similarly marked, also shows at a glance the stock required, Fig. 45, B.

The stock of ball is just of sufficient size to fill impression in auxiliary tool, Fig. 46, A, to which it is immediately transferred from ball tool and completed in one heat as shown in Fig. 44. Part A, Fig. 46, is made from a piece of 8-inch steel driving axle, the hole punched or drilled, as convenient. A forged band, with handle is shrunk on to strengthen the tool and facilitate handling. B is a

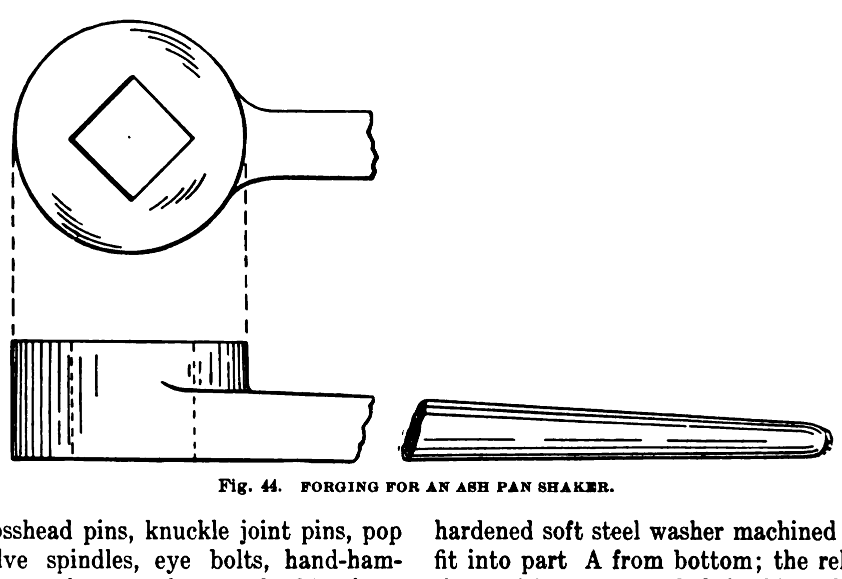

Fig. 44. FORGING FOR AN ASH PAN SHAKER.

hardened soft steel washer machined to fit into part A from bottom; the relative position of square hole in this and in guide plate C being secured by dowel pins in top and bottom.

The thickness of forging can be increased or diminished, and a larger or

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smaller hole secured by having duplicate parts of B and C adjusted accordingly. The welding of 1¼-inch shank to forged piece completes the job.

The application of this tool will, I trust, appear plainly, from reference to perspective sketches of its several parts. When in use the washer B is inserted in bottom of tool A, the square hole in same being temporarily plugged by a small piece of square iron, which is allowed to drop out after the ball has been flattened to shape. The guide plate C is then adjusted upon top, the punch D inserted and driven through. The whole operation completed in one heat, producing a clean-cut, uniform, substantial forging at a very low cost.

(To be continued.)

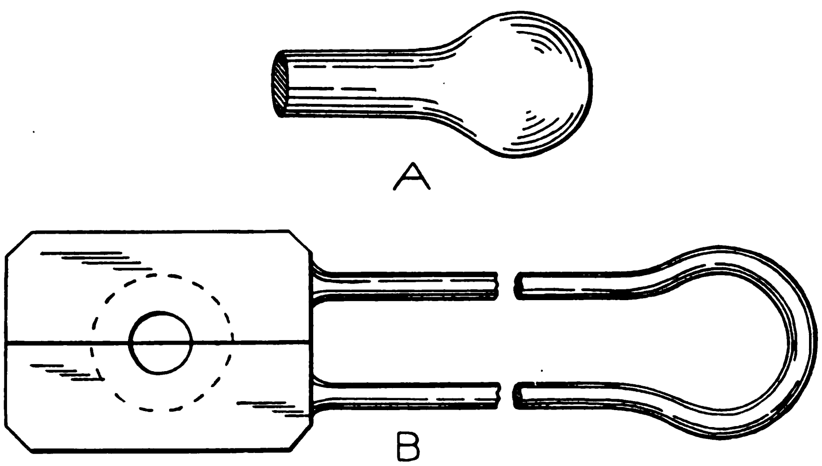

Fig. 45. ASH PAN SHAKER FORGING. TOOL FOR FORMING BALL.

National Railroad Master Blacksmiths' Association.

Eleventh Annual Convention.

The annual convention of Railroad Master Blacksmiths was opened Tuesday morning, August 18th, at the Genesee Hotel, Buffalo, N. Y. Owing to the absence of President McNally because of sickness, Vice-President Lindsay presided. The convention was well attended and most successful in every respect. Sessions were held Tuesday morning and afternoon, Wednesday morning and evening, and Thursday morning. On Wednesday afternoon the members went on an inspection visit to the New York Central Railroad shops at Depew, N. Y., on Thursday afternoon to the Pullman Car Works at East Buffalo, and on Friday to Niagara Falls. A very pleasant program was arranged for the entertainment of the ladies. The photograph which was taken of the members will be reproduced in the October issue of THE AMERICAN BLACKSMITH if possible.

Addresses of welcome were delivered by Councilman John J. Smith, of Buffalo, and by Mr. F. Howard Mason, Chamber of Commerce. The report of the secretary showed thirty-nine new members since last year, and a total membership of three hundred. The various subjects assigned for consideration at this Convention were thoroughly discussed, the greatest interest being displayed on all topics. Among the subjects under discussion were the repair of frames, the preparation and working of scrap for locomotive forgings, oil as fuel for axle work, piece work, machine forging in car and locomotive work, tool steel flue welding, track tools, tuyere irons, case hardening, frogs and crossings and car and locomotive springs. The discussions of the papers as read were particularly interesting.

The following officers were chosen for the ensuing year: President, George Lindsay; first vice-president, T. F. Keane; second vice-president, James Reiley; secretary and treasurer, A. L. Woodworth; chemist, G. H. Williams. After numerous ballots, Indianapolis was chosen as the meeting place for next year's convention.

We reproduce herewith an engraving of the new president, together with a short sketch of his life. We also append some of the papers, and in the October AMERICAN BLACKSMITH, will be printed some of the other most interesting of the papers read before the convention.

Mr. George Lindsay, the newly elected president of the National Railroad Master Blacksmiths' Association, was born and reared in Fifeshire, Scotland. At the age of sixteen he was bound as an apprentice to John Barrowman & Co., manufacturers of agricultural implements, serving four years, eleven hours a day, at a salary of $1.50 per week, and boarding himself.

In 1873 he sailed for the United States and accepted service with the Hinkley Locomotive Works at Boston, which firm at that time employed about 600 men and put out about four engines—half brass polished pilot bars and smoke arch braces—a week. After this he worked in several of the principal shops of the east, among them the N. Y., N. H. & H. R. R., where he had charge of the night crew.

Mr. Lindsay worked for the United States government at the Watertown Arsenal for three years until politicians got to wrangling about appropriations to carry on the work of coast defenses, and adjourned, making no provision for the 600 men who were thrown out of employment. Ten days later he accepted his present position as foreman of the Evansville & Terre Haute R. R.

High Speed Steel.

It is not my intention to present tables showing the high speeds, heavy feeds, or the amount of metal removed from certain pieces in a given time with this high duty steel, but rather to state a few facts that have been gleaned from daily practice which may be helpful to some in gaining a higher degree of efficiency from their tools. These high records are usually tests made under favorable conditions, and are rarely maintained any length of time in daily practice. It is sufficient to say that the gains are so large in using this steel that it would show poor business tact if we did not take full advantage of it regardless of its present high price.

In 1901 patents were granted Messrs. Taylor and White for a brand of steels alloyed with tungsten, molybdenum and chromium in certain given proportions, also a special heat treatment for the same. The edge holding power of tools made from this steel and given the special heat treatment exceeded all previous attainments to such an extent that it required the reconstruction of certain machine tools to use the steel up to its limit.

Mr. Taylor was superintendent of the Bethlehem Steel Company, and he was testing the relative merits of the standard brands of self-hardening steel when one brand failed to give results as represented.

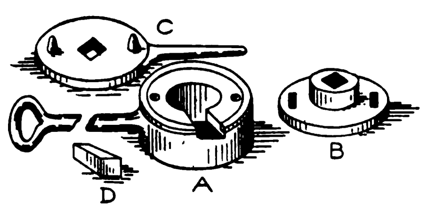

Fig. 46. TOOL FOR FINISHING.

The agent for the steel being apprised of the failure, determined to investigate the cause, and readily discovered that the heat treatments were much lower than he had recommended them to use.

By complying with the instructions the tools were forged and quenched at a much higher range of heats, which resulted in a marked increase in the efficiency of the tools. Encouraged by these results, he tried other brands by heating them to this same range, but finally carried the heats

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to that point where the steel softens or crumbles (between 1,900 degrees and 2,000 degrees F.), if touched with a rod. As all the self-hardening brands vary considerably in composition, so did his final results, but the increased efficiency of some brands was surprising. He concluded to push his investigations a little further and see if a steel could be made that would give better results than the self-hardening when given the high heat treatment. By enlisting the assistance of Mr. White, a chemist, they eventually produced the remarkable steel that bears their names.

It is with interest that we note the rapid trend of events; it is a trifle over two years since this remarkable steel was patented, and to-day it is scarcely heard of. Spurred on by the successes of this new rival, the leading steelmakers were soon upon its heels with a superior steel, willing to sell to all, requiring no expensive shop right to use it or the signing of a binding contract, consequently it was forced to retire before it was generally introduced.

It is well known that if tools for planers, slotters, etc., were made from the self-hardening steels of the past (Taylor-White included), there was a decided tendency of the cutting edge to crumble, especially when cutting hard, tough materials, thereby leaving a rough finish. The construction of the above mentioned machines are such that, during the time they are retrieving, the cutting edge of the tools are required to drag back over the surface just cut, then the machine being reversed, the tools suddenly enter the work at full speed and full depth cut.

Therefore it must be obvious that tools working under these conditions, and required to maintain a good cutting edge, must be of the highest quality, and not the least friable. It is under these trying conditions that this new steel has easily demonstrated superiority over those of the past. Another advance is the manufacture of twist drills from this material; the results are very encouraging for a better drill in the near future. It is true they are not equal to the carbon steel drills in strength; there is a tendency to split through the center, but if the workman exercises his good judgment, there will be very little trouble from this direction. Taps, milling cutters, reamers, etc., are being made and used with some success, but, like all things in their incipiency, there are some failures. There are good reasons for believing that in strengthening the teeth, improving the methods of hardening and regulating speeds and feeds to suit the new conditions, they will be a decided success. It will be observed that the cutting edge of tools made from this steel (or in fact any of the alloyed steels) soon becomes slightly rounded, and in this condition they appear to render their best service. This peculiarity makes it unsuitable for finishing tools where keen and enduring edges are required; for instance, a tool for chasing a standard tap must cut perfectly smooth and accurate the full length of the tap; if not, the tap would be worthless. This is one of the reasons why the alloyed steels are a failure for edge tools.

The process of annealing can be easily accomplished by any of the methods employed with the self-hardening brands. A sure and safe method is to pack the steel in an iron box or a piece of pipe and surrounding the steel with powdered charcoal, then well-sealing the openings with fire clay. The box or pipe is placed in the furnace, heated to a bright cherry red color for several hours, then permitted to cool down slowly; the slower the process of cooling the softer will be the steel. If properly annealed, it will machine as easily as tool steel. It has superior forging properties when compared with the self-hardening steels of the past which allows it to be forged into the difficult shapes. Furthermore, this has been quite an advantage to the steelmakers in producing a steel almost free from seams. In order to forge it successfully it should be heated to a good lemon color heat, taking care to heat it slowly and thoroughly in a well burnt coke or coal fire. If heated properly it will be in a perfectly plastic condition and the steel will flow readily under the hammer. Remember it cools down much more quickly than carbon steel and when slightly cooled it becomes hard and unyielding; far more can be accomplished in a given time by frequent heating and only working it in a perfectly plastic condition; furthermore, if this is observed strains and ruptures will be avoided. It is absolutely necessary that the base of all tools should be perfectly straight, and the attention should be directed to this important part before the tools are finished. By heeding this caution it will save the loss of many valuable tools, besides the tools can be held more firmly and rigidly in the tool post. After forging the tools it is advisable to lay it down and allow it to grow cold, then re-heating for hardening.

Probably the most interesting and important part in manipulating this new steel is the process of tempering it. To temper the steel properly it must be heated to a fusing or welding heat; the conditions required are about the same as for welding tool steel. The methods used in applying the heat are very important, regardless of the advice to the contrary. To obtain satisfactory results, it is best to build a covered fire with a liberal amount of crushed coke over the tuyere, thus avoiding an oxidizing fire. The blast must be used rather sparingly, for if time is not allowed for the steel to conduct the heat properly the point of the tool may burn off, or the coke over the tuyere will burn down to such an extent that it will allow the blast to impinge too strongly against the steel, and thereby prevent the proper conditions from taking place. If the steel is heated too quickly and to the highest possible temperature, the fractured piece will show a dry, brittle, lifeless structure, proving that deterioration has taken place, consequently there will be a corresponding loss in edge-holding power. When the steel is carefully heated in a fire as above mentioned, and a white heat has been attained, a faint fluxing will be noted; as the temperature increases, innumerable minute bubbles will be observed; by prolonging the treatment the bubbles become larger and less numerous; when carried to the extreme the steel will finally soften and melt. This part of the process, for the want of a better term, has been called "sweating" which it somewhat resembles.

The "sweating" properties are more pronounced in some brands than in others, besides some steelmakers recommend a longer sweating than others, but if the smith is guided by his trained judgment and observation, he will soon learn to regulate the sweating to meet the requirements. Although not generally known, these sweating properties are inherent in all steel, and some of the old self-hardening brands can be improved considerably by this treatment, providing the sweating is not carried to the extreme. The toolsmith, to be successful in his business, must have a well-trained eye; he is required to work in all degrees of light, and at times it is with difficulty that he locates the proper hardening heat. The locating of these high sweating heats will place a greater strain upon his eyes, and will make his position more difficult and important than ever.

After sweating, the tools are quenched in oil, the compressed air, or a strong blast. There are other methods, but they are not used to any extent. In some cases it is advisable to draw the temper, and this can be accomplished by cooling the point, drawing in the usual way, or they can be cooled in their entirety and then drawing the points by conducting the heat from the other end of the tools, and then permitting them to cool down slowly. In order to harden taps, mills, reamers, etc., successfully, they must be heated in a lead bath, and a graphite crucible is absolutely necessary, for the lead must be heated to a white heat or to the highest possible limit The lead should be covered with powdered charcoal, to prevent it from wasting or oxidizing.

My experience with this new branch of the art is somewhat limited, but I readily discovered that when a smith's forge is used, caution must be exercised in heating even the best graphite crucibles to this high temperature. If the blast is too strong the crucible will melt away in spots before the lead is hot enough to meet the requirements. The tools should be previously heated in a furnace to a bright red heat, then placed in the white hot lead. After the proper heat is obtained, the tools are submerged in the oil, and when cold, they are polished and drawn the same as carbon steel tools.

Some of these steels refine equally as well as carbon steel, if the sweating is not carried to the extreme, and it is necessary that tools like milling cutters, reamers, etc., be hardened from this refining heat. We have been led to believe that the steel cannot be injured by overheating, but when we see a number of tools made from the same bar of steel, and some of them giving extraordinary results, and the others a complete failure, it is quite evident that the heat treatment is a point that needs the closest attention.

There are special furnaces upon the market for sweating this steel, and it is claimed they are giving good satisfaction. It will be noticed that in grinding any of the alloyed tool steels, the emery wheels become glazed very quickly. It is believed that the alloy tungsten is responsible for this sudden glazing; the little grains of emery from which the wheels are composed, become dull and then coated with the tungsten; hence the glazing. The tools are often ground upon these glazed wheels, and this inattention has caused the loss of many

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valuable tools, and I dare say that one-half of the tools ground on these wheels are injured to a greater or less extent. As a rule the workman takes no account of this glazing and bears with greater pressure as the wheel fails to cut, thereby causing an intense friction; this creates unequal expansion and contraction, resulting in numerous surface checks.

This can be avoided by replacing the wheels with others that are softer and coarser, then dressing them as soon as they show the least indication of glazing, and the workman limiting the pressure according to the cutting power of the wheels. The sparks emanating from the majority of these high speed steels, when ground upon the emery wheel, are of a bright orange color. The sparks emanating from the old self-hardening when ground are darkred in color. The sparks being much lighter from the high speed steel is due to the presence of molybdenum and chromium. In one or two brands, I noted the sparks were very light, and resembled the sparks emanating from machinery steel. H. W. RUSHMER.

Case Hardening.

As chairman of Committee on Case-hardening I followed the rule of writing each member of the committee, asking their views on the subject, and with the exception of two, they also followed the rule of not replying, consequently we have no report of the full committee. I will read separately the paper of the chairman and those received from the two members interested.

In mechanics, the term case-hardening means the converting of the surface of iron into steel, for the purpose of creating not only a better wearing surface, but to lessen friction as well.

In the writer's opinion, the best material to be case-hardened for guides, links, link litters, blocks and saddles, eccentric rod jaws and all motion work, is Number 1 fibrous hammered iron. In preparing this iron, the pile should be large enough, the heating perfect, and the manipulation under the hammer sufficiently skillful to produce a refined, perfectly welded iron, free from longitudinal seams, or sheared fibres, frequently caused by disregarding these essentials.

We do not think it advisable to use granular iron for any purpose where case-hardening is required. To do so would greatly depreciate its reliability, owing to the shortness of its initial structure, nor would we recommend Merchant bar iron with its rawness, lack of density, and containing as it does, too great a percentage of slag; all of which, once working or forming into shape, will not fully rectify.

The penetration of carbon depends upon the medium used, the compactness of the iron, and the length of time subjected to a temperature of about 1,550 degrees Fahr. Guides made of good hammered iron should remain in the carbon, after becoming red-hot, from twenty to twenty-four hours. A carbon penetration of $\frac{3}{16}$ of an inch or even $\frac{1}{4}$ inch is none too deep for them. Lighter articles, such as links and all motion work, will have the proper penetration of carbon, $\frac{3}{32}$ of an inch, after being held at the right temperature for from fifteen to sixteen hours. The proper temperature for case-hardening runs from 1,550 to 1,700 degrees, and can be easily recognized by the experienced eye. There are no railroad foremen-smiths who should not be perfectly familiar with the proper temperature or low shade of red heat for steel-hardening and annealing purposes, which runs from 1,400 to 1,500 degrees Fahr. The best results in case-hardening are obtained with a temperature almost bordering on the bright cherry red, or any degree of heat, as stated above, from 1,550 to 1,700 degrees Fahr. If we are practical men, and not color-blind, the pyrometer is not a necessity. They are unreliable and are mostly used for experimental purposes, as they are gradually destroyed by use, and the responsibility of detecting their false indications is left to the eye and judgment of the practical man operating the furnace. If the man is reliable and the pyrometer only his distant second, why burden him with an uncertainty?

GEORGE LINDSAY,
PRESIDENT OF THE N. R. M. B. A.

As to the medium for case-hardening, some use charcoal, some carbonated bone black and some use a compound of yellow prussiate of potash, soda-ash, salt, etc., and each get fairly good results. It is claimed that old leather belting, old shoes, etc., will meet all requirements as a case hardening medium, but it would bare-foot Uncle Sam's whole army to furnish enough old shoes to case-harden the engine motion work on one of our many railroads of today. I have used many mixtures to coat iron with steel, and wish to acknowledge my indebtedness to Mr. John Buckley, of Chicago, Ill., whose explanation at our meeting in Pittsburg, Pa., in 1894, as to the results he obtained from using granulated raw bone prompted me to give it a trial, and I am still using it in preference to anything else on the market or home made. It is cheap, always ready for use, easily handled, does excellent work, and all the rats in the neighborhood will grow fat on it if you do not protect it.

As to furnaces for case-hardening purposes, there is no doubt that some are more convenient than others, yet with any kind of furnace, when the same medium is used and same uniform temperature and time observed, the results will be equally good. In the shops I have charge of we use the style of furnace in use in most railroad shops; inside dimensions 8 feet x 2 feet x 6 inches, built of fire brick, incased with old tank plates, and three 3-inch perforated pipes running through the bottom lengthwise. We use coke as fuel. Our boxes are cast iron, 10 inches x 10 inches x 36 inches for motion work; for guides, etc., 12 inches x 12 inches, 60 inches to 70 inches in length. We pack in the customary way, alternating layer after layer of raw bone and the iron, placing cast lid on the box and seal with fire-clay. We also insert two test pieces of $\frac{3}{4}$-inch diameter iron through the end of the box, and withdraw one at five hours, the other at six hours after placing box in furnace. We then know the temperature of contents of box, and date our time limit accordingly. We quench in water, tank 42 inches diameter by 6 feet long, let in the ground level with floor line, with inlet pipe at bottom end and overflow pipe at top.

[The conclusion of this report on Case Hardening, as presented by the Chairman, Mr. A. W. McCaslin, will be printed in the October issue—EDITOR.]

A Few Arguments for New Tools.

Are you progressive about new tools, or are you doing your work by "main strength and awkwardness"? There are mighty few mechanics who can get along these days with the tools of their grandfathers. In the first place there is the saving in time which comes from improved tools, and time is money. New tools and machinery take much of the hard labor from a man, and especially is this true of power in the shop. New tools enable the smith to turn out more work and better work. They are one of the best kinds of an advertisement to draw new trade, for customers seek and patronize the up-to-date, progressive man. There are men who work hard, early and late, but who look upon improved tools and labor-saving machines as useless, new-fangled things, and then wonder why their industry is not better rewarded.

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QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

A Question of Emery—What is the best way to put emery on a cloth polishing wheel? W. M. Exline.

A Good Side Line—We handle farm machinery on the side, and find it a very paying business. The blacksmith is naturally adapted for this line, and all made is clear gain. A. W. Strong.

Lack of Apprentices—There are five shops in this town in Minnesota and not one apprentice. Can anybody tell why this is—why the number of apprentices to the trade is steadily decreasing? H. W. Strong.

Tempering Mill Picks—In reply to J. F. Tramor, as to tempering mill picks or axes, would say that if he will take a half barrel of rain water, a half bushel of salt, a quarter pound of salt petre, and draw the temper to pigeon blue and cool in the same water, I think he will have no trouble in tempering axes, mill picks, butcher knives and so forth. Ira A. Munson.

Foot Power Machinery—In answer to G. P. Blanchard's question as to whether it would pay to have foot power machinery, I would say yes, certain kinds of machines pay. For instance a band saw will pay, you can rip, cross cut and circle cut. Also a small lathe and emery stand I have found profitable for foot power. I have gone through the mill starting with foot power and afterwards using other power for many years. I have a Weber Gas Engine, which as a rule does very well, but sometimes it goes on strike, but I am getting better acquainted with the mechanism, so I have less trouble than at first. J. H. Jensen.

Cutting and Preserving Wood—A good way of preserving wood is to cut it between August and October. Remove all the branches, leaving only the leaves at the top. Carefully cut or saw the trunks, so that the pores remain open, and place them upright in tanks of water into which has been thrown about one pound of cupric sulphate for 12 gallons of water. A. C. S.

A Few Remarks on Prices—I think we are very much in need of a Lien Law. I am in favor of the union of all blacksmiths and horseshoers, for mutual protection, and to restore prices, at least, to a living basis. Think of it! Hired labor $3.00 a day,—Piedmont coal $16.00 per ton, and 16-inch plow shares only 15 cents each. This shows something of our present condition. I hope we shall meet with success in securing protection. B. F. Dougherty.

How Build a Varnish Room?—I desire to know how a varnish room should be built for the use of a jobbing shop painter, where it is necessary to paint from five to eight buggies at a time. I have a shop 25 feet by 40 feet, two stories high. I have used the upper floor for a paint shop, but I find that I need a varnish room too. Will some brother smith advise me how large it should be, and how much light it should have, also, how it should be planned and equipped? C. D. Briddell.

A Shaper—Will some one who has a shaper for shaping wagon felloes and buggy rims kindly let me know through these columns how the same is made? I will be glad to give any brother smith the necessary information to make a forty-inch drill press self feed, also a band saw, if desired.

With regard to the question as to whether foot power machinery pays, would say that it does not. Buy a Dempster gasoline engine, six horse-power, and then the machinery. Buy a Barnes Lathe 5½x7-foot bed, and then you can make the rest of your machinery all right. W. M. Exline.

A Number of Questions—I should like to know a good and easy method of making a die to forge tumblers for gun locks, one that does not have to be filed so much before it will fit.

What is the best way to drill into the end of a rod to keep the hole straight in order to make screw joints in rods and tool handles?

Also what is the best way to make a die for forging adjustable boxes or bearings, so that they can be adjusted when the shaft or spindle has too much play?

I am interested in machinery, and as some of The American Blacksmith's readers have made some machinery, I think some one will answer my questions. Wm. Duff.

A Question from California—We have the latest improved machinery, including a Champion blower No. 400, which gives good satisfaction, a Champion drill, No. 7, a Western Chief drill, a Champion Columbian tire bender, No. 1, a Stoddard tire upsetter No. 2, and a Champion Star vise axle upsetter and welding machine No. 2.

Our line of work here is horseshoeing, new wagon work and repairing of all kinds, the most important being the making of steel wedges for logging in red woods. We make both wedges and sledges. They must be tempered to stand at least two or three years without seeing a mark. The wedges are made of 8½ by 1¾-inch iron. Please let me know what horsepower it would take to drive the hammer and what kind of hammer would be best for this work. Emil Seman.

A Useful, Simple Recipe.—For granite tools, that is, tools or chisels used by granite or marble workers for cutting inscriptions on tombstones, the following recipe is especially good: When dressed, heat to a red heat and harden in the following solution: one gallon of soft water and four ounces of salt. Draw the temper to straw color.

When a man understands these tools it is easier to prepare them. They require an unusual hardness. The hammer used in cutting is very small, and the blow very light, therefore, it will stand a high heat and temper. The chisels should be very thin for this work. When dressed and ready to harden heat to a red heat. W. Z. M.

Cutting Timber—I will give my experience as to the proper time of the year to cut timber, such as hickory, ash and oak, the principal timbers used in wheel work. This is in the spring, just when the leaves are opening, say the size of a squirrel's foot. Cut your trees and let them lie a month at which time the leaves will have enlarged, drawing all the sap out of the trunk. Next cut up, saw and pile in a dry place where the wind can blow through. You will be surprised when working to find no trace of borers. It is a mistaken idea to think the sap ever goes out of timber. Whoever tries this method will find tougher timber and much more durable, the first cause of decay having been removed and its life lengthened. John Dowswell.

Contraction.—In most cases only one side is contracted and therefore just the contracted side must be expanded. As a general rule the toe is wide enough, and if both sides are contracted they want to be spread just at the heel or as far as it is contracted. Now M. Koepplinger's plan in July paper expands it all around.

I use a Burden horseshoe and punch extra holes in the heel part, then I make the shoe a little weaker where the hoof starts to turn under. Sometimes between the second and third nails from the heel, sometimes between third and fourth. Take a good deep hold with the heel nails, and when the shoe is driven on, spread with a tongue or spreader till the horse flinches. I trim all the bad hoof off the contracted side and raise the shoe on that side either with leather or a high heel so as to make the horse stand level. I had sixteen years experience and for the last three years have been treating contraction this way. With three times shoeing the hoof will be all right. If one side is contracted you can burn the other side a little with a hot shoe. This will hold it back a little from growing so fast, but don't burn the contracted side. I have used this method successfully. A. H.

Words From Distant Lands—I am working on a mine in British Columbia, but I have some horses to shoe. There is also one mule. I shoe her so that I can see the outside edge of the shoe, and I have been told that I should set the shoe under the foot and then rasp the foot off some. I do not know whether I am right or wrong. If a brother smith could tell me anything about it, I should be glad. As far as The American Blacksmith is concerned, I would not be without it for anything. Horseshoeing is what I like best, and I think your books are just right as far as I can see. I have tried different things in shoeing which I saw in your paper and they have proved A 1, so I do not intend to do without it. Could you tell me of a good place where I could take a course of study on the horse's foot, and what it would cost? I saw, some time ago, some talk about a blacksmith's having papers to be a horseshoer, thus to prevent home shoeing. I think this would be the finest thing ever invented, not only to stop home shoeing, but to prevent so many so-called horseshoers from butchering the poor dumb animals' feet. Joseph McNutt.

Babbitting a Journal—In answer to A. J. K. in the July paper with regard to babbitting a journal I would give the following as my method. I would first raise the shaft up just so the babbitt would run around it. Take a piece of pasteboard and cut it out the same shape as the shaft, making the same so that it will cover the journal. To prevent the babbitt from running out, place some brick clay or putty outside of the board. If the journal is in two parts, I would do the bottom half first, and then put on the top with a piece of pasteboard strip between the journal, so that the babbitt will not run together. Bolt down tight and pour. Drill out the oil hole. Don't screw down the top on the shaft. If one piece of pasteboard is not enough, put in as many as are required to make it tight without bearing on the shaft, and you will have a good job. Heat the babbitt hot enough so that it will burn a very thin pine chip. Do not get it too hot, or it will not be a good job. Heat up your journal with some oily waste before you babbitt it and it will run better. Put on three times the thickness of the pasteboard after babbitting, and bolt tight. M Lambe.

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Tempering Rock Drills—In answer to Mr. William Curry's question with regard to tempering rock drills, would say that after the drills are sharpened, lay them down in a dry place to cool, that is, keep the bits away from the ground by putting a bar of iron under them to rest on. When ready to temper, have a clean fire, heat the steel short as possible to an even cherry red by turning the drills quite often. Take out and plunge in a bath of salt water, mixed in the proportions of two pounds of table salt to each five gallons of water. Hold the drill at an angle of about sixty degrees and stir in the water long enough until it almost stops sizzling. Then take out and put bit down in a moist place. This will keep the bit hard, while the heat above will keep the drill from getting too hard in the shank. Remember, it depends more on the heat of the drills in getting a good temper than the water. With a little practice you will find it a first-class and quick method in tempering drills, either Burleigh or single hand steel. I have worked different brands of steel; as Firth, Sanderson Bros., Canton C. & C., and some grades of Black Diamond, and tempered the same for some of the hardest rock in California, but have always had good results from the employment of the above method. WM. ANDERSON.

An Inadvertance and a Fool Blacksmith.—In my article on how to lay out an octagon, in the August number, please read wood as well or instead of "iron." When I wrote, it was not my intention to use either word, as, while it related mostly to wood, I once had to round up a square shaft for a bearing with a cold chisel and file and used the wrinkle then. Some might think I alluded to rounding up a square on the anvil in that manner which would be more than foolish. It is a good thing for the wood worker to know and it may come handy to the other fellow as it did to me.

Not long ago as I entered a smithy, my ears were offended with profane language, my nose suggested sulphur and the shop was blue. The smith was at the first one of a set of wheels to set the tire. He had ruined the felloes by trying to drive out the bolts, and cutting the bolts with a cold chisel between the felloe and tire, into which latter they were rusted fast. I asked him why he did not prick punch the heads, take the wheels to the drill and drill out the countersink and then drive the bolts out through the felloe with a punch? His first look was one of surprise, then it changed to sheepishness and then back to rage as he yelled "Fool, fool, foolish fool, — fool, — fool, why didn't I think of that?" The brimstone was too thick and I absconded. JOHN W.

A Chatty Pennsylvania Letter.— My shop is in reality the only horseshoeing shop I know of in Blair County, as I do not repair nor do I make or build wagons of any kind. I have for twenty years made it my study to interest myself in horseshoeing only, and believe I have made it a success in building up a trade, as I am well known. I have all I can do, and all the business my shop will allow. I shoe the majority of the light driving horses for track and road use. I don't want nor will I shoe plugs that require number seven or eight shoes, and would not think of shoeing a mule. I get my prices for my work which is a great item you know. We make a great many bar shoes, side and toe weight shoes. We have some very good horses here at present and in these palmy days of prosperity more good ones are coming. I do a nice and a good business in my line, could do a great deal more, but have about all we can do at all times, for which I am duly grateful and satisfied. There are in this city as well as all towns of our size blacksmiths who want to do it all, that is, do all wagon work and all kinds of work along with horseshoeing, who will sooner or later find that our branch must and will be separated from the other. Our city has nearly 50,000 population, and is seeking metropolitan airs, so of course, we must keep up with the procession, as New York, Philadelphia, Chicago, Pittsburg and a host of others all over the Union have done. B. W. STORY.

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Prices Current — Blacksmith Supplies.

The following quotations are from dealers' stock, Buffalo, N. Y., December 28, 1902, and are subject to change. No variations have occurred since last month's figures.

All prices, except on the bolts and nuts, are per hundred pounds. On bars and flats prices are in bundle lots.

Bars—Common Iron and Soft Steel.

¼ in., round or square;	Iron, $3.10;	Steel, $2.90
⅜ in., " "	" 2.70	" 2.70
½ in., " "	" 2.50	" 2.40

Flats—Bar and Band.

¼ x 1 in.,	Iron $2.50;	Steel $2.40
¼ x 1¼ in.,	" 2.40;	" 2.40
3-16 x 1½ in.,	" 2.60;	" 2.60

Norway and Swedish Iron

¼ in., round or square	$4.90
⅜ in., " "	4.50
½ in., " "	4.30
½ x 1 in.	4.30
¼ x 1½ in	4.20

Horseshoe Iron

For No. 1 shoe, ⅜ x ½ in	$3.40
For No. 2 shoe, ½ x ⅝ in	3.00
For No. 3 shoe, ⅝ x ¾ in	2.90
For No. 4 shoe, ⅝ x ⅞ in	2.90

Toe Calk Steel

½ x ⅜ in. and larger	$3.50

Spring Steel.

⅝ to 1½ in. Rounds.	Op. Hearth $4.00,	Crucible $6.00
1¼ to 6 in. by No. 4 gauge to ½ in. Flats	" 4.00,	" 6.00

Carriage Bolts. (Net Price per Hundred).

¼ x 2 in.	$0.54	⅜ x 2½ in.	$0.82
¼ x 2½ in.	.58	⅜ x 3½ in.	.96
¼ x 3 in.	.62	⅜ x 6 in.	1.31
5-16 x 2 in.	.65	½ x 4 in.	1.70
5-16 x 3 in.	.75	½ x 6 in.	2.10

Tire Bolts (Net Price per Hundred).

3-16 x 1½ in.	$0.18	¼ x 1½ in.	$0.28½
3-16 x 2 in.	.21	¼ x 2 in.	.31½
3-16 x 3 in.	.27	¼ x 3 in.	.37½

Hot Pressed Nuts. (Blanks)

¼ in.	$0.09 lb. net
⅜ in.	.06 " "
7-16 in.	.05 " "
½ in.	.04 7-10 "

NOTE.—Base prices or most common sizes are listed above. Should subscribers desire net prices upon other sizes than those given, same will be published in following issues.

FOR SALE.—Owing to poor health, I have decided to sell my blacksmith shop and tools. This is a splendid location and good trade, and good prices. W. J. SISSON, Sterling, Colo.

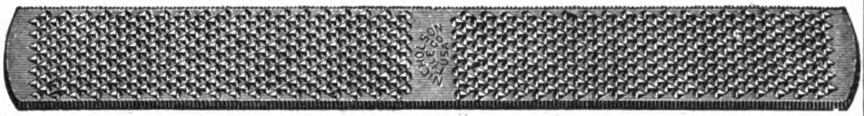
FOR SALE—For one dollar. New ideas and new methods for working steel by using Toy's hand-colored charts. Chart A explains hardening to any degree. Chart B explains scientific and plain tempering in oil, water or tallow, showing true color each tool should be and telling what it will stand. Also 40 new steel working methods on plow and machine forging, with five of the best steel welding compound receipts in use for all the new steels made. All for $1.00. Samples Free. W. M. TOY, Sidney, Ohio.

NICHOLSON FILE COMPANY

PROVIDENCE, R. I., U. S. A.,

THE K&F TRADE MARK.

MANUFACTURERS OF



FILES AND RASPS

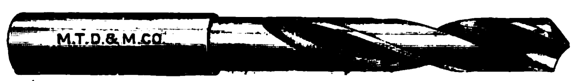
Blacksmiths Recommend our Rasps.

BECAUSE

Their Wearing Qualities Have Been Proven.

MORSE TWIST DRILL & MACHINE CO.

New Bedford, Mass., U. S. A.



A WORD TO BLACKSMITHS: We can supply you to your advantage with Drills of good quality and prices to suit. We would be glad to have your orders for such tools as we manufacture. Send for Catalogue and note the many kinds there listed.

"LOOK AT THIS"

THEN "LOOK AT THIS"

WRITE FOR PRICES

We Are Experts at Repairing Old Wrot Anvils.

COLUMBUS ANVIL AND FORGING CO., Columbus, O.

BLACKSMITHS, HORSESHOERS, WHEELWRIGHTS: If you are in sympathy with the movement described on page 74, sign and send the blank below. Send money orders, express orders or stamps, but not checks.

AMERICAN BLACKSMITHS & HORSESHOERS' ASSOCIATION,

453 WASHINGTON STREET, BUFFALO, N. Y.

Please enroll my name as in favor of securing in this State a Blacksmiths and Horseshoers' Lien Law, and other legislation favorable to the craft. I agree to use my influence personally and by correspondence with our representative in the State Legislature.

I enclose $1.00 in payment of a year's subscription, beginning February, 1903, to THE AMERICAN BLACKSMITH, the official organ of the movement. NOTE.—If you are already a paid subscriber, scratch this out.

Please send me your plans of forming local county associations.

Name and Address...

Town.............................. County.............................. State..............................

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Prices Current — Blacksmith Supplies.

The following quotations are from dealers' stock, Buffalo, N. Y., December 23, 1902, and are subject to change. No variations have occurred since last month's figures.

All prices, except on the bolts and nuts, are per hundred pounds. On bars and flats prices are in bundle lots.

Bars—Common Iron and Soft Steel.

¼ in., round or square; Iron, $3.10; Steel, $2.90
⅜ in., " " " 2.70 " 2.70
½ in., " " " 2.50 " 2.40

Flats—Bar and Band.

¼ x 1 in., Iron............$2.50; Steel...............$2.40
¼ x 1½ in., " .... 2.40; " 2.40
3-16 x 1½ in., " .... 2.60; " 2.60

Norway and Swedish Iron

¼ in., round or square.............................. $4.90
⅜ in., " " 4.50
½ in., " " 4.30
¼ x 1 in.. 4.30
¼ x 1½ in 4.20

Horseshoe Iron

For No. 1 shoe, ⅜ x ½ in.......................... $3.40
For No. 2 shoe, ½ x ⅝ in.......................... 3.00
For No. 3 shoe, ⅝ x ¾ in.......................... 2.90
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1¼ to 6 in. by No. 4
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Carriage Bolts. (Net Price per Hundred).

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NICHOLSON FILE COMPANY

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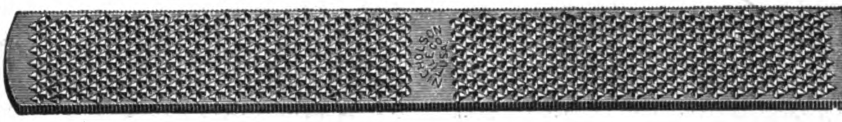
NICHOLSON.

THE K&F TRADE MARK.

MANUFACTURERS OF



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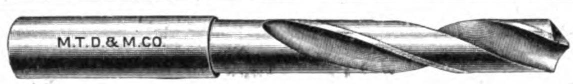

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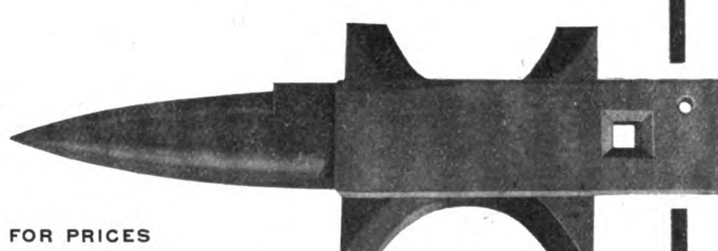

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Please send me your plans of forming local county associations.

Name and Address____________________

Town____________ County____________ State____________

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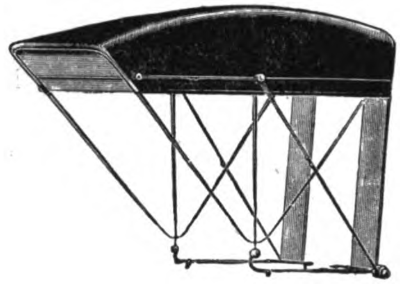
Prof. Wm. Russell

On Scientific Horseshoeing

ranks as the highest authority on the subject of shoeing. My Sixth Edition has over 550 cuts of shocs, feet and legs, and 372 pages. The value of the horse depends upon soundness of the feet and legs, and the soundness of the feet and legs depends upon the good judgment of the shoer. The man that knows where to cut and when to stop cutting is an artist in his protession, and I would say to him who has any doubt, "Beware and not cut too much, as only time can replace the damage, which means loss of money to the owner, and in many cases an early death to the horse." Every horse owner ought to have a copy to know when his horses' feet are properly balanced. Every man that shoes horses should have a copy to know how to pare the feet so as to keep them natural. No rule can be given to shoe any two horses alike, as there are scarcely any two horses shaped and gaited alike. The style and weight of shoes that would suit one horse would not be suitable for another. The long pastern horse wants to be shod with a long toe, while the short pastern horse wants to be shod with a short toe. In my experience as a practical horseshoer for 64 years, as time changes all things change, and the Farrier must keep up with the march of improvements. There is a cause for all things; first find the cause, then by removing the cause the effect ceases.

My Sixth Edition is published by the ROBERT CLARK CO., 31-35 East 4th Street, Cincinnati, Ohio. Price, $4.00. Charges prepaid.

PROF. WM. RUSSELL,
1722 FREEMAN AVENUE,
SEND FOR A COPY. *CINCINNATI, OHIO.*



Buy Carriage Tops, Seats and Trimmings of

C. A. HALLIDAY

And get goods that are O. K. as to QUALITY and STYLE. Write for 1903 Catalogue.

C. A. Halliday,
24 Cedar St., - ONEIDA, N. Y.

The Best Flux known for Welding

IRON to IRON.

STEEL to STEEL.

And MALLEABLE Iron to Steel.

SEND FOR SAMPLES (NO CHARGE), CIRCULARS, PRICE LIST, AND NAME OF NEAREST DEALER

Cherry Heat

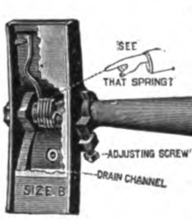
Sole Manufacturer

The Welding Compound Co.

PATERSON, N. J.

Only firm in this line awarded DIPLOMAS and GOLD MEDALS at CHICAGO EXPOSITION, 1893, and OMAHA EXPOSITION, 1896.

"Spring" Brake Blocks



For all Kinds of Vehicles, light or heavy. Wear Shoes fitting these Blocks adapted to either steel or rubber tire.

MORGAN POTTER, Sole Manufacturer,

CATALOGUES. *FISHKILL-ON-HUDSON, N. Y., U. S. A.*

THE OLD RELIABLE

Send for Free Sample and Prices

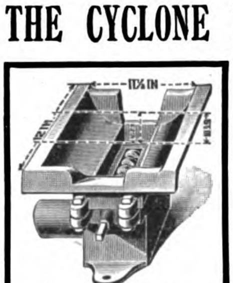
The Blacksmith's Friend.

Welds at low heat Iron to Iron, Steel to Steel, Malleable Iron to Tool Steel.

No 3 welds Axles, Springs, Steel Tire and general work—medium fine.
No. 4 for Brazing or Welding Knives, Scissors, Bow Sockets, etc.—fine.
No. 5 for Anvil Welding and heavy work—coarse. Sole Manufacturers,

The CORTLAND SPECIALTY CO.
CORTLAND, N. Y., U. S. A.

THE CYCLONE TUYERE IRON



AND COMMON SENSE FIRE BOX

IS NOT THE LOWEST PRICED, BUT THE CHEAPEST.

It will last a life time, and pay for itself in a short time. Requires no clay or plastering. Have been sold all over the United States and Canada under a guarantee and none returned. It stays and gives satisfaction. If your fire is not up-to-date, do not imagine you need a new bellows or fan, as nine times out of ten the fault is with the tuyere iron. A **Cyclone** will surprise and save you money.

Mr. Wright, of Lone Oak, Texas, tried most all makes. Did not get satisfaction until he got a Cyclone. Send for circular.

John H. Wiestner,
3556 Frankford Ave., Philadelphia, Pa.

Trade Literature and Notes.

We have just been informed that the Weber Gas & Gasoline Engine Company, Kansas City, Mo., have increased the capital stock of their incorporation from $150,000 to $200,000. This company has been engaged continuously since 1884 in the manufacture of gas and gasoline engines, and has just completed a new factory at Sheffield. They are shipping engines all over the world, recent foreign shipments going to Ecuador, Peru and Australia. The company's business in the neighboring republic of Mexico is quite extensive.

The Kalamazoo Wagon Company, Kalamazoo, Mich., sends a very tasty 24-page catalogue, illustrating and describing their handsome complete line of wagons for the season of 1902. The catalogue will well repay sending for to anyone interested in the slightest in wagons and the like.

The Columbus Anvil and Forging Company, Columbus, Ohio, sends us their folder of the "Arm and Hammer Anvil," which they state is a superior product. A handsome mailing card from the same firm sets forth an interesting line of work which is done by this company, consisting in the repair and working over of old and battered anvils. The cuts show the old anvils to be finished up as good as new.

It is a pleasure to review a catalogue so handsomely attractive as the 24-page book which the Columbus Machine Company, Columbus, Ohio, have just sent us, describing their portable, stationary and electric types of Columbus Gas and Gasoline Engines. The catalogue will repay sending for by any interested in the subject of gas engines.

Ernest G. Smith, Columbia, Pa., sends us his neat 16-page booklet showing his Vernier calipers, levels and other tools, making a very interesting catalogue.

A 12-page catalogue from Geo Sears & Company, Clinton, Pa., treats fully of the punches, shears and bar cutters, their construction, operation and advantages.

From the Carl Anderson Company, Chicago, Ill., comes a neat catalogue, illustrating the "Gus" gasoline engine and various applications to which the same may be put. This is a very interesting catalogue.

A 4-page folder from A. A. Wood & Sons Company, Atlanta, Ga., sets forth the many advantages of their hollow augers and spoke shaves, which tools appeal strongly from many points to the carriage woodworker

A 64-page catalogue which has just come to hand from the E. F. Reece Company, Greenfield, Mass., shows their improved bolt cutter, screw plates, tap and die holder, etc., for blacksmiths' use, and is a book which all blacksmiths could send for to advantage.

The Columbia Carriage Company, Hamilton, Ohio, sends us one of the handsomest catalogues which has come to this office for many days, and illustrates the big line of carriages which this company places upon the market.

The Steel Wheel and Wagon Company, Pueblo, Colo., have issued a handsome catalogue, showing their line of heavy wagons, and will well repay sending for. This concern manufactures steel wheels, steel wagons, steel gears and steel wagon beds.

A 32-page booklet of the International Steel and Machinery Company of New York City deals with the various grades of tool steel manufactured by this company, indicating also what each brand is

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suitable for, together with instructions for the treatment of the same.

Bittenbender & Company, Scranton, Pa., sends a very comprehensive 300-page catalogue fully illustrating and describing the large and complete line of supplies and heavy hardware for blacksmiths and wagonmakers—a very interesting book.

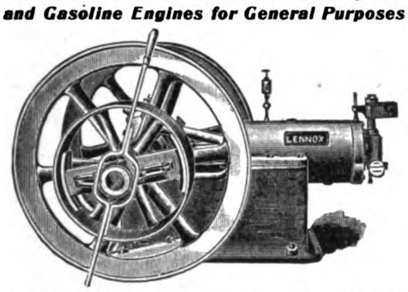
The Havana Metal Wheel Co., of Havana, Ill., informs us that since their disastrous fire of last September, they have re-arranged their full factory equipment, adding new and special machinery for the manufacture of High Grade Agricultural Steel Shapes, of which they make the "Crescent" brand. Their goods are regarded with much favor where fine quality, shape and finish are recognized.

KICKING, Balking, Shying or any kind of a habit cured in a few hours by my system. Particulars free.

PROF. JESSE BEERY, Pleasant Hill, Ohio.

Lennox Machine Co.

Manufacturers of the Lennox Stationary Gas and Gasoline Engines for General Purposes



Complete Blacksmith Power Outfits. Shafting, Hangers, Pulleys, Belting and Emery Stands.

WRITE FOR ESTIMATES

LENNOX MACHINE COMPANY

101 9th Ave., MARSHALLTOWN, IOWA

Leather Aprons

For the Jobbing Trade.

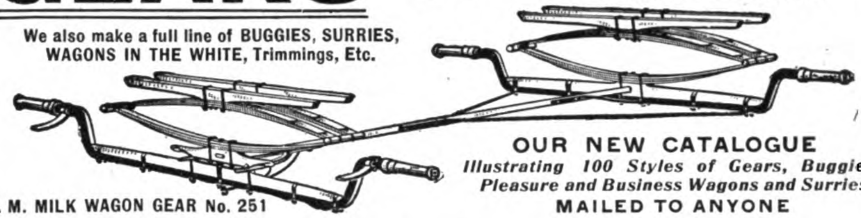
Samples of Leather and prices on application

The Hull Bros. Co.

Danbury, Conn.

GEARS—50 DIFFERENT STYLES FOR BUSINESS, SURREY AND PLEASURE WAGONS

We also make a full line of BUGGIES, SURRIES, WAGONS IN THE WHITE, Trimmings, Etc.



O. M. MILK WAGON GEAR No. 251

OUR NEW CATALOGUE *Illustrating 100 Styles of Gears, Buggies, Pleasure and Business Wagons and Surries* MAILED TO ANYONE

SCHUBERT BROS. GEAR CO.

ONEIDA, N. Y.

Cutters and Sleighs of All Kinds.

THIS is our twenty-third season of manufacturing sleigh goods, and we have a more complete assortment of up-to-date styles this season than ever before.

We are offering special inducements in the way of low prices for orders placed during the next thirty days.

Write for catalogue and price-list.

We can also furnish you some bargains in the carriage line, as we have a stock on hand that must be closed out to make room for our extensive line of cutters and sleighs.

This is a rare opportunity, and if interested we would be glad to mail you catalogue and prices.

KALAMAZOO WAGON CO.

BOX 305. KALAMAZOO, MICH.

TO REMIND YOU.

The **BUFFALO ELECTROTYPE** *AND* **ENGRAVING CO.**

PHONE US. Seneca 1344

COR. S. DIVISION & ELLICOTT STS. BUFFALO N.Y.

MAPS, DIAGRAMS & CHARTS.

MAKES EVERY KIND OF PLATE FOR PRINTING USE

HALF-TONE, ZINC ETCHING, WOOD & WAX ENGRAVING, ELECTROTYPES, NICKELTYPES, EMBOSSING DIES, BOX PLATES, *And* THREE COLOR PROCESS

"R. Mushet's Special Steel"

The Original Air-Hardening Steel

and STILL UNAPPROACHABLE in general excellence.

Thirty Years' Experience in Engineering Works in All Parts of the World has Proved Beyond all Doubt that this Steel is in every respect

THE BEST TOOL STEEL

YET MANUFACTURED

Uniformity of Quality in Every Bar. A Great Saving in Steel, Time and Wages, and Easy to Work.

There are no difficulties to contend with in forging R. Mushet's Special Steel into tools and no loss in reheating. The best all-round Steel.

R. Mushet's HIGH-SPEED Steel.

If a fast cutting Steel is required, this is the best and most reliable of this grade. It will do more work than any other known Steel, and every bar is uniform and free of the "Cracking" so generally a feature in steels of this grade.

The "R. Mushet's" Steels are manufactured only by **SAMUEL OSBORN & CO,** Clyde Steel & Iron Works. Sheffield, England.

Sole Representatives in the United States, Canada and Mexico:

B. M. JONES & CO.

159 Devonshire St., BOSTON. 143 Liberty St., NEW YORK.

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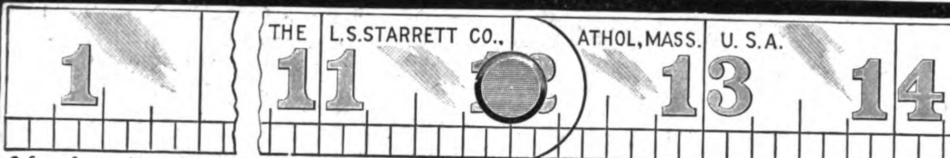


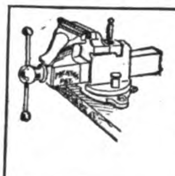
2 feet long, ¾ inches wide, folding in middle. Made of Best Quality Spring Tempered Steel

BLACKSMITHS Will find this Steel Rule just what they need. We send it post-paid for 50 cents.

Catalogue of Fine Tools Free.

The L. S. STARRETT CO.
ATHOL, MASS., U. S. A.

BARGAINS In Rebuilt Second-hand *GASOLINE ENGINES*
Good as New
Also New Gas and Gasoline Engines
GET MY PRICES
J. MONTGOMERY JOHNSTON
216 LAKE STREET - - CHICAGO, ILL.



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ALL STYLES AND SIZES FOR ALL USES
LARGEST LINE IN THE WORLD
ILLUSTRATED CATALOGUE · FREE
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Steel Stamps.
Steel Letters and Figures
Burning Brands
Stencil Dies, Stencils, &c.
GEO. M. NESS, Jr.,
61 Fulton St., N.Y.

The New and Modern Method of WELDING STEEL IS BY USING MONARCH WELDING COMPOUND

It unites readily and makes perfect welds of Tool or Cast Steel under any conditions. Used the same as borax, though far superior and cheaper. Samples free to convince you.

W. M. TOY, - - SIDNEY, OHIO.

Climax Welding Compound

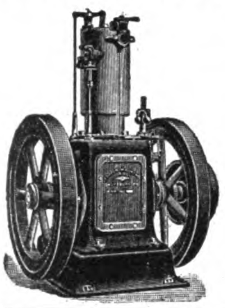
Welds all kinds of Steel as easily as Iron

Sample Free

For sale by dealers in Blacksmith's Supplies.

Manufactured only by
CORTLAND WELDING COMPOUND CO.
CORTLAND, N. Y.

COOPER GAS AND GASOLINE ENGINES



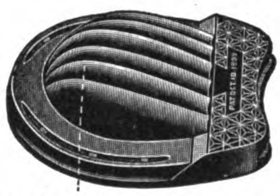
Built in Standards, Pumpers, Geared Bases, Etc.

WRITE FOR PARTICULARS

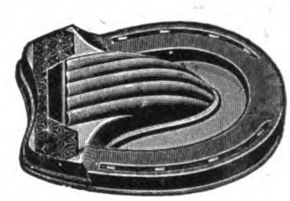
Cooper Machine Co.
Saltsburg, Pa.

Philadelphia Agents:
LOVEGROVE & CO., Inc.
143 N. Third St.
Philadelphia, Pa.

AIR CUSHION Rubber Horseshoe PADS.



Highest Award
Buffalo Expo., 1901.
"A. C." Pads cure all ordinary cases of Foot Lameness.
"TRY THEM."
No Slipping.
No Balling of Snow.
Write for Illustrated Booklet M.



SEE THAT CUSHION?
It fills with air at each step.
That's what breaks concussion.
That's what prevents slipping.
That's what keeps the foot healthy.
That's what cures lameness.

REVERE RUBBER CO., Mfrs.
BOSTON, MASS.

Engineer's License

Mechanics, Electricians, Engineers, Firemen, Etc.

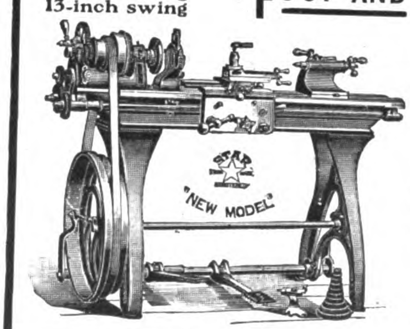
40-page pamphlet containing questions asked by Examining Board of Engineers **SENT FREE!**

GEORGE A. ZELLER, Publisher,
Room 318, 18 So. 4th St.,
St. Louis, Mo.

New 96-page Catalogue sent FREE to any part of the world.

9-inch swing
11-inch swing
13-inch swing

FOOT AND POWER "STAR" LATHES



High-grade screw-cutting engine lathes with power cross feed, either plain, compound or raise and fall rests, U. S. Standard, Whitworth or metric lead screws; also draw-in chuck, gear-cutting, milling and tapering attachments.

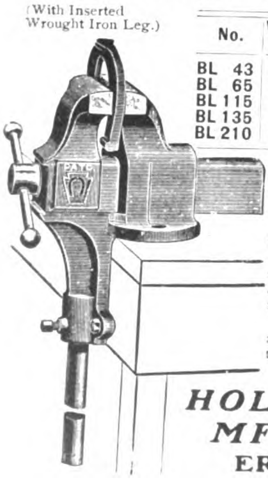
Heavy, rigid, and, above all else, accurate. Suitable for electrical and repair work, tool-makers, gunsmiths, technical schools, and any shop requiring fine, accurate work. Send for Catalogue "B."

The SENECA FALLS MFG. CO.
274 Water St., - SENECA FALLS, N. Y., U. S. A.

KEYSTONE MALLEABLE BLACKSMITH VISE.

(With Inserted Wrought Iron Leg.)

No.	Width Jaw	Opens	List
BL 43	4 in.	4 in.	$16.00
BL 65	5 in	5 in.	24.00
BL 115	6 in.	6 in.	37.00
BL 135	7 in.	7 in.	58.00
BL 210	8 in.	8 in.	90.00



Opens Parallel

Figures in first column of table indicate weight.

Strong as scientific design, with steel, wrought and malleable iron, can make it.

Any blacksmith can fit a (wrought iron) leg to this vise if it is desired.

HOLLANDS MFG. CO.
ERIE, PA.

THE CRESCENT "EVEREADY" PLOWSHARE

Extra Heavy and Smooth Upset Shin on all Plowshares.

SAVES TIME, PATIENCE AND MATERIAL

Can be fitted to plow easily, quickly. Are welded securely, point finished and fully ground and polished.

ORIGINATED AND MANUFACTURED BY
HAVANA METAL WHEEL CO., HAVANA, ILL., U. S. A.
Manufacture a full line of CRESCENT Steel Lister shares, Subsoilers, Cultivator Shovels, Landsides, Moldboards from Solid, Crucible and Genuine Soft Center Steels.
IF YOUR JOBBER DOES NOT HAVE THE CRESCENT WRITE US.
We are the Largest Manufacturers of Truck Wheels in all America

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Prices Current — Blacksmith Supplies.

The following quotations are from dealers' stock, Buffalo, N. Y., January 1, 1903, and are subject to change. No variations have occurred since last month's figures.

All prices, except on the bolts and nuts, are per hundred pounds. On bars and flats prices are in bundle lots.

Bars—Common Iron and Soft Steel

1/4 in., round or square;	Iron, $3.10;	Steel, $2.90
3/8 in., " "	" 2.70	" 2.70
1/2 in., " "	" 2.50	" 2.40

Flats—Bar and Band.

1/4 x 1 in.,	Iron $2.50;	Steel $2.40
1/4 x 1 1/2 in.,	" 2.40;	" 2.40
3-16 x 1 1/2 in.,	" 2.60;	" 2.60

Norway and Swedish Iron.

1/4 in., round or square	$4.90
3/8 in., " "	4.50
1/2 in., " "	4.30
1/4 x 1 in.	4.30
1/4 x 1 1/2 in	4.20

Horseshoe Iron.

For No. 1 shoe, 3/8 x 1/2 in	$3.40
For No. 2 shoe, 1/2 x 5/8 in	3.00
For No. 3 shoe, 5/8 x 3/4 in	2.90
For No. 4 shoe, 5/8 x 7/8 in	2.90

Toe Calk Steel.

1/2 x 3/8 in. and larger	$3.50

Spring Steel.

5/8 to 1 1/2 in. Rounds.	Op. Hearth $4.00,	Crucible $6.00
1 1/4 to 6 in. by No. 4 gauge to 1/2 in. Flats	" 4.00,	" 6.00

Carriage Bolts. (Net Price per Hundred).

1/4 x 2 in.	$0.54	3/8 x 2 1/2 in.	$0.82
1/4 x 2 1/2 in.	.58	3/8 x 3 1/2 in.	.96
1/4 x 3 in.	.62	3/8 x 6 in.	1.31
5-16 x 2 in.	.65	1/2 x 4 in.	1.70
5-16 x 3 in.	.75	1/2 x 6 in.	2.10

Tire Bolts (Net Price per Hundred).

3-16 x 1 1/2 in	$0.18	1/4 x 1 1/2 in	$0.28 1/2
3-16 x 2 in	.21	1/4 x 2 in	.31 1/2
3-16 x 3 in	.27	1/4 x 3 in	.37 1/2

Hot Pressed Nuts. (Blanks).

1/4 in.	$0.09 lb. net
3/8 in.	.06 " "
7-16 in.	.05 " "
1/2 in.	.04 7-10 "

NOTE.—Base prices for most common sizes are listed above. Should subscribers desire net prices upon other sizes than those given, same will be published in following issues.

WANTED AND FOR SALE.

WANTED—A blacksmith, either a married or single man. Wm. R. QUIMBY, Peapack, N. J.

WANTED—A good horseshoer or floorman. Good pay and steady work. JOSEPH GEYER, Elma Center, New York.

WANTED—An all-around blacksmith to run shop for half income. I furnish stock. D. M. BARNES, Tracy, Ind.

FOR SALE—A second-hand 2,000-pound Bell Steam Hammer in good condition. COLEMAN BRASS & IRON WORKS, Elmira, N. Y.

FOR SALE—On easy terms if sold at once, one of the finest stone Blacksmith and Horseshoeing shops in the state in fine growing town. Owner wishes to retire from blacksmithing. A. G. BIMSON, Berthoud, Colo.

FOR SALE—Shop and tools in first-class location, with good prices. Those interested should write me about terms and business done the last three years. Am going into other business. W. H. EXLEY, Palmyra, Neb.

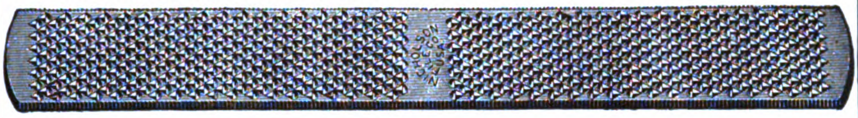
FOR SALE—For one dollar. New ideas and new methods for working steel by using Toy's hand-colored charts. Chart A explains hardening to any degree. Chart B explains scientific and plain tempering in oil, water or tallow, showing true color each tool should be and telling what it will stand. Also 40 new steel working methods on plow and machine forging, with five of the best steel welding compound receipts in use for all the new steels made. All for $1.00. Samples Free. W. M. TOY, Sidney, Ohio.

Are there **LAWN MOWERS** in your Section?

If so, you should grind them. With power and one of my grinders in your shop you could control the business in your section. Prices, $75, $150 and $225. C. R. ZACHARIAS, Asbury Park, N. J.

NICHOLSON FILE COMPANY

NICHOLSON. PROVIDENCE, R. I., U. S. A., MANUFACTURERS OF THE K&F TRADE MARK.

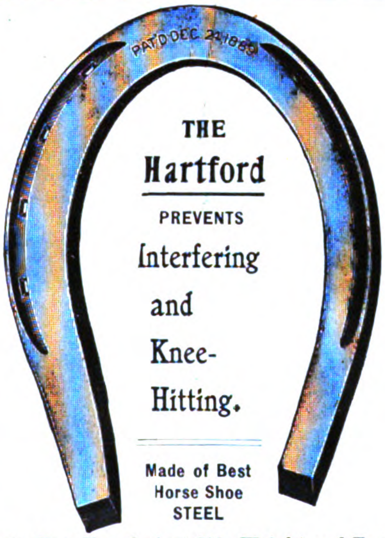


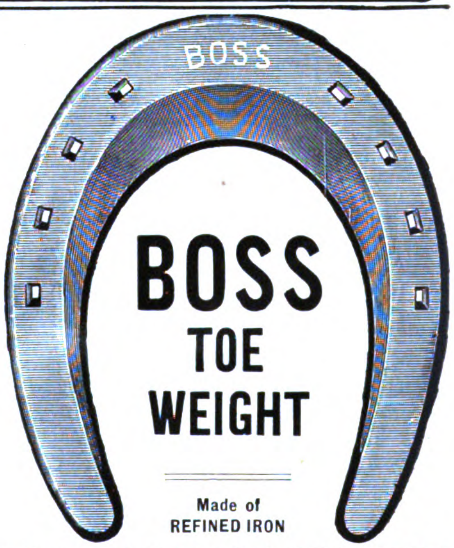
FILES AND RASPS

Blacksmiths Recommend our Rasps.

BECAUSE

Their Wearing Qualities Have Been Proven.



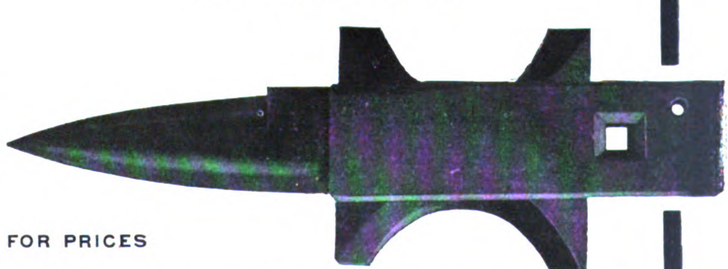


Do You Use the best Side Weight and Toe Weight Shoe made in this country? **If Not, Why Not?** They cost you less labor and money and are superior to a hand made shoe. Carried by all leading jobbers. Sample pair of either size or weight mailed postpaid on receipt of 50 cents. We make four sizes Nos. 1, 2, 3, 4. Three weights—Track, Medium, and Heavy.

THE SIDE WEIGHT HORSE SHOE CO.
MECHANIC STREET, HARTFORD, CONNECTICUT.

"LOOK AT THIS"

THEN "LOOK AT THIS"



WRITE FOR PRICES

We Are Experts at Repairing Old Wrot Anvils. *COLUMBUS ANVIL AND FORGING CO., Columbus, O.*

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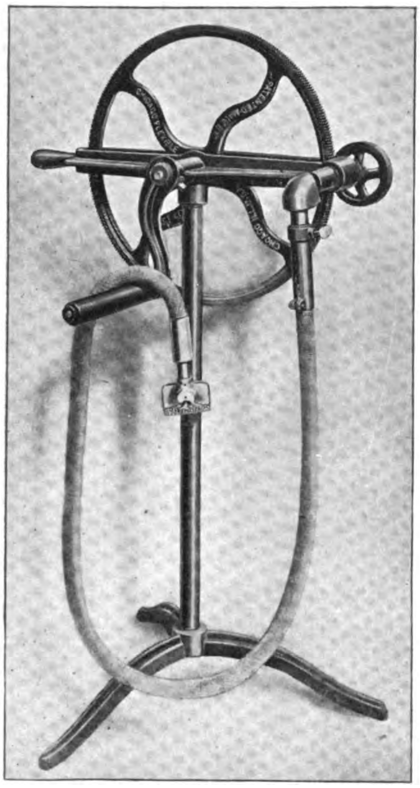
Horse Clipping Machines.

A few years ago the benefits of clipping were not widely known, but to-day every progressive farmer and horse dealer knows that the natural process of shedding the hair is a draft on the vitality of the animal, and that a clipped horse looks cleaner, requires less food, and is not so liable to take cold as one with long hair.



A LATE MODEL CLIPPING MACHINE.

The clipping machine, shown by the accompanying illustration, is simple, strong and compact. It is a new design, using cut gears in place of belts, and unlike former machines, can be turned with either right or left hand. This machine runs lightly and without noise, and a boy can turn the crank steadily without tiring. The knife is dustproof and guaranteed to be of superior construction and quality by the manufacturers, the Chicago Flexible Shaft Company, Chicago, Ill.

New Publications.

Hardening, Tempering, Annealing and Forging of Steel, by Joseph V. Woodworth. Price, prepaid, $2.50.

This is a new work treating clearly and concisely on modern processes for Heating, Annealing, Forging, Welding, Hardening and Tempering of Steel. It is a book of exceptional value to metal-working mechanics, giving directions for the successful hardening and tempering of all steel tools, including milling cutters, taps, thread dies, reamers (both solid and shell) hollow mills, punches and dies, the various metal-working tools, shear blades, saws, fine cutlery, metal-working and metal-cutting tools, and other implements of steel both large and small. Simple and satisfactory hardening and tempering processes are described.

The uses to which the leading brands of steel may be adapted are discussed, and their treatment for working under different conditions explained, also particular methods for the hardening and tempering of special brands. There are embodied various "kinks" and practical points which contribute in making the volume a useful text-book on the modern treatment of steel.

A chapter devoted to the different processes for Case-hardening is included, and reference is made to the adoption of Machinery Steel for Tools. The illustrations will help the mechanic by showing him modern devices, machines and furnaces.

Published by N. W. Henley & Co.

Dies: Their Construction and Use, by Joseph V. Woodworth. Price, $3.00.

This work is aimed to be a complete treatise upon the Designing, Constructing and Use of Tools, fixtures and devices, together with the manner in which they should be used in the power press, for the cheap and rapid production of the great variety of sheet-metal articles now in use. It is designed as a guide to the production of sheet-metal parts at the minimum of cost with the maximum of output. The hardening and tempering of press tools and the classes of work which may be produced to the best advantage by the use of dies in the power press are fully treated.

The book was written by a skilled and successful workman and is one that die-makers, machinists, toolmakers and other metal workers cannot afford to be without.

Published by N. W. Henley & Co.

Scientific Horse, Mule and Ox Shoeing, by J. G. Holmstrom.

This is a treatise of 117 pages, adapted for veterinarians, farriers and amateur horseshoers. The book is handsomely printed, illustrated and is bound in cloth. Price, $1.00.

Published by F. J. Drake & Co.

Any or all of the above three books may be had from THE AMERICAN BLACKSMITH, prepaid, for the figures stated.

Trade Literature and Notes.

The Champion Tool Company, Conneaut Lake, Pa., manufacturers of farrier's tools, hammers, vices, tongs, hoof-parers, etc., have just issued a new catalogue, which they will be glad to mail, upon request, to any one interested.

Edmund C. Beckmann, St. Louis, Mo., informs us that he is making very advantageous offers at the present time to apron-users which would repay their communicating with him regarding the same.

Mayer Bros., Mankato, Minn., state that they ship their Little Giant Trip Hammer nearly everywhere. During the past few months their sales have nearly doubled, as hundreds of smiths have put in power and added a Little Giant Hammer. One man with one of these Little Giants can do more than two in sharpening plowshares and doing general hammering; the smith's helper has little sledging to do, and may be used on profitable work. Mayer Bros. state that each hammer is thoroughly tested before leaving the factory, and that it will soon pay for itself in saving of labor.

Acme Tongs Company, 110 No. Kedzie Avenue, Chicago, Ill., send us a pamphlet of their Acme Adjustable Blacksmith Tongs, for which are claimed, among other things, that one pair will do the work of a dozen ordinary tongs, and that they are quickly and perfectly adjustable, are always at hand and will stand the same heat and abuse that ordinary tongs will.

Cray Brothers, Cleveland, Ohio, sent us their complete 192-page catalogue of carriage and wagon materials and tools. It shows a remarkably complete line of goods filling every requirement of the blacksmith and carriage shop and it will well repay sending for.

A neat little 10-page catalogue describes clearly and in detail the line of forges made by H. L. Chapman, Marcellus, Mich. Interesting folders describe the foot power emery grinding machines also made by him.

"R. Mushet's Special Steel"
The Original Air-Hardening Steel
and STILL UNAPPROACHABLE in general excellence.
Thirty Years' Experience in Engineering Works in all parts of the World has proved Beyond all Doubt that this Steel is in every respect
THE BEST TOOL STEEL
YET MANUFACTURED
Uniformity of Quality in Every Bar. A Great Saving in Steel, Time and Wages, and Easy to Work. There are no difficulties to contend with in forging R. Mushet's Special Steel into tools and no loss in reheating. The best all-round Steel.
R. Mushet's HIGH-SPEED Steel.
If a fast-cutting steel is required, this is the best and most reliable of this grade. It will do more work than any other known steel, and every bar is uniform and free of the "Cracking" so generally a feature in steels of this grade.
The "R. Mushet's" Steels are manufactured only by SAMUEL OSBORN & CO, Clyde Steel & Iron Works. Sheffield, England.
Sole Representatives in the United States, Canada and Mexico:
B. M. JONES & CO.
159 Devonshire St., BOSTON. 143 Liberty St., NEW YORK.

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Prices Current — Blacksmith Supplies.

The following quotations are from dealers' stock, Buffalo, N. Y., February 27, 1908, and are subject to change. No variations have occurred since last month's figures.

All prices, except on the bolts and nuts, are per hundred pounds. On bars and flats prices are in bundle lots.

Bars—Common Iron and Soft Steel

¼ in., round or square;	Iron, $3.10;	Steel, $2.90
⅜ in., " "	" 2.70	" 2.70
½ in., " "	" 2.50	" 2.40

Flats—Bar and Band.

¼ x 1 in.,	Iron $2.50;	Steel $2.40
¼ x 1½ in.,	" 2.40;	" 2.40
3-16 x 1½ in.,	" 2.60;	" 2.60

Norway and Swedish Iron.

¼ in., round or square	$4.90
⅜ in., " "	4.50
½ in., " "	4.30
¼ x 1 in.	4.30
¼ x 1½ in	4.20

Horseshoe Iron.

For No. 1 shoe, ⅜ x ½ in	$3.40
For No. 2 shoe, ½ x ⅝ in	3.00
For No. 3 shoe, ⅝ x ¾ in	2.90
For No. 4 shoe, ⅝ x ⅞ in	2.90

Toe Calk Steel.

½ x ⅜ in. and larger	$3.50

Spring Steel.

⅝ to 1½ in. Rounds.	Op. Hearth $4.00,	Crucible $6.00
1¼ to 6 in. by No. 4 gauge to ½ in. Flats	" 4.00,	" 6.00

Carriage Bolts. (Net Price per Hundred).

¼ x 2 in.	$0.54	⅜ x 2½ in.	$0.82
¼ x 2½ in.	.58	⅜ x 3½ in.	.96
¼ x 3 in.	.62	⅜ x 6 in.	1.31
5-16 x 2 in.	.65	½ x 4 in.	1.70
5-16 x 3 in.	.75	½ x 6 in.	2.10

Tire Bolts. (Net Price per Hundred).

3-16 x 1½ in.	$0.18	¼ x 1½ in.	$0.28½
3-16 x 2 in.	.21	¼ x 2 in.	.31½
3-16 x 3 in.	.27	¼ x 3 in.	.37½

Hot Pressed Nuts. (Blanks).

¼ in.	$0.09 lb. net
⅜ in.	.06 " "
7-16 in.	.05 " "
½ in.	.04 7-10 "

NOTE.—Base prices for most common sizes are listed above. Should subscribers desire net prices upon other sizes than those given, same will be published in following issues.

WANTED AND FOR SALE.

WANTED—An all-around blacksmith to run shop for half income. I furnish stock.
D. M. BARNES, Tracy, Ind.

WANTED—By a young man, situation as a helper; 2 years' experience in general shop.
P. O. Box 237, Lindsborg, Kan.

FOR SALE—On easy terms if sold at once, one of the finest stone Blacksmith and Horseshoeing shops in the state in fine growing town. Owner wishes to retire from blacksmithing.
A. G. SIMSON, Berthoud, Colo.

FOR SALE—My shop and tools complete. Best location in the San Luis Valley. Cause for selling, going into the implement business. For particulars write W. F. SMITH, Hooper, Colo.

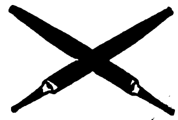
FOR SALE—A full set of working drawings for building a modern type of Gasoline Engine, in six sizes, 4, 6, 8, 10, 12 and 15 H. P. Cuts of the engine furnished on application. Address
MANUFACTURER, care
AMERICAN BLACKSMITH CO., Buffalo, N. Y.

FOR SALE.—Cheap. New treatise on Steel, Welding and Forging all the new steels, and welding compounds for same. Also Thermite welding explained, with seventy-five new steel working methods and recipes. Also two-colored scientific Tool Tempering Charts, A and B. All the above for one dollar. Samples free. Anyone having bought my recipes can have the new treatise for 25 cents in stamps.
W. M. TOY, Sidney, Ohio.

CUMMINGS & EMERSON,
Blacksmith and Wagon Makers' Supplies,
PEORIA, ILL.

Newton's Heave, Cough, Distemper and Indigestion Cure. A veterinary specific for wind, throat and stomach troubles. Strong recommends. $1 per can. Dealers, mail or Ex. paid.
Newton Horse Remedy Co.
(3) Toledo, Ohio.

NICHOLSON FILE COMPANY

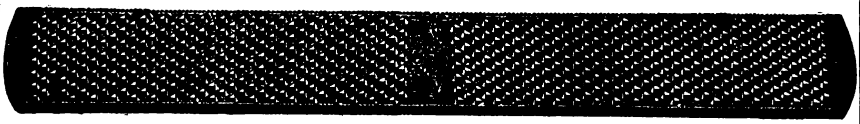


NICHOLSON.

PROVIDENCE, R. I., U. S. A.,

MANUFACTURERS OF

THE K&F TRADE MARK.



FILES AND RASPS

Blacksmiths Recommend our Rasps.

BECAUSE

Their Wearing Qualities Have Been Proven.

Hand Forged Butcher Knives

Ground, Tempered and all ready for the handles, either round or riveted, for ***15 cents each*** or ***$1.50 a dozen.*** All sizes from 5-inch to 8-inch. These Blades are made from Sanderson Steel and ***warranted.*** Will replace any imperfect knife with two new ones. Handles all ready to put on, ***one cent each.*** . . . .
Try a sample. ***Hundreds of 'Smiths are using these blades and make money and friends selling them. Liberal discount in quantities. Address*** . . . . . .

WOODWORTH KNIFE WORKS, - NUNDA, N. Y.
ESTABLISHED IN 1876.

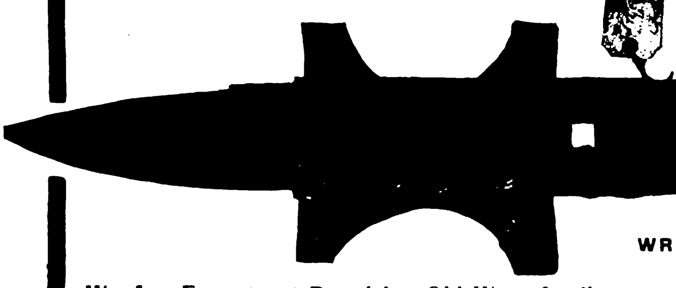
Morse Twist Drill & Machine Co.

NEW BEDFORD, MASS., U. S. A.

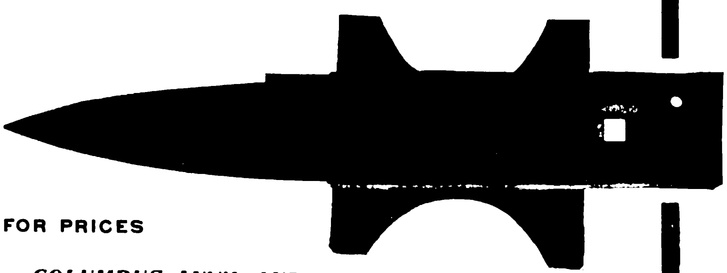
Makers of Arbors; Beach, Stetson and Centre Drill Chuck; Counterbores and Countersinks.

Increase Twist and Constant Angle Drills; Dies; Gauges; Mandrels; Metal Slitting Saws; Milling Cutters; End Mills; Taper Pins; Reamers, with and without Oil Holes; Screw Plates with Dies; Sockets; Sleeves; Taps and Tap Wrenches.

"LOOK AT THIS"



THEN "LOOK AT THIS"



WRITE FOR PRICES

We Are Experts at Repairing Old Wrot Anvils. ***COLUMBUS ANVIL AND FORGING CO., Columbus, O.***

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Trade Literature and Notes.

ANYONE INTERESTED in Gas Engines or thinking of installing power in his shop, would be more than repaid by sending for the catalogue just issued by the Weber Gas and Gasoline Engine Co., P. O. Box V1114, Kansas City, Mo. Its 72 pages are full of excellent illustrations, interesting facts and convincing testimonials. The advantages of gas engine power are well set forth. A handsome and complete catalogue. Sent on receipt of postal.

The above company are building four distinct types of engines, and a large range of sizes.

A very attractive catalogue is the "Red Book" (already widely advertised) of the Fort Wayne Iron Store Company, 1117 Calhoun St., Fort Wayne, Ind. Its 267 pages, with price lists and illustrations, detail the Company's stock of iron, steel, wagon and carriage hardware, wood stock and carriage trimmings, for the year 1903. On page XII this firm makes a special offer.

The Lawrence-Williams Co., Cleveland, Ohio, send us their neat little folder and testimonial cards, relating to Gombault's Caustic Balsam for both horse and human ailments.

Goodell-Pratt Co., Greenfield, Mass., have sent us their handsome catalogue, No. 6, of 128 pages, with descriptions and engravings of their large range of tools. An unusually interesting book of its kind. Free on request.

A new catalogue of Cray Brothers, Cleveland, Ohio, will be ready about March 15th, showing a complete line of tools and all kinds of supplies for blacksmiths. We are informed that the catalogue will be sent free of charge upon request, and that the information contained therein will make it well worth sending for. See page XII.

The Selle Gear Company, Akron, Ohio, send us their latest complete catalogue, a neat booklet of 120 pages, illustrating, listing and describing their spring wagon gears and wagon specialties. The catalogue gives a great many specifications for gears, particularly platform gears of different carrying capacity, ranging from 1-inch axles to the heaviest merchandise trucks, and will be found a very valuable guide to the wagon maker in this class of work.

A very valuable booklet has been issued by the Nicholson File Company of Providence, R. I. "File Filosophy" it is called, and it certainly contains some very solid "filosophy" concerning files of every class and description—how to use them. how to clean them and the names of different kinds with illustrations of each. This booklet is to be had of the above company for the asking.

Bryden Horse Shoe Company, Catasauqua, Pa., manufacturers of shoes, plates, ribbed steel, etc., have just forwarded their revised trade price list, taking effect February 1st.

We have been informed that the Bauer Carriage Goods Company, at 937-941 West Eighth Street, Cincinnati, Ohio, manufacturers of buggy tops, cushions and backs and all kinds of carriage trimmings, has recently changed their firm style and will in the future do business under the name of Bauer Brothers Manufacturing Company.

The Chicago Flexible Shaft Company, Chicago, Ill., sends a handsome and elaborate 64-page catalogue, illustrating and describing completely their line of Stewart Gas Furnaces, adapted for illuminating gas, natural gas or gasoline, and outlining their convenience and advantages. The same catalogue shows the Flexible Shaft made by this company and its various applications.

The new Sweet Tire and Rubber Company, of Batavia, N. Y., has been recently organized and incorporated with the following officers: Frank Richardson, president; A. W. Caney, vice-president; John M. Sweet, secretary and George E. Perrin, treasurer.

Work at the company's new plant at Batavia is progressing speedily. All of the machinery has been shipped and considerable has arrived. The special foundations for the large rubber machines have been completed. The officers expected to move into their offices at the plant last month.

Special Offer for March

TO INDUCE Blacksmiths, Horseshoers and Wheelwrights, who do not know THE AMERICAN BLACKSMITH, to become acquainted with the paper and read it regularly, we make the following special offer:

For $1.00 we will send—

The American Blacksmith for one year.
A Copy of "The Village Smithy," and
A Premium—A Hoof Knife or a Pocket Level.

DO NOT MISS "The Village Smithy"

IT IS a beautiful and faithful reproduction in twelve colors of a valuable picture painted expressly for us by Raphael Beck. It will be sent to all subscribers with our fine April number. A handsome picture for framing. If not a paid subscriber, take advantage of the above liberal offer while it lasts. Send $1.00 now so you won't miss "The Village Smithy."

And You Get Your Choice of Two Premiums—

A strong, serviceable Farrier's Hoof Knife, Crucible Steel and Bone Handle.
OR
A Handy and Dandy 3½-inch Pocket Bench Level, Neat and Useful.

NOTE.—Send us two new subscribers and get a good serviceable gold fountain pen as a premium. Include your own name as one if not already a subscriber.

You Will Find that THE AMERICAN BLACKSMITH itself is the **biggest dollar's worth** that goes into your shop. **Twenty pages of** solid **reading** matter **guaranteed** each month from the brightest writers of the craft. No trade puffs or stale clippings. Read on page 111 what we are doing for the craft. We are going to get 30,000 subscribers this year—will you be one of them?

When sending subscriptions, state premium desired. Send money by Registered Letter, Express Order, Stamps, or Money Order, but not checks.

American Blacksmith Company

P. O. Drawer 974 **Buffalo, N.Y. U. S. A.**

"R. Mushet's Special Steel"

The Original Air-Hardening Steel

and STILL UNAPPROACHABLE in general excellence.

Thirty Years' Experience in Engineering Works in all parts of the World has proved Beyond all Doubt that this Steel is in every respect

THE BEST TOOL STEEL

YET MANUFACTURED

Uniformity of Quality in Every Bar. A Great Saving in Steel, Time and Wages, and Easy to Work. There are no difficulties to contend with in forging R. Mushet's Special Steel into tools and no loss in reheating. The best all-round Steel.

R. Mushet's HIGH-SPEED Steel.

If a fast-cutting steel is required, this is the best and most reliable of this grade. It will do more work than any other known steel, and every bar is uniform and free of the "Cracking" so generally a feature in steels of this grade.

The "R. Mushet's" Steels are manufactured only by **SAMUEL OSBORN & CO.**, Clyde Steel & Iron Works. Sheffield, England.

Sole Representatives in the United States, Canada and Mexico:

B. M. JONES & CO.

159 Devonshire St., BOSTON. 143 Liberty St., NEW YORK.

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Prices Current — Blacksmith Supplies.

The following quotations are from dealers' stock, Buffalo, N. Y., April 1, 1908, and are subject to change. No variations have occurred since last month's figures.

All prices, except on the bolts and nuts, are per hundred pounds. On bars and flats prices are in bundle lots.

Bars—Common Iron and Soft Steel.

¼ in., round or square;	Iron, $3.10;	Steel, $2.90
⅜ in., " "	" 2.70	" 2.70
½ in., " "	" 2.50	" 2.40

Flats—Bar and Band.

¼ x 1 in.,	Iron $2.50;	Steel..............$2.40
¼ x 1½ in.,	" 2.40;	" 2.40
3-16 x 1½ in.,	" 2.60;	" 2.60

Norway and Swedish Iron.

¼ in., round or square	$4.90
⅜ in., " "	4.50
½ in., " "	4.30
¼ x 1 in.	4.30
¼ x 1½ in	4.20

Horseshoe Iron.

For No. 1 shoe, ⅜ x ½ in	$3.40
For No. 2 shoe, ½ x ⅝ in	3.00
For No. 3 shoe, ⅝ x ¾ in	2.90
For No. 4 shoe, ⅝ x ⅞ in	2.90

Toe Calk Steel.

½ x ⅜ in. and larger	$3.50

Spring Steel.

⅝ to 1½ in. Rounds.	Op. Hearth $4.00,	Crucible $6.00
1¼ to 6 in. by No. 4 gauge to ½ in. Flats	" 4.00,	" 6.00

Carriage Bolts. (Net Price per Hundred).

¼ x 2 in	$0.54	⅜ x 2½ in	$0.82
¼ x 2½ in	.58	⅜ x 3½ in	.96
¼ x 3 in	.62	⅜ x 6 in	1.31
5-16 x 2 in	.65	½ x 4 in	1.70
5-16 x 3 in	.75	½ x 6 in	2.10

Tire Bolts. (Net Price per Hundred).

3-16 x 1½ in	$0.18	¼ x 1½ in	$0.28½
3-16 x 2 in	.21	¼ x 2 in	.31½
3-16 x 3 in	.27	¼ x 3 in	.37½

Hot Pressed Nuts. (Blanks).

¼ in.	$0.09 lb. net
⅜ in.	.06 " "
7-16 in.	.05 " "
½ in.	.04 7-10 "

NOTE.—Base prices for most common sizes are listed above. Should subscribers desire net prices upon other sizes than those given, same will be published in following issues.

CUMMINGS & EMERSON,
Blacksmith and Wagon Makers' Supplies,
PEORIA, ILL.

WANTED AND FOR SALE.

Want and for sale advertisements, situations and help wanted, twenty-five cents a line. Send cash with order. No insertions of less than two lines accepted.

WANTED—Carriage blacksmith and platform blacksmith.
COLUMBUS BUGGY CO., Columbus, Ohio.

WANTED—A reliable young man with some experience in blacksmithing. A good chance.
M. F. AMES, West Kendall, N. Y.

FOR SALE—Gasoline Engines, second-hand, rebuilt, from two to ten horse-power.
CAPITAL GAS ENGINE CO., Indianapolis, Ind.

FOR SALE—On easy terms if sold at once, one of the finest stone Blacksmith and Horseshoeing shops in the state in fine growing town. Owner wishes to retire from blacksmithing.
A. G. BIMSON, Berthoud, Colo.

FOR SALE—My shop and tools complete. Best location in Central Illinois; no competition; cause for selling—owner wishes to retire from blacksmithing. For particulars, address
T. E. LARSON, Box 45, Perdue, Ill.

FOR SALE—Blacksmith and wagon shop and residence property. Also tools and stock. Have new gasoline engine, five horse-power. Good location. No competition. Good reasons for selling. JNO. F. PINNE, Otho, Webster Co., Ia.

FOR SALE.—Cheap. New treatise on Steel, Welding and Forging all the new steels, and welding compounds for same. Also Thermite welding explained, with seventy-five new steel working methods and recipes. Also two-colored scientific Tool Tempering Charts, A and B. All the above for one dollar. Samples free. Anyone having bought my recipes can have the new treatise for 25 cents in stamps.
W. M. TOY, Sidney, Ohio.

FOR SALE—Blacksmith and Wood Shop, 36 by 46 feet, stock and tools. Ten horse-power gasoline engine, power hammer, emery grinder, grindstones, two drills, screwplates and pipe tools, two forges, bench tools, and other items. A good outfit, plenty of work for two men the year round and more in harvest. Centrally located in the best farming country in Oregon. Good prices. A good place for a good man. Retiring on account of health.
W. H. SAYER, Adams, Oregon.

NICHOLSON FILE COMPANY

NICHOLSON.

PROVIDENCE, R. I., U. S. A.,

MANUFACTURERS OF

THE K&F TRADE MARK.

FILES AND RASPS

Blacksmiths Recommend our Rasps.

BECAUSE

Their Wearing Qualities Have Been Proven.

Hand Forged Butcher Knives

Ground, Tempered and all ready for the handles, either round or riveted, for ***15 cents each*** or ***$1.50 a dozen.*** All sizes from 5-inch to 8-inch. These Blades are made from Sanderson Steel and ***warranted.*** Will replace any imperfect knife with two new ones. Handles all ready to put on, ***one cent each.*** . . . .
Try a sample. ***Hundreds of 'Smiths are using these blades and make money and friends selling them. Liberal discount in quantities. Address*** . . . . .

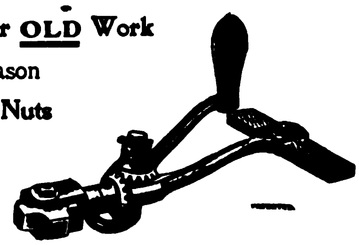
WOODWORTH KNIFE WORKS, - NUNDA, N. Y.
ESTABLISHED IN 1876.

LANG'S PATENT TIRE BOLT WRENCHES

The most CONVENIENT Wrench for NEW or OLD Work

Will save its cost many times in one season

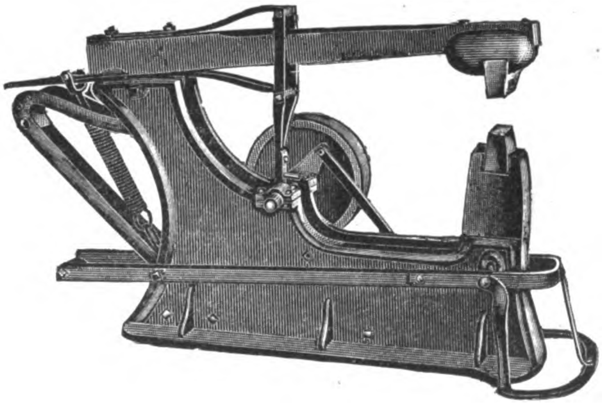
Will put on or take off QUICKLY 3/16, ¼ and 5/16 Nuts



For sale by all Heavy Hardware Jobbers, or will be sent to any part of U. S. prepaid for . . . **$1.25**

Miller Wrench Co., Fort Wayne, Ind.

BICKNELL'S POWER HAMMER



Simple in construction. Fewer parts than any other hammer, Solid forged crank shaft. Designed for carriage factories, blacksmith and machine shops. Our price will interest you. Write for catalogue of hammers, punches, shears, emery grinders, buzz planers, etc.

THE BICKNELL HARDWARE CO.
14-16 N. ACADEMY ST.,
JANESVILLE, WISCONSIN.

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SPECIAL

THE edition of "The Village Smithy" is **limited. While they last** we make the following **special offer—**

For $1.00 we will send—

The American Blacksmith for one year,
A Copy of "The Village Smithy," and
A Premium—A Hoof Knife or a Pocket Level.

THIS is to induce Blacksmiths, Horseshoers and Wheelwrights, who do not know THE AMERICAN BLACKSMITH, to become acquainted with the paper and read it regularly.

DO NOT MISS "The Village Smithy"

IT IS a beautiful and faithful reproduction in twelve colors of a valuable picture painted expressly for us by Raphael Beck. A handsome picture for framing. If not a subscriber, take advantage of the above liberal offer while it lasts. Send $1.00 now so you won't miss "The Village Smithy."

And You Get Your Choice of Two Premiums—

A strong, serviceable Farrier's Hoof Knife, Crucible Steel and Bone Handle,
OR
A Handy and Dandy 3½-inch Pocket Bench Level, Neat and Useful.

NOTE.—Send us two new subscribers and get a serviceable gold fountain pen as a premium. Include your own name as one if not already a subscriber.

A copy of THE VILLAGE SMITHY, carefully packed in a pasteboard tube, will be sent prepaid to any address, together with a sample copy of THE AMERICAN BLACKSMITH, for 25 cents

You Will Find that THE AMERICAN BLACKSMITH itself is the **biggest dollar's worth** that goes into your shop. **Twenty pages of** solid **reading** matter **guaranteed** each month from the brightest writers of the craft. No trade puffs or stale clippings. Read on page 131, what we are doing for the craft. We are going to get 30,000 subscribers this year—will you be one of them?

WHEN sending subscriptions, state premium desired. Send money by Registered Letter, Express Order, Stamps, or Money Order, but not checks.

American Blacksmith Company

P. O. Drawer 974 **Buffalo, N.Y. U. S. A.**

Trade Literature and Notes.

Wells Bros. & Company, whose handsome and striking advertisement appears on page III, have just sent us their latest

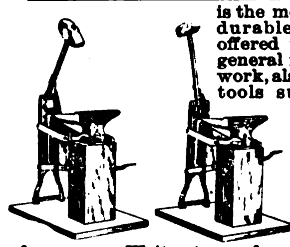
catalogue, 120 pages, of screw cutting and labor-saving tools. This firm manufactures a long and complete line of tools and appliances well known to the trade under the name "Little Giant," and intended for blacksmiths, horseshoers, wagon builders, machinists and repairmen. Thread and screw-cutting tools form a large proportion of their line; they turn out large quantities of "Little Giant" Taps, Dies, Screw Plates and Collets. The accompanying illustration indicates how these goods are turned out. The catalogue above mentioned is mailed free upon request, and is worth the asking.

Wells Bros. Company, in twenty years, have built up a large business, their factories now occupying 40,000 square feet and employing upwards of 200 men.

The Havana Metal Wheel Co., Havana, Ill., whose advertisement appears on page XXVII, sent us several interesting circulars dealing with their line of metal wheels and plow adjuncts. They desire us to inform all plow repairmen that they have lately invented a gauge for determining the proper length and angle to cut landsides on Eveready Plowshares. They are selling them for 25 cents, but furnish one free with each first order for Eveready Plowshares. Directions for using and for fitting the shares accompany each one.

G. Fred Collins has resigned his position with B. M. Jones & Co., Boston, Mass., and will be succeeded in the Eastern department of their business, on April 1st, by Richard L. Thomas, long and favorably known in the Railway Supply trade. Mr. Thomas will continue to act for the National Lock Washer Company also.

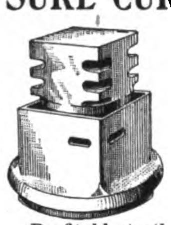
The Modern TRIP HAMMER



is the most practical and durable machine ever offered to the trade for general forging and plow work, also for striking on tools such as chisels, punches, flatters, swages, etc. It is easily operated and will strike just as light or heavy as desired, and practically will save the work of one man. Write at once for price and descriptive circular.

AUG. L. LOCKREM, Pierpont, S. D.

SURE CURE FOR WOBBLES



The Terry Patented
Extension Axle Nuts
Make an Old Buggy Run like New

Profitable to the Blacksmith and satisfactory to the User. SATISFACTION GUARANTEED.

Large saving over cost of new stubs and boxes. Trial set by mail post-paid, *$1.50;* when ordering give size of square section of axle next to wheel. Special prices for quantity lots. Descriptive Circular on application.

Stops the Rattling

PONTIAC HARDWARE SPECIALTY CO.
PONTIAC, MICHIGAN.

"R. Mushet's Special Steel"

The Original Air-Hardening Steel

and STILL UNAPPROACHABLE in general excellence.

Thirty Years' Experience in Engineering Works in all parts of the World has proved Beyond all Doubt that this Steel is in every respect

THE BEST TOOL STEEL

YET MANUFACTURED

Uniformity of Quality in Every Bar. A Great Saving in Steel, Time and Wages, and Easy to Work. There are no difficulties to contend with in forging R. Mushet's Special Steel into tools and no loss in reheating. The best all-round Steel.

R. Mushet's HIGH-SPEED Steel.

If a fast-cutting steel is required, this is the best and most reliable of this grade. It will do more work than any other known steel, and every bar is uniform and free of the "Cracking" so generally a feature in steels of this grade.

The "R. Mushet's" Steels are manufactured only by **SAMUEL OSBORN & CO,** Clyde Steel & Iron Works. Sheffield, England.

Sole Representatives in the United States, Canada and Mexico:

B. M. JONES & CO.

159 Devonshire St., BOSTON. 143 Liberty St., NEW YORK.

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Prices Current — Blacksmith Supplies.

The following quotations are from dealers' stock. Buffalo, N. Y., April 27, 1908, and are subject to change. No variations have occurred since last month's figures.

All prices, except on the bolts and nuts, are per hundred pounds. On bars and flats prices are in bundle lots.

Bars—Common Iron and Soft Steel.

¼ in., round or square;	Iron, $3.10;	Steel, $2.90
⅜ in., " "	" 2.70	" 2.70
½ in., " "	" 2.50	" 2.40

Flats—Bar and Band.

¼ x 1 in.,	Iron $2.50;	Steel $2.40
¼ x 1¼ in.,	" 2.40;	" 2.40
3-16 x 1½ in.,	" 2.60;	" 2.60

Norway and Swedish Iron.

¼ in., round or square	$4.90
⅜ in., " "	4.50
½ in., " "	4.30
¼ x 1 in.	4.30
¼ x 1½ in	4.20

Horseshoe Iron.

For No. 1 shoe, ⅜ x ½ in	$3.40
For No. 2 shoe, ½ x ⅝ in	3.00
For No. 3 shoe, ⅝ x ¾ in	2.90
For No. 4 shoe, ⅝ x ⅞ in	2.90

Toe Calk Steel.

½ x ⅜ in. and larger	$3.50

Spring Steel.

⅝ to 1½ in. Rounds.	Op. Hearth $4.00,	Crucible $6.00
1¼ to 6 in. by No. 4 gauge to ½ in. Flats	" 4.00,	" 6.00

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Blacksmith and Wagon Makers' Supplies,
PEORIA, ILL.

WANTED AND FOR SALE.

Want and for sale advertisements, situations and help wanted, twenty-five cents a line. Send cash with order. No insertions of less than two lines accepted.

FOR SALE.—A good shop, half acre of land, six miles from the anthracite coal fields, shop 24 x 40. Write for terms.
A. L. MERITHEW, South Canaan, Wayne Co., Pa.

FOR SALE.—Chance of lifetime. I must sell tools and stock on account of poor health. Best country stand in the State and best prices. One man can earn fifty dollars a week. Work for two. Address, BOX 21, Red Hook, N. Y.

FOR SALE—My shop and tools complete. Best location in Central Illinois; no competition; cause for selling—owner wishes to retire from blacksmithing. For particulars, address
T. E. LARSON, Box 45, Perdue, Ill.

WANTED.—A partner who understands the wagon manufacturing business thoroughly. Must have from $10,000 to $20,000 to put in the business. Address,
HENRY MILLER, Calmar, Iowa.

WANTED.—We invite applications from those desiring steady employment, at good wages, as first class salesmen, machinists, wood workers, blacksmiths, painters and trimmers. Experienced men in wagon and carriage manufacturing. Address,
STUDEBAKER BROS. MFG. CO., South Bend, Ind.

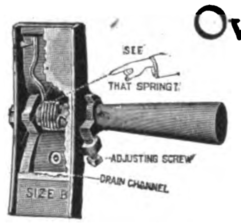
FOR SALE.—Cheap. New treatise on Steel, Welding and Forging all the new steels, and welding compounds for same. Also Thermite welding explained, with seventy-five new steel working methods and recipes. Also two-colored scientific Tool Tempering Charts, A and B. All the above for one dollar. Samples free. Anyone having bought my recipes can have the new treatise for 25 cents in stamps.
W. M. TOY, Sidney, Ohio.

BUSINESS OPPORTUNITY—A rare chance to engage in a general Blacksmith, Carriage and Jobbing Business, including a line of carriage wood and material kept in stock for sale. The business may be enlarged or contracted to suit purchaser, as may be desired. Established by me fifty years ago. In one of the most desirable and central stands. Terms will be made very liberal if desired, by small monthly payments in addition to rent. Stock and tools at a discount from appraisal.
G. J. GREENLEAF, Portsmouth, N. H.

NICHOLSON FILE COMPANY
PROVIDENCE, R. I., U. S. A.,
MANUFACTURERS OF

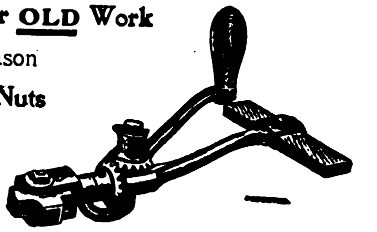
THE K&F TRADE MARK.

FILES AND RASPS
Blacksmiths Recommend our Rasps.
BECAUSE
Their Wearing Qualities Have Been Proven.



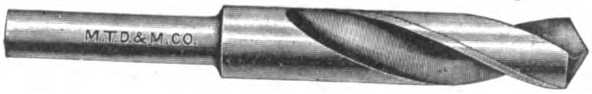
Over 20,000 Sets Sold AND MERIT SOLD THEM
"SPRING" BRAKE BLOCKS
For Carriages, Wagons and Trucks
12 Sizes for Tires from ⅞ in. to 5 in. wide. Wear shoes fitting these blocks adapted to either Steel or Rubber Tires.
Catalogues and Prices cheerfully furnished.
MORGAN POTTER, Sole Manufacturer,
FISHKILL-ON-HUDSON, N. Y., U. S. A.

LANG'S PATENT TIRE BOLT WRENCHES
The most CONVENIENT Wrench for NEW or OLD Work
Will save its cost many times in one season
Will put on or take off QUICKLY 3/16, ¼ and 5/16 Nuts
For sale by all Heavy Hardware Jobbers, or will be sent to any part of U. S. prepaid for . . . $1.25



Miller Wrench Co., Fort Wayne, Ind.

No. 112 Drills Fitting Silver & Deming's and Prentice Blacksmiths' Drill Presses. Nos. 1 and 2, with Shanks ½ inch Diameter.
All Drills 7-32 inch and larger are 6 inches entire length.



MAKERS OF
INCREASE TWIST AND CONSTANT ANGLE DRILLS, REAMERS, CHUCKS, MILLING CUTTERS, MANDRELS, TAPER PINS, GAUGES, COUNTERBORES, MILLS, SCREW PLATES, TAPS, DIES, SOCKETS, SLEEVES, and Special Tools.
Write for Catalogue.
Morse Twist Drill & Machine Co., NEW BEDFORD, MASS. U. S. A.

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SPECIAL

THE edition of "The Village Smithy" is limited. **While they last** we make the following **special offer—**

For $1.00 we will send—

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A Copy of "The Village Smithy," and
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WHEN sending subscriptions, state premium desired. Send money by Registered Letter, Express Order, Stamps, or Money Order, but not checks.

American Blacksmith Company

P. O. Drawer 974 **Buffalo, N.Y. U. S. A.**

Trade Literature and Notes.

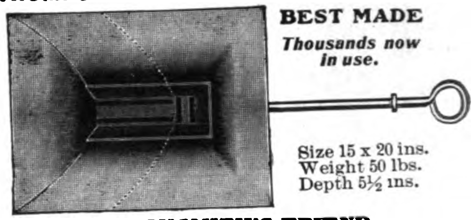
Clark Manufacturing Company, of Moline, Ill., inform us that they have just placed upon the market the emery stand which is illustrated herewith, and which contains many novel features of interest. One of the features consists in the rests, which can be raised, lowered or set at any angle to the face of the wheel, which is a great convenience for plow grinding work. In shops where there is power an emery grinder is of great service for plow and tool grinding. This firm makes the stand in two sizes, one of 200 pounds to carry two wheels up to 16 inches diameter and two inches thick, and a smaller one weighing 50 pounds and which carries two wheels up to ten inches diameter and 1⅛ inches face. Directions for making polishing wheels are included with the stand.

The Chapman Portable Forge Works, Marcellus, Mich. (see ad. on page IX) have issued several attractive circulars regarding their latest patterns of grinding machines and forges. They are free for the asking and those interested would do well to write. This company is also perfecting a gas engine possessing many excellent features.

A folder from H. S. Bossart & Co., Pittsburg, Pa., is devoted to "Curine," a remedy for Spavins, Curbs, Ring Bone, Splints, Sprung Knee, Sprung Tendons, Navicular Disease, Thoroughpins, etc. A long list of testimonials is added.

The Standard Ball Axle Works of Lancaster, Pa., send a neat little folder, dealing with the Standard Ball Axle, and specifying the many advantages which are claimed for it. These may be summed up by the following adjectives—noiseless, self-oiling, dust proof, clean, strong and convenient.

THOMPSON EXTENSION TUYERE IRON



BEST MADE

Thousands now in use.

Size 15 x 20 ins.
Weight 50 lbs.
Depth 5½ ins.

A BLACKSMITH'S FRIEND

Saves coal and time: can get a long or short fire from 2 to 14 inches—meets all demands—Ask your jobber for them. If he can't supply you, write to us direct. Catalogue free.

MANUFACTURED BY

Thompson Tuyere Iron Co., *Indianapolis, Ind.*

Blacksmiths, Tool and Die Makers

Did You Ever Have a Broken Die? If so, what was the cause?

Imperfect Annealing of course.

USE **VULCAN ANNEALING PUTTY** and avoid further trouble.

Send for descriptive circular and price list. We guarantee to save you 50 per cent on your tool steel work or money refunded. Agents wanted.

The Ray Automatic Mach. Co., 9 Water St., CLEVELAND, OHIO.

CUT SHOWS A

No. 5 Combined Punch and Shear

with 12-in. throat for punching ¾ in., and a 12-in. blade for cutting No. 8 gauge metal, 2 x ⅝ in. bars, ⅝ in. round, weight 525 lbs. Made in 18 different sizes, from 240 to 2,200 lbs. We make a specialty of shears, punches and rolls. Tools for shearing, punching and bending sheet metal, bar iron and angle iron

BERTSCH & CO.

CAMBRIDGE CITY, IND., U. S. A.

"R. Mushet's Special Steel"

The Original Air-Hardening Steel

and STILL UNAPPROACHABLE in general excellence.

Thirty Years' Experience in Engineering Works in all parts of the World has proved Beyond all Doubt that this Steel is in every respect

THE BEST TOOL STEEL

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Uniformity of Quality in Every Bar. A Great Saving in Steel, Time and Wages, and Easy to Work. There are no difficulties to contend with in forging R. Mushet's Special Steel into tools and no loss in reheating. The best all-round Steel.

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B. M. JONES & CO.

159 Devonshire St., BOSTON. 143 Liberty St., NEW YORK.

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Prices Current — Blacksmith Supplies.

The following quotations are from dealers' stock, Buffalo, N. Y., May 20, 1908, and are subject to change. No variations have occurred since last month's figures.

All prices are per hundred pounds. On bars and flats prices are in bundle lots.

Bars—Common Iron and Soft Steel.

1/4 in., round or square;	Iron, $3.10;	Steel, $2.90
3/8 in., " "	" 2.70	" 2.70
1/2 in., " "	" 2.50	" 2.40

Flats—Bar and Band.

1/4 x 1 in.,	Iron $2.50;	Steel $2.40
1/4 x 1 1/4 in.,	" 2.40;	" 2.40
3-16 x 1 1/2 in.,	" 2.60;	" 2.60

Norway and Swedish Iron.

1/4 in., round or square	$4.90
3/8 in., " "	4.50
1/2 in., " "	4.30
1/4 x 1 in.	4.30
1/4 x 1 1/2 in	4.20

Horseshoe Iron.

For No. 1 shoe, 3/8 x 1/2 in	$3.40
For No. 2 shoe, 1/2 x 5/8 in	3.00
For No. 3 shoe, 5/8 x 3/4 in	2.90
For No. 4 shoe, 5/8 x 7/8 in	2.90

Toe Calk Steel.

1/2 x 3/8 in. and larger	$3.50

Spring Steel.

3/8 to 1 1/2 in. Rounds.	Op. Hearth $4.00,	Crucible $6.00
1 1/4 to 6 in. by No. 4 gauge to 1/2 in. Flats	" 4.00,	" 6.00

CUMMINGS & EMERSON,
Blacksmith and Wagon Makers' Supplies,
PEORIA, ILL.

WANTED AND FOR SALE.

Want and for sale advertisements, situations and help wanted, twenty-five cents a line. Send cash with order. No insertions of less than two lines accepted.

WANTED—A first-class horseshoer and general repair man. Steady work. Good Wages.
EVERSOLE BROS., Hindsboro, Ill.

FOR SALE—Blacksmith shop and residence. For particulars call on or address,
MACK THOMAS, Curtisville, Ind.

FOR SALE—House, blacksmith shop, stock and tools. Good location. No competition.
B. ELKMAN, Williams Bay, Wolwort Co., Wis.

FOR SALE—One Henderson cold tire setter, complete, same as new; never used any to speak of. $75.00.
ALLEN P. ELY & CO., 1110 Douglas St., Omaha, Neb.

FOR SALE—My shop and tools complete, also dwelling house. Good location. Wish to retire from blacksmithing. For information address,
C. F. HEYDE, Poe, Ind.

FOR SALE—My shop and tools complete. Best location in Central Illinois; no competition; cause for selling—owner wishes to retire from blacksmithing. For particulars, address
T. E. LARSON, Box 45, Perdue, Ill.

WANTED.—We invite applications from those desiring steady employment, at good wages, as first class salesmen, machinists, wood workers, blacksmiths, painters and trimmers. Experienced men in wagon and carriage manufacturing. Address,
STUDEBAKER BROS. MFG. CO., South Bend, Ind.

FOR SALE—Blacksmith, wheelwright and hame shop, also complete set of tools. Located near Shrewsbury, York County, Pa., convenient to railroad. Also two dwelling houses, with two acres of land adjoining shops. Paying location, no competition. Owner desires to retire from business on account of age. For particulars address, W. G. ALLEN, Shrewsbury, Pa.

FOR SALE—One No. 4 Egan Hub Mortiser and Borer; one No. 0 Defiance Double Drum Polishing Machine; one Lane & Bodly Sixty-ton Hydraulic Wheel Press; one Cam Press or Hub Press, power feed. The Mortising machine is supplied with two sliding tables, one for hub mortising, the other for plain mortising Further particulars upon application to
NESS BROS. & CO., York, Pa.

BE AN EXPERT BLACKSMITH—By using Toy's Colored Tool Tempering Charts, A and B, explaining Scientific and Plain Tempering to Standard in Oil, Water or Tallow, showing true color each tool should be and tells what each tool will stand. These charts are same as are used by Woolwich Arsenal, England.

Also new treatise on all the new steels and seventy-five new methods and recipes for forging and welding on machine and plow work, all the secrets in plow making and repairing and ten new steel welding compounds for different kinds of steel, also Thermite Welding fully explained, it welds solid in the twinkle of an eye.

All the above for One Dollar. Samples free. Forty years a factory steel worker.
W. M. TOY, Sidney, O.

NICHOLSON FILE COMPANY

NICHOLSON.

PROVIDENCE, R. I., U. S. A.,

MANUFACTURERS OF

THE K&F TRADE MARK.

FILES AND RASPS

Blacksmiths Recommend our Rasps.

BECAUSE

Their Wearing Qualities Have Been Proven.

Over 20,000 Sets Sold *AND MERIT SOLD THEM*

"SPRING" BRAKE BLOCKS

For Carriages, Wagons and Trucks

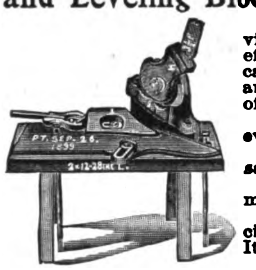
12 Sizes for Tires from 7/8 in. to 5 in. wide. Wear shoes fitting these blocks adapted to either Steel or Rubber Tires.

MORGAN POTTER, Sole Manufacturer,

FISHKILL-ON-HUDSON, N. Y., U. S. A.

Catalogues and Prices cheerfully furnished.

Plow Lay Welding Machine and Leveling Block Combined



An invention to provide a novel, simple, efficient and economical method of welding and shaping all kinds of plow shares. **Indispensable to every Blacksmith. Guaranteed to give satisfaction.** If not satisfactory, money refunded. Send for Illustrated circular and prices. It tells the rest.

G. S. STROM, Whiterock, Minn.

Great Scott

Why don't you write for circulars of our Grinding Machines. Portable Forges, and Gasoline Engines, 1 1/2 horse power.

WHY NOT.

Get the best you can for your money? Beckley Ralston Co. Chicago, say the Chapman No. 6 Grinder is the best machine they have ever sold aside from the Chapman No. 2.

Address all orders or enquiries to

H. L. CHAPMAN,
Box A. 64 **MARCELLUS, MICH.**

The Crescent "Eveready" Plowshare

Extra Heavy and Smooth Upset Shin on all Plowshares.

SAVES TIME, PATIENCE AND MATERIAL

Can be fitted to plow easily, quickly. Are welded securely, point finished and fully ground and polished.

ORIGINATED AND MANUFACTURED BY

HAVANA METAL WHEEL CO., HAVANA, ILL., U. S. A.

Manufacture a full line of CRESCENT Steel Lister shares, Subsoilers, Cultivator Shovels, Landsides, Moldboards from Solid, Crucible and Genuine Soft Center Steels.

IF YOUR JOBBER DOES NOT HAVE THE CRESCENT WRITE US.

We are the Largest Manufacturers of Truck Wheels in all America.

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to get acquainted with The American Blacksmith, if not already a subscriber, we make the following offers:

For $1.00 we will send—

The American Blacksmith for one year,
A Copy of "The Village Smithy," and
A Premium—A Hoof Knife or a Pocket Level, as desired.

THIS offer good only while "The Village Smithy" lasts. After you know the paper, you won't do without it. Remember, no premiums for renewal subscriptions.

"The Village Smithy"

Is a beautiful reproduction in twelve colors of a picture painted for us by Raphael Beck. A handsome picture for framing. If not a subscriber, take advantage of the above liberal offer while it lasts. Send $1.00 now so you won't miss "The Village Smithy."

Which Premium do You Want?

A serviceable Hoof Knife, Crucible Steel and Bone Handle,
OR
A Handy 3½-inch Pocket Bench Level, Neat and Useful.

NOTE.—Send us two new subscribers and get a serviceable gold fountain pen as a premium. Include your own name as one if not already a subscriber.

A copy of THE VILLAGE SMITHY, carefully packed in a pasteboard tube, will be sent prepaid to any address, together with a sample copy of THE AMERICAN BLACKSMITH, for 25 cents

THE AMERICAN BLACKSMITH is the

Biggest Dollar's Worth

that goes into your shop. **Twenty pages of** solid **reading** matter **guaranteed** each month from the brightest writers of the craft. No trade puffs or stale clippings.

SEND money by Registered Letter, Express Order, Stamps, or Money Order, but not checks.

American Blacksmith Company

P. O. Drawer 974 **Buffalo, N.Y. U. S. A.**

Trade Literature and Notes.

Empire Fifth Wheel Works, Quincy, Ill. Small illustrated pamphlet of the roller bearing fifth wheel made by this firm. The advantages claimed for this roller wheel are ease of turning the same, cleanliness, freedom from oil and grease, saving in repairs on horse, harness and wagon. This fifth wheel can be put under any wagon without changing the old circles.

W. B. Eddy & Co., of Whitehall, N. Y., state that the following letter is a sample of hosts of similar letters which they receive regarding their ointment:

BARNESVILLE, O., March 30, 1903.

W. B. EDDY & Co.,

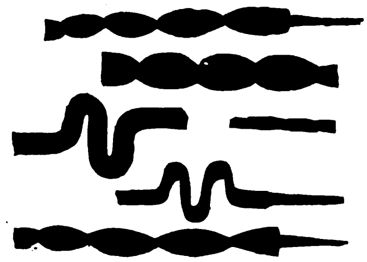
Find enclosed postal note in payment of one-fourth dozen QUINN'S OINTMENT. Seen it used on the worst cases of scratches and also a case of grease heel that I have ever known of and it cured them both inside of three days.

You may ship me one dozen bottles and all the booklets you can, as I would like to use them for advertising. Sold my last bottle today. FRANCIS MOORE.

Cray Bros., 57-59 Water Street, Cleveland, Ohio, have sent us their latest catalogue (March, 1903). It contains 192 pages, illustrating and clearly describing their carriage and wagon material and tools. Pages 78 and 79 are of special interest to horseshoers.

H. L. Chapman, Marcellus, Mich., sends us a little folder showing their different styles of grinding machines, which they state are specially adapted for carriage-makers, blacksmiths, and cycle repair shops. These machines are useful for a large variety of purposes, and interested parties would do well to send for a full description.

The large losses yearly in shops where crucible steel is used for tool and die making, commends most strongly any method which may be devised for the purpose of preventing loss and breakage of milling cutters, lathes, planer tools, taps, dies, files, etc. The Ray Automatic Machine Company of Cleveland, Ohio, are marketing a product called Vulcan Annealing Putty, which they claim will anneal the hardest tool steel to such softness that it can be cut, bent, twisted or drawn into almost any shape without fracturing or injuring the steel



itself. The illustration herewith shows what can be done with steel after treating with Vulcan Annealing Putty. The treatment is very simple, consisting only in heating the steel slowly to a good cherry red, and packing it in the putty, where it remains until cold. This process it is stated will anneal Mushett or self-hardening steel so that it can be readily turned or machined. They also claim that hard cast iron may be annealed by its use.

Newton's Heave, Cough, Distemper and Indigestion Cure. A veterinary specific for wind, throat and stomach troubles. Strong recommends. $1 per can. Dealers, mail or Ex. paid. Newton Horse Remedy Co. (3) Toledo, Ohio.

$60. Back-geared screw cutting foot or power **LATHES**, made in large lots with special tools; swing ten inches over bed. Our ten years of manufacturing small lathes enables us to make a low price on a high grade tool. Write for guarantee, circulars and discount.

Carroll & Jamieson Machine Co.
BATAVIA, - - - OHIO.

"AND DON'T YOU FORGET IT."

Mohr's Blowers

FOR BLACKSMITHS. . . .

Are guaranteed equal to any, are more convenient, require less room and have a wider range of adjustment.

CIRCULARS FREE.

B. FRANK MOHR, Mifflinburg, Pa.

CUT SHOWS A

No. 5 Combined Punch and Shear

with 12-in. throat for punching $\frac{5}{16}$ in., and a 12-in. blade for cutting No. 8 gauge metal, 2 x ⅜ in. bars, ⅝ in. round, weight 525 lbs. Made in 18 different sizes, from 240 to 2,200 lbs. We make a specialty of shears, punches and rolls. Tools for shearing, punching and bending sheet metal, bar iron and angle iron

BERTSCH & CO.
CAMBRIDGE CITY, IND., U. S. A.

"R. Mushet's Special Steel"

The Original Air-Hardening Steel

and STILL UNAPPROACHABLE in general excellence.

Thirty Years' Experience in Engineering Works in all parts of the World has proved Beyond all Doubt that this Steel is in every respect

THE BEST TOOL STEEL

YET MANUFACTURED

Uniformity of Quality in Every Bar. A Great Saving in Steel, Time and Wages, and Easy to Work. There are no difficulties to contend with in forging R. Mushet's Special Steel into tools and no loss in reheating. The best all-round Steel.

R. Mushet's HIGH-SPEED Steel.

If a fast-cutting steel is required, this is the best and most reliable of this grade. It will do more work than any other known steel, and every bar is uniform and free of the "Cracking" so generally a feature in steels of this grade.

The "R. Mushet's" Steels are manufactured only by **SAMUEL OSBORN & CO,** Clyde Steel & Iron Works, Sheffield, England.

Sole Representatives in the United States, Canada and Mexico:

B. M. JONES & CO.

159 Devonshire St., BOSTON. 143 Liberty St., NEW YORK.

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Trade Literature and Notes.

The Lennox Machine Company, Marshalltown, Iowa, informs us that in addition to their horizontal gasoline engine of from four to twenty-five horsepower, they furnish a line of two and three horsepower engines suitable for blacksmith shops, pumping water, running separators, feed grinders, corn shellers, wood saws, etc. This firm also construct a rotary power shear, which will handle from ⅛ to ½-inch material.

A 16-page booklet from Geo. Sears & Co., Clinton, Iowa, describes and illustrates the Sears Blacksmithing Device. "It is unequaled in efficiency, capacity and perfect working qualities," says the catalogue.

An 8-page circular describes the Bliss Hoof Cutter, recommended for its simplicity, durability and its property of escaping contact with the frog and making a perfectly level cut. Sent by the Bliss Manufacturing Company, South Egremont, Mass.

A handsome catalogue is that of Fairbanks, Morse and Company, Franklin and Monroe Streets, Chicago. Its 32 pages, with half-tone engravings, describe the Fairbanks-Morse engines for gasoline, naphtha distillate, kerosene and crude oil. A smaller booklet is devoted to the Fairbanks-Morse gasoline engines for farm work. Still another describes and illustrates the Fairbanks Power Hammer, the mitering and bevelling saw table and the Fairbanks saw-sharpening machine.

The American Well Works, Aurora, Ill., who have been occupied during the last two years in rebuilding their works, are now in a position to handle promptly their order for well sinking and pumping machinery for heavy work, air compressors, gasoline engines and the Chapman Patent Air Water Lift System.

The Rumsey-Williams Co., St. Johnsville, N. Y., issue a catalogue containing information of considerable interest to the gas engine user. This firm makes a line of stationary, portable and semi-portable engines, ranging from two to fifteen horsepower and adapted to a large variety of uses, such as general power work, lighting, pumping, feed grinding, etc.

A 32-page catalogue, 18 B, of the Seneca Falls Mfg. Co., of Seneca Falls, N. Y., describes and illustrates the Star foot and power lathes, accessories and specialties manufactured by this company. A complete set of price lists is an added convenience to the intending purchaser.

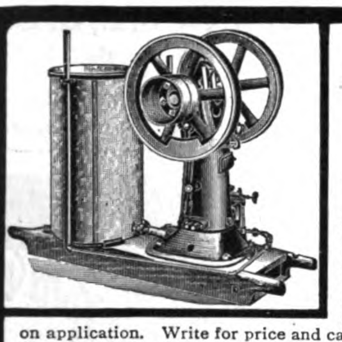
Another attractive booklet from the same firm catalogues their full line of foot and hand power wood working machinery. The last page gives valuable advice on "The Best Way to Order."

A catalogue of unique design has just been issued by the Montross Metal Shingle Co., manufacturers of metal shingles and tiles, Camden, N: J. The designs in metal roofing and siding illustrated herein, are both handsome and interesting.

Queen City Wheel Co., Cincinnati, Ohio, send us their special net price list No. 1, calling special attention to their net prices on Sarven patent wheels with Queen City tires, and also their figures for re-rubbering old wheels.

The Standard Tire Setter Company, Keokuk, Iowa, have recently issued a novel advertisement in the edition of a newspaper termed "*The Tire Setter News*," which gives an interesting supplement, showing many views of the Henderson Hand Power Tire Setter, manufactured by this concern. An idea of the growth of their tire setter business is gained and many strong testimonials also printed.

A neat little twenty-four-page catalogue of the Brooks Cold Tire Setter Company of 118 North Wichita Street, Wichita, Kansas, is devoted to describing and illustrating the Brooks Cold Tire Setter as the "latest and best up-to-date machine for wagon and carriage shops."



The Many Purpose Power

On account of its compactness, simplicity and adaptability to so many purposes, the

Webster Vertical Gasoline Engine

is indispensable to repair shops, smiths and other artisans. Self-contained and complete as shown in cut. Easily carried by hand to any work to be done. **Develops 3 full horse power at a cost of 3 cents per hour.** Handiest, safest, most durable little power made, with no end to its uses. Handsome large card, printed in colors, showing this engine at work in shop, sent free on application. Write for price and catalogue fully illustrating this engine.

WEBSTER M'F'G CO., 2013 WEST 15TH STREET, CHICAGO, ILL.

NO MONEY IN ADVANCE.

The "Success" Grinder

has the highest speed of any Foot Power Grinder and is the only one fitted with **CARBORUNDUM** wheels.
Is regularly equipped with **two Carborundum wheels** and complete **polishing outfit,** consisting of felt wheel coated for use, and cloth buffers with the necessary polishing compound. Same will be shipped to any part of the United States, east of the Rockies, on ten days' free trial. If satisfactory, remit us $9. If machine is not satisfactory, return to us.

LUTHER MANUFACTURING CO.,
NORTH MILWAUKEE, WIS.

Ashmead, Clark & Company
Commercial Engraving
LETTER HEADS, STOCK CERTIFICATES, BONDS, CHECKS, CATALOGUE COVERS, CARDS
611-613 Chestnut St., PHILADELPHIA.

GAS ENGINES . . .

Will do anything any engine can do. Simple, durable and fully guaranteed. Furnish reliable power at the least cost for fuel. Perfectly safe. You are losing money every day you delay ordering. Our engines can be started and successfully run by anyone. We can save you money Write today for our catalogue A.

CANFIELD GAS & GASOLINE ENGINE WORKS
Binghamton, N. Y.

SPRAGUE'S FLY BOUNCER

Every blacksmith knows it is almost impossible to do a good job of horseshoeing during fly time, even with one or two helpers to hold the horse and try to keep the flies away, as no horse will stand still when bothered with these pests, and no horseshoer can do good work unless the horse stands still.

All blacksmiths welcome Fly Bouncer, for by spraying a very little of it around the doors and windows of the shop, no fly will enter the building. With no flies to bother him, the horse stands quietly to be shod. The blacksmith not only saves the expense of one or two helpers, but can turn out better work at a very little expense, as one gallon of Fly Bouncer will be sufficient to keep the flies out of a shop for two or three months. When once used it is always used during the fly season. Try It.

We make special low prices to blacksmiths for their own use. They can also make money by selling to liverymen, dairymen and others. Fly Bouncer is an easy seller, and big profit for agents. Write at once for circulars, testimonials, etc.

SPRAGUE COMMISSION CO. **Address Nearest Office**

218 So. Water St., Chicago, Ill.; 201 Front St. Portland, Ore.; 10 S. 4th Street, St. Joseph, Mo.; 27 Juneau Ave., Milwaukee, Wis.; 204 Market St., St. Louis, Mo.; 3404 University Ave., Minneapolis, Minn.; 615 Locust St., Des Moines, Iowa; 439 Cole Ave., Dallas, Texas.
26-28 Vesey Street, New York City. 206 E. Jefferson St., Louisville, Ky. 815 Sansome St., San Francisco, Cal. 444 St. Paul St., Montreal.

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RUBBER TIRED RUNABOUT, $35.00

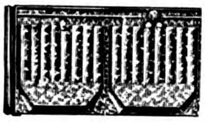
TOP BUGGY, $27.50

BUGGY TOPS, $4.50

Write for 100-page Catalogue. It's free. Compare Our Prices.

BUOB & SCHEU, Estab. 1883 500-520 EAST COURT ST. CINCINNATI, OHIO.

METAL SHINGLE ROOFING...



With Montross Telescope Side-Lock is the best roofing in the world for house or barn. ☞ Storm proof. Easily applied. Catalogue, Prices and Testimonials free for the asking.

Montross Metal Shingle Co., Camden, N. J.

"The Australasian Coachbuilder & Wheelwright."

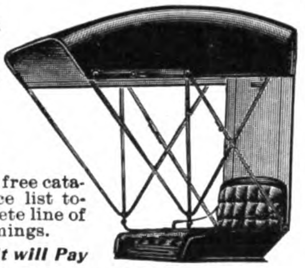
A Monthly Illustrated Technical Journal circulating amongst Coachbuilders, Wheelwrights and Blacksmiths throughout the Commonwealth of Australia, New Zealand and South Africa.

Advertising and subscription rates on application to

J. E. BISHOP & CO.,
65 MARKET STREET,
Sydney, Australia.

Good Tops Help Make Good Buggies

You can get good tops from **MEYER** and his *Prices are the Lowest*



Send for our free catalogue and price list today. A complete line of tops and trimmings.

Write today—It will Pay

C. G. MEYER

Main and Ann Streets TIFFIN, OHIO

Ranchman Combination Tool

DROP FORGED TOOL STEEL
HATCHET, HAMMER, PINCERS, BELT or HARNESS PUNCH, CLAW WIRE CUTTER, SCREW DRIVER.
EVERY FARMER AND DRIVER SHOULD OWN ONE.
Retail Price $1.00. Agents Wanted.

Automatic Specialty Co., Newark, N. J.

CUT SHOWS A

No. 5 Combined Punch and Shear

with 12-in. throat for punching $\frac{11}{16}$ in., and a 12-in. blade for cutting No. 8 gauge metal, 2 x $\frac{3}{8}$ in. bars, $\frac{5}{8}$ in. round, weight 525 lbs. Made in 18 different sizes, from 240 to 2,200 lbs. We make a specialty of shears, punches and rolls. Tools for shearing, punching and bending sheet metal, bar iron and angle iron

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BOOKMAKERS

253-257 Ellicott Street, Buffalo, N. Y.

Complete Equipment for the production of Machinery Catalogues, Stock Farm Catalogues, College Annuals, also Catalogues in Foreign Languages, promptly, accurately and tastefully.

Newton's Heave, Cough, Distemper and Indigestion Cure. A veterinary specific for wind, throat and stomach troubles. Strong recommends. $1 per can. Dealers, mail or Ex. paid. **Newton Horse Remedy Co. (3) Toledo, Ohio.**

$60. Back-geared screw cutting foot or power **LATHES**, made in large lots with special tools; swing ten inches over bed. Our ten years of manufacturing small lathes enables us to make a low price on a high grade tool. Write for guarantee, circulars and discount.

Carroll & Jamieson Machine Co.
BATAVIA, - - - OHIO.

The Crescent "Eveready" Plowshare

Extra Heavy and Smooth Upset Shin on all Plowshares.

SAVES TIME, PATIENCE AND MATERIAL

Can be fitted to plow easily, quickly. Are welded securely, point finished and fully ground and polished.

ORIGINATED AND MANUFACTURED BY

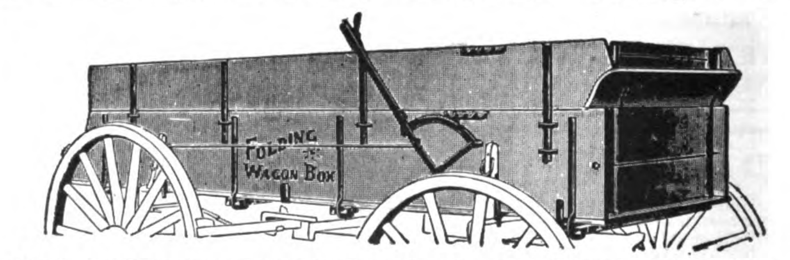
HAVANA METAL WHEEL CO., HAVANA, ILL., U. S. A.

Manufacture a full line of CRESCENT Steel Lister shares, Subsoilers, Cultivator Shovels, Landsides, Moldboards from Solid, Crucible and Genuine Soft Center Steels.

IF YOUR JOBBER DOES NOT HAVE THE CRESCENT WRITE US.

We are the Largest Manufacturers of Truck Wheels in all America.

Do You Build Farm Wagons?



THEN YOU ARE INTERESTED in the FOLDING WAGON-BOX.

Built in separable parts which firmly and tightly interlock, making a simple, practical, strong and durable farm wagon bed which a boy can handle—put it on or off the running gear—easily and quickly, any place. Easily and compactly stored in very small space when not in use. Its simplicity and convenience appeal to all classes of farmers. (See description in February AMERICAN BLACKSMITH.) : : : : : : : : : : :

With the special irons any wagon-maker can build this knock-down box, right in his own shop, easily, quickly and cheaply, with the same wood-work as is used in the old-style box, of any pattern or dimensions to suit the trade.

PRICE OF IRONS $1.75 PER SET; $10 PER HALF DOZ. SETS. FREIGHT PREPAID ON DOZ. SET ORDERS.

FOLDING WAGON BOX CO., : : Haverhill, O.

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VOLUME 3 NUMBER 1

THE AMERICAN BLACKSMITH

BUFFALO N.Y. U.S.A.

A PRACTICAL JOURNAL OF BLACKSMITHING

OCTOBER, 1903

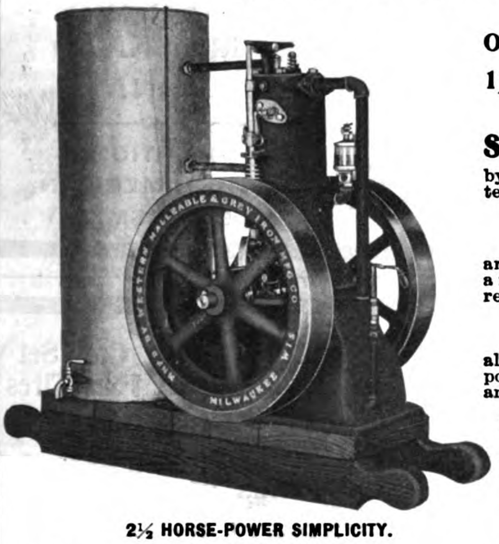
$1.00 A YEAR 10¢ A COPY

SIMPLICITY

The Engine that will do all your work in your shop under all conditions and AT ALL TIMES.

Shipped on Trial and Fully Guaranteed.

If not as represented can be returned at our expense. Let us ship you one on trial.



2½ HORSE-POWER SIMPLICITY.

OUR VERTICAL ENGINES ARE BUILT IN THREE SIZES 1½, 2½, AND 4½ H.-P. HORIZONTAL, 6 H.-P. AND UP.

SIMPLICITY ENGINES ARE MADE IN OUR OWN FACTORY

by the most expert workmen in the world. We make every part of our engines—we test every part—and then we test each engine when finished.

CAPACITY 1,500 ENGINES PER YEAR.

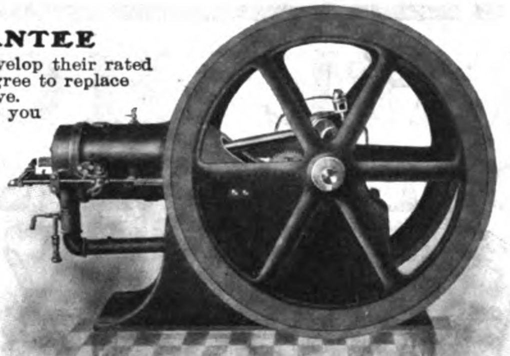
We have been in the manufacturing business for thirty years and consequently are now well known in all parts of the country. When you deal with us, you deal with a reliable, trustworthy house—a house in position to guarantee satisfaction in every respect. Write us to-day.

WE GUARANTEE

all Simplicity Engines to develop their rated power with a surplus, and agree to replace any part that proves defective.

Write to-day stating size you require.

We have a fine proposition to Agents in unoccupied territory.



6 HORSE-POWER SIMPLICITY.

Our Engines are Shipped Complete, Ready to Start

Every Simplicity Sold is an Advertisement.

DURAND, WIS., July 1, 1903.

WESTERN MALLEABLE & GREY IRON M'F'G CO.
Milwaukee, Wis.

GENTLEMEN:—The 2½ horse-power gasoline engine we got of you is all that is claimed for it. We are driving a small feed mill, our engine lathe, emery wheel and grind stone, and have not had any trouble or lack of power. To any one wanting a small and economical power we heartily recommend the "Simplicity."

Yours truly,
HILL BROS.

WHITEFIELD, MAINE, April 6, 1903.

WESTERN MALLEABLE & GREY IRON M'F'G CO.
Milwaukee, Wis.

GENTLEMEN:—In reply to your favor of recent date, I take pleasure in saying that the engine purchased of you is in every way satisfactory, and well worth the price I paid for it. I am more than pleased with it, and we had no trouble in starting it. It runs smoothly, does its work well, and I can truthfully say it is a dandy. I wish that every man that thinks of purchasing an engine could see this one work, and I think he would want one of the same kind.

I wish to thank you for the prompt and efficient manner in which you sold and shipped the engine and fixtures to me.

Yours respectfully, E. C. JEWETT.

Western Malleable & Grey Iron M'f'g Company

8 to 20 Chase Street, Milwaukee, Wisconsin.

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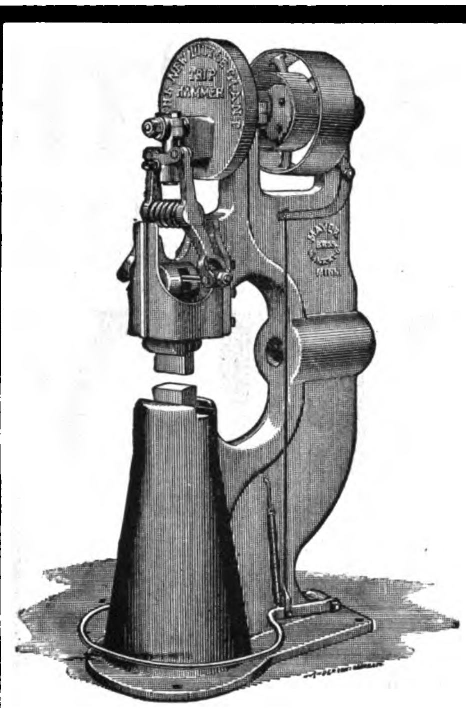


THE NEW LITTLE GIANT

U. S. PATENT, JANUARY 1, 1901

CANADA PATENT, AUGUST 20, 1901

550 NOW IN USE

TRIP HAMMERS

NOW IS THE TIME TO BUY

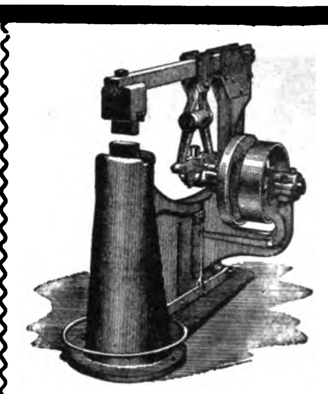
A TRIP-HAMMER

Is the Blacksmith's

BEST HELPER

And Will Pay for Itself

IN ONE YEAR



THE EASY

PATENT APPLIED FOR

50 NOW SOLD

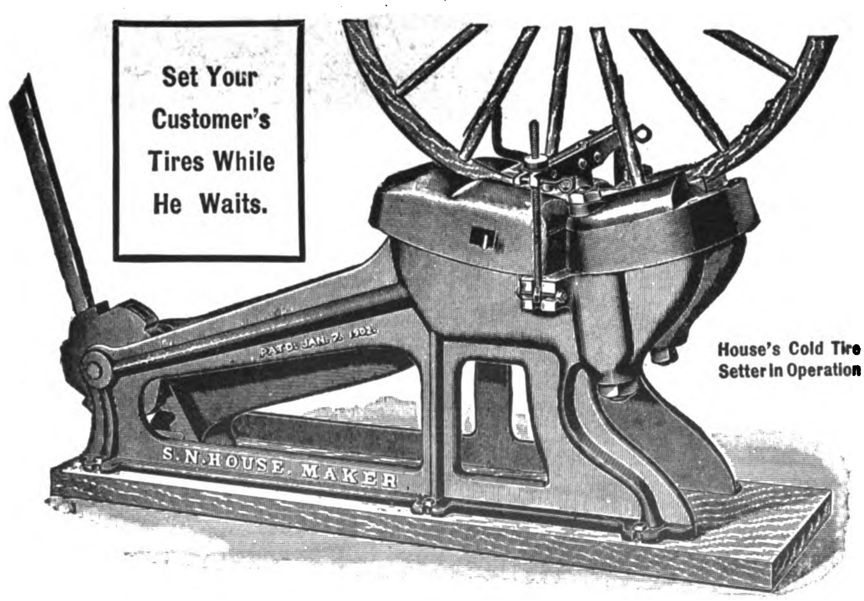
For Prices and Information Write to

MAYER BROS.

MANKATO MINN.

MENTION THE AMERICAN BLACKSMITH

THE HOUSE COLD TIRE SETTER



Set Your Customer's Tires While He Waits.

House's Cold Tire Setter in Operation

ONE MAN Can Set Four Tires in Twenty Minutes.

NOT NECESSARY TO REMOVE THE TIRES OR THE BOLTS

It Does Not Crush or Injure the Wheel.

You cannot afford to lose an hour taking off a tire and setting it the old way, for you can do it better with this machine in five minutes and save your fuel and bolts. It does not injure the tire nor woodwork, for it simply grips the tire on the edges in two places close together and shrinks it in a two or three-inch space, cold, just as we have been doing for years after they had been taken off and heated.

The grip keys are eight inches long, so they cannot scar nor cup the tire. The wheel is screwed down firm against the machine so that the tire cannot kink while setting. It sets them quickly and nicely, and it is the only machine that does. It is as simple and easily operated as the hot tire setters, made on the same principle, and will last forever. It is made of steel and cannot be broken; it weighs seven hundred pounds. Write at once for descriptive circular and price, which is very reasonable.

Will ship on trial. It is manufactured by

S. N. HOUSE, St. Louis, Mo.

MacGowan & Finigan Foundry and Machine Co.

SELLING AGENTS,

41, 42 AND 43 GAY BUILDING ST. LOUIS, MO.

SOLD ON TRIAL. GUARANTEED TO DO EXACTLY AS REPRESENTED OR NO SALE AND WE LOSE THE FREIGHT.

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THE AMERICAN BLACKSMITH

A PRACTICAL JOURNAL OF BLACKSMITHING.

VOLUME 3 | OCTOBER, 1903 | NUMBER 1

BUFFALO, N. Y., U. S. A.

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A New Prize Article Contest.

Readers of THE AMERICAN BLACKSMITH are invited to participate in a new prize article contest. For the best contributions upon wagon and carriage building topics, eleven prizes are offered, aggregating in value forty dollars. Any subject connected with the building or repairing of vehicles may be chosen to write upon, so that a wide range of topics is afforded. The articles will be judged by their practical value to readers, and the prizes so awarded. That one will be chosen as best which will be of the greatest benefit to the wagon man in his every-day work.

Ten prizes in all will be given; a first prize of twenty dollars, two second prizes of five dollars each, three serviceable leather blacksmith's aprons as third prizes, and lastly, four yearly subscriptions to THE AMERICAN BLACKSMITH. The conditions are very simple: First, the contest ends and all articles must be in our hands by December twelfth next. Second, all contestants must be regular subscribers to THE AMERICAN BLACKSMITH.

If you have had experience of any kind in carriage work, send in your article early. Never mind about the spelling—the editor will take care of that. Owing to the large number of prizes, your chances are good. Will you compete? Address your article—"Editor, AMERICAN BLACKSMITH,
Drawer 974, Buffalo, N. Y."

Prosperous Signs for the Shipsmith.

There must surely be a great demand for competent shipsmiths all over the country. Every day we hear of new ports springing into prominence. In the north are our lake ports with their great internal shipping industries, and all along the Atlantic are dotted those thriving cities that derive their chief sustenance from the traffic of the sea. The South, too, is awaking to new life. Down in Texas, for example, is situated a town that has made tremendous progress of late years. Galveston, built on the shore of the Gulf of Mexico, now claims third place among the shipping points of the United States.

All this advancement means that ships are continually being built and repaired, and that a vast army of shipsmiths is required to keep up this mighty fleet.

We should like once more to ask any of our readers who are engaged in this branch of the craft to send us any interesting, useful bits of information or kinks that may have come to them in their daily work.

Contributors for the Coming Volume.

In this, the first number of a new volume, some announcement may be proper regarding the reading matter to appear in these columns during the coming twelve months. The names of those who will contribute articles, insure that the interests of readers in this particular, will be especially well cared for. They are among the brightest, foremost minds in their respective spheres, and it is to be doubted if the services of more up-to-date writers could possibly be secured. Whatever appears under their signatures can be implicitly relied upon by readers of THE AMERICAN BLACKSMITH.

Mr. M. C. Hillick will continue to conduct the department of wagon and carriage painting with the marked skill and felicity which has caused his efforts to be so highly appreciated in the past by AMERICAN BLACKSMITH readers. The articles on steel-working, by Mr. Joseph V. Woodworth, an authority on the subject, will be continued, and will be found interesting reading by all concerned with the heating, annealing, hardening and tempering of steel, of which topics it will fully treat. On machine and railroad blacksmithing, contributions may be expected from Mr. William B. Reed, whose excellent series of articles in the past make him well known to our readers. Solid, practical information, presented in bright, humorous style characterizes the writings of "Billy Buntz," from whom monthly articles will appear. His series, "The Progressive Smith as a Business Man," beginning in this number, will be good reading for all who run shops of their own. The department of horseshoeing will be especially valuable to practical farriers during the coming year, and many articles from writers standing high in the craft will appear. Two such authorities, known to our readers in the past, Mr. E. C. Perrin and Dr. E. Mayhew Michener, will be heard from at intervals.

Carriage and wagon builders will find much more interesting matter pertaining to their craft than in previous years. Special attention will be paid to this department. Readers should remember that they can aid greatly in making the paper more interesting by writing from their experience on any topic, and thus stimulating others to do the same. Attention is called to the prizes offered in another column, as rewards for contributions from readers.

Desiring to make this journal of maximum value to subscribers, the publishers request readers to ask for articles on any special topics of craft interest. In response to such demands, a series of articles on Mechanical Drawing for the blacksmith is now appearing, and

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announcement is also here made of a series on the metallurgy of iron which will be given during the coming year, outlining the various processes of making iron and steel of different kinds, from pig iron to crucible steel.

Blacksmiths and Blacksmiths.

Shops differ. Between the ramshackle edifice, dark and dirty, and the bright, clean, scientific one, there are unnumbered stages of difference, until, taking the two extremes, it is hard to classify them as the same kind of establishment. Just as great, or even greater, is the gap between the two extremes of blacksmiths. On the one hand is the ungroomed, slouching individual who never reads —possibly cannot read—and can scarcely write his own name. On the other is the bright, intelligent man, neat and well-dressed, (for say what we will, personal appearance is a very fair index to a man's mental make-up) who reads all the current literature, and is able to talk intelligently upon any current topic.

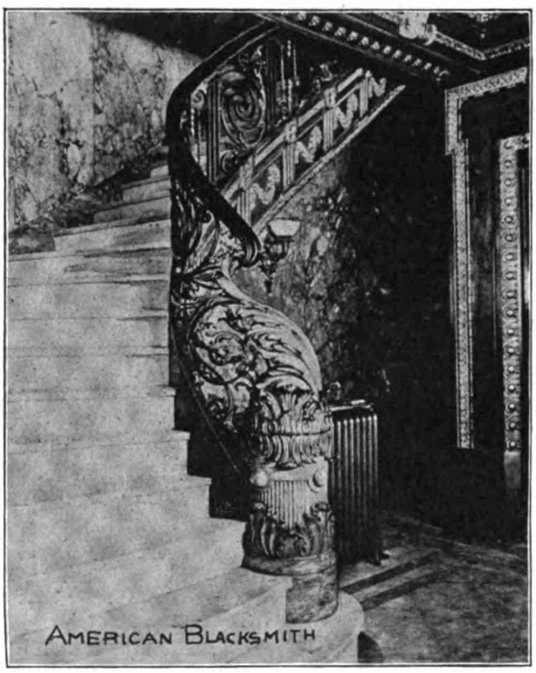
There is no reason why any man should not bring himself up to the latter standard. No craft in the world offers greater opportunity for quiet mental growth and thought. The man who makes and mends and plans, is, by the very nature of his work, bound to be intelligent. Why any intelligent man is satisfied to be anything but an honor to his calling is beyond comprehension, and the calling of the smith has always been especially honorable and worthy.

Regarding education—There never was a man yet who sincerely wanted it and could not get it. The present school system provides amply for the education of the younger generation, but even the man of advanced age may educate himself. We read every day of men of even forty-five, fifty and sixty years, patiently mastering the English language or setting out upon a course in one branch or another. It is not lack of opportunity, but lack of purpose that keeps people back.

Follow Directions.

Many are the failures men meet with in the daily craft routine. A smith tries a kink as recommended by another smith, and in spite of all that has been said of its excellence, he can derive no results from it. Just so, a repairman undertakes to varnish a job, and although his varnish has been advertised widely, and a brother smith has proved its value, he spoils the job simply by using it. Or a smith undertakes to use a compound that has been well spoken of on all sides, and to him it is useless.

Now, there is always something behind such failures as these. As a matter of fact, men read directions in a haphazard way, grasp the general notion and think they "know it all." They set to work on their own accord to do the job, and when it turns out a complete failure, these geniuses declare the recipe was no good (it is worth remarking that they always credit themselves with the good results.) In employing any method or using any compound, a smith should adhere rigidly to every detail of the directions given. It is this loose system of following directions that botches so many good pieces of work, and throws into disrepute so many good articles and recipes.



A BEAUTIFUL WROUGHT IRON BALUSTRADE.

Some Beautiful Work in Ornamental Iron.

A particularly rich effect is secured by the employment of foliage designs in wrought iron. Different adaptations of the large, graceful leaf of the Greek acanthus are exceptionally good in this metal. This also combines happily with conventionalized floral forms and geometrical figures. An example of this is seen in the beautiful specimen of art hammered iron work shown in the first engraving. The winding stairway of stone is most effectively guarded by a balustrade in wrought iron after this style. The final pillar and the curve of the rail are especially graceful and unique. This piece is to be found on the main stairway, Hanover Bank Building, New York City.

The other two engravings are from photographs, one of an iron grating guarding the vaults in this bank, and the other of an iron door in the same building.

All three are from the forge of Richey, Browne and Donald, Architectural Iron Workers, Long Island City, N. Y.

Talks to the Jobbing Shop Painter.—7.

M. C. HILLICK.

Ways of Creating Business During the Dull Months—How Some Painters Have Succeeded and May Succeed in Uniting Carriage Painting with Other Lines of Work.

The season's rush of carriage and wagon painting will have passed ere this is printed, and with the country painter, the next two or three months must be considered as a season for resting on the oars more or less. Naturally, if of an ambitious disposition—and ambition was never more needed in the paint shop than now —the painter casts about in search of something closely allied to carriage painting to assist him in tiding over the dull season. In the country and small towns, the painter cannot hope to rigidly adhere to carriage and wagon painting as a business the entire twelve months, as does his city brother. If located in the snow belt of country—and this has become an unreliable territory during recent years—he may count on a run of sleigh painting. This, of course, is of short duration, but it helps to fill in an "aching void" sometimes, and calls in some welcome money at a time when the "root of all evil," to quote an ancient book, passes as an exceedingly precious commodity. But if outside the snow line, when the bottom drops out of the carriage painting business, after the October Fairs have been called in, it is a matter for earnest calculation what particular line of work to take up in connection with one's regular business. To recite what others have done, under the personal observation of the writer, may help readers of THE AMERICAN BLACKSMITH in above noted emergencies.

A carriage painter in Central New York, during dull seasons, paints scenery for small opera houses and amusement resorts. He writes that he finds the work profitable, and it enables him to occupy his shop twelve months in the year. Another one makes a brand of

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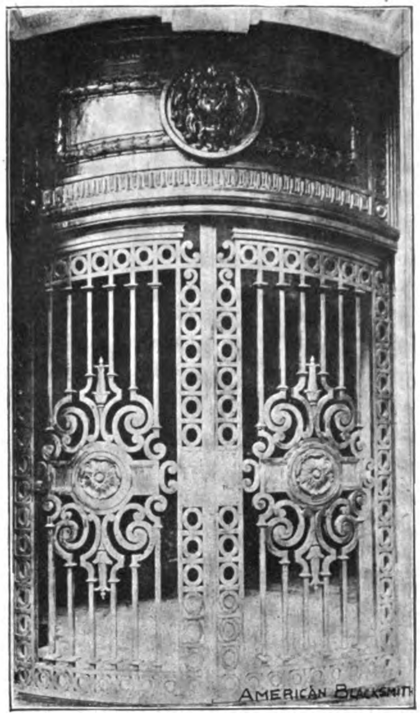
carriage rubber and leather dressing. He advertises this dressing in all the surrounding country papers, and deposits with leading country dealers in paint supplies a quantity of the dressing to sell upon commission. His trade has grown from year to year to such an extent, that the dull season of painting is altogether too brief to enable him to manufacture sufficient dressing to supply the trade.

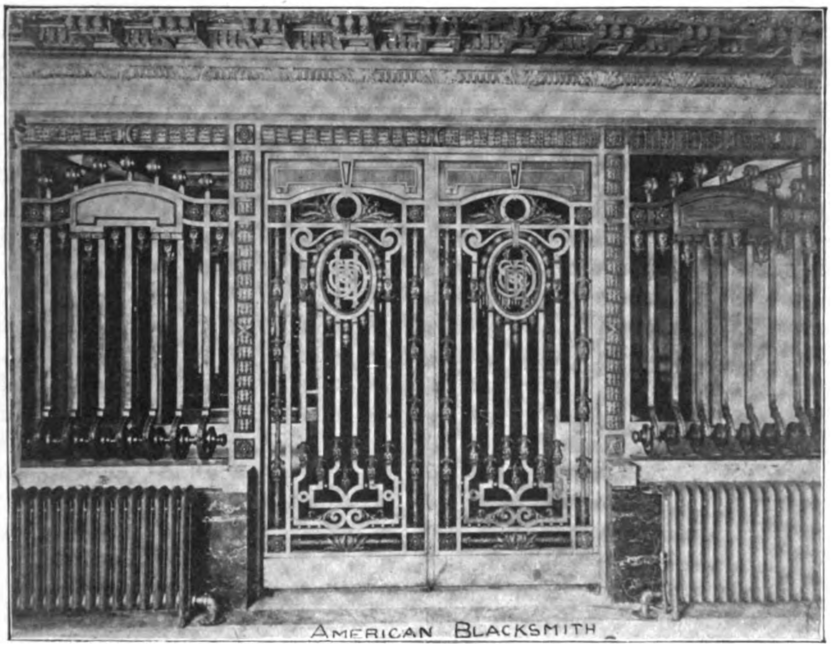
Another makes striping pencils and sells them through correspondence to parties who find it inconvenient to manufacture their own pencils. It takes practice, of course, to become sufficiently skillful in the work to make a profit from this business. Some years ago through the writer's suggestion, a young carriage painter of Cortland, N. Y. was persuaded to take up the manufacture and sale of sword and dagger striping pencils. He advertised in the various carriage trade papers of the country, and presently found his services in great demand. Orders in plenty came to him from all parts of the country, and for several years he did a flourishing business; and it was only through neglect and inattention that his trade was finally permitted to languish. To-day, this field, outside of whatever trade the big brush-makers may command, remains unoccupied, and it is rich with opportunities for development.

Graining is a branch of work quite as well suited to the grasp of carriage painters. One of the ablest grainers it has been the writer's pleasure to know, was the late John Tied, of Ithaca, N. Y., who for a long term of years, was credited as being one of the best carriage body finishers in Central New York. As a carriage painter Mr. Tied began the study of different woods in their varied grain and color conformations; and from this study, given at leisure moments, he was led to attempt the imitation of woods with the result that he eventually became a past master in the art of graining. What this humble toiler in the carriage paint shop accomplished may be repeated by many a painter anxious to discover a line of work calculated to carry him over at least three dull months of the year. The popularity of grained surfaces that will pass under the title of works of art, is annually increasing, and while the autumn months are not the most favorable ones for securing work of this kind, there is, nevertheless, no small amount to be had for the asking by the competent grainer. Why not mix graining with carriage painting, and thereby increase the annual income?

Then there is the opportunity—the golden opportunity, perhaps—of buying carriages in the white, trimmed and ready to paint. This business is peculiarly adapted to the resources and circumstances of the country painter, and it offers him a way like the voice crying in the wilderness, out of the dead level of nothing to do, to a legitimate enterprise invested with a fair measure of profit, if properly handled. The writer has had nine years' experience with a carriage painter, located in a small community, who, for a part of that time was engaged in buying vehicles in the white, and painting and selling them. Needless to add, there were no dull months with the painter alluded to, and the profits realized from this combination of business were entirely satisfactory. The blacksmith, the wood-worker, the trimmer, and even the country liveryman, has turned carriage dealer with varying success. Why should the carriage painter hold aloof from the experiment, when by natural right he is best equipped to take up this class of business and carry it to a successful issue? Selling vehicles in the white has grown into a flourishing business of large proportions, and it is a business which the carriage painter, seeking new and broader fields of activity, may incorporate with his regular line of work, and realize a fine profit upon a small financial investment.



A VERY EFFECTIVE DESIGN FOR WROUGHT IRON VAULT DOORS.



ANOTHER GOOD SPECIMEN OF IRON WORK—GRATINGS AND DOORS.

(To be continued.)

A Wagon Kink.

D. M. LOVE.

I suppose all parts of the country are filled with a cheap grade of buggies which, after being used a year, will come loose at the corners, the side panels split and spring down below the bottom of the bed. Take a piece of two-inch band iron, from six to ten inches long, drill a hole for first bolt in loop, and insert between the bottom of the bed and the loop, so it will come all but flush with outside of

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panel. Tighten up the bolt. This will draw the panel up to place and will always have something to hold it there. Put a screw in the back end of the iron to keep it straight.

Timely Talks on Carriage Repair Work.

A. J. YEAGER.

Welding Steel Axles.

I saw in the May number of THE AMERICAN BLACKSMITH, a method given

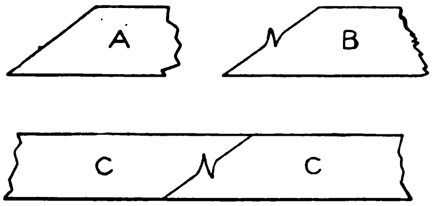


Fig 1. A.—READY FOR AN ORDINARY SCARF-WELD. B.—PIECE WITH NOTCH. C, C.—NOTCHED PIECES PLACED FOR WELDING.

for welding steel axles, and it seems to me that it is the old way of doing it, that is, getting a good heat, and striking right, and thus making a good weld. I give a simple sketch of the way I scarf the ends of axles. Shaping the axle as at A for the first performance, I then take a sharp chisel and cut across the scarf, when it appears as at B. I use Cherry Heat for a flux, and getting the desired heat, proceed to weld as shown at C. The hooks that are formed by the cuts of the chisel hold the ends together, and you cannot miss making a weld every time. This method applies to all kinds of steel welding. I should have saved myself a great many welds and heats had I known about this method twenty years ago.

Spring Welding—A Welding Compound.

JOHN CAMPBELL.

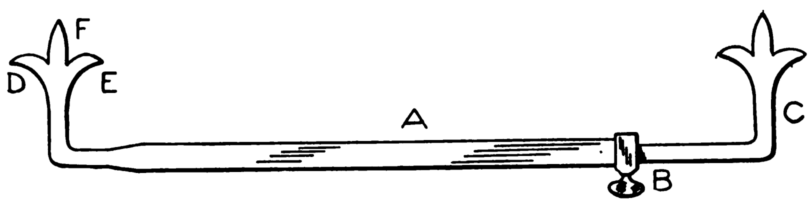
The accompanying illustration will show the method which I employ in welding spring leaves, and by means of which I always succeed in securing a compact weld. Cut as shown by the upper illustration, and then fork together, as the lower one indicates. I do not use any coal, but instead use good dry tan bark, breaking it up fine and placing it in the forge, which serves the same purpose. Take an even, steady heat; and when dressing, use lots of water on the hammer, and when cooled to a dark red, pour some common machine oil upon the weld and put the spring away to cool.

As a welding compound, use an ounce of carbonate of iron mixed with twelve ounces of finely powdered borax. I find this compound such an excellent one that you can burn an old rasp or file in your fire until it almost drops in two, put some of the compound on both pieces, take separate heats and it will weld as easily as a piece of common iron.

Calipers for Tire Setting.

C. C. HENDERSON.

In setting all kinds of tires, one often needs a pair of calipers to measure the tire in order to see when it is expanded sufficiently. Such a tool, as shown in the accompanying drawing, will be found useful in a great many places, and will repay making. A is a hollow pipe with a collar welded on at one end. The other end of the pipe forms the points D, E and F. B is a thumb screw in the collar, to hold the sliding end C. The points D are for the outside dividers, E for the inside, and F are trammel points.



ORIGINAL DEVICE FOR USE IN SETTING TIRES.

This tool is exceedingly simple, and I would not be without it in my work.

The Progressive Smith as a Business Man.—1.

BILLY BUNTZ.

The Treatment of Patrons.

Aside from having a clean shop and doing good work, the progressive smith is otherwise qualified to look out for his own best interests, the same as business men in other lines of trade.

Recognizing that out of the multitude of workers in the business world there are few who really meet success financially, the up-to-date smith knows that to depend simply upon the strength of his arm would be conducive to progression only to a certain degree; hence, he "works his head" by reading and studying everything pertaining to smithing, and adopts such new tools and employs such business tact as he sees have proven profitable to others in mounting the rungs to financial success.

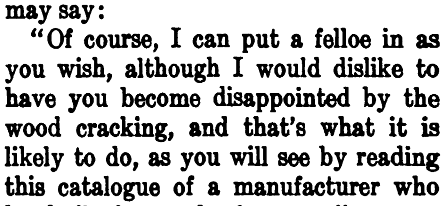
Under this plan he knows that whether one method or another of doing work will prove substantial depends largely upon the kind of material used and the way the job is handled—that he must vary his methods at times in order to follow a certain principle in doing jobs of all kinds.

Likewise, he learns that whether one maxim or another in business will prove profitable, depends much upon his own tact, shrewdness and judgment in following it. Consequently, when he hears some brother say that this, that or the other does not pay, he knows that that man is speaking more generally from his own individual standpoint, while other smiths may be making a grand success of the same thing by handling it differently. Quite a number of ways are there to "kill a cat," although some folk quite naturally think theirs the only one.

By wearing a "thinking cap" the progressive smith becomes proficient not only by adopting up-to-date methods of smithing, but expert in handling customers as well. He would rather see iron rust, than to allow his "upper story" to become "corroded." He knows that to please individuals, many of whom are of different mind, requires a fine perception of human nature. Thus, when a customer with a ridiculous hobby becomes "pig-headed," instead of showing disgust, he pats him on the back and proceeds to "change his mind" without hurting his feelings, by citing well-founded principles, and may say:

"Of course, I can put a felloe in as you wish, although I would dislike to have you become disappointed by the wood cracking, and that's what it is likely to do, as you will see by reading this catalogue of a manufacturer who has built thousands of wagons."

Of manufacturers' catalogues he has a regular library, which he studies as studiously as a child in school, gleaning from them practical ideas and talking points that he could obtain in no other



A GOOD WAY OF MAKING A WELD.

way. These he uses daily. In small matters, as where a customer insists that cast iron would answer where malleable iron or steel will be needed, he has only to give a chip of a casting a light

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rap to illustrate that cast iron would not last a minute were something to strike it.

From a business point of view probably the worst feature with some smiths

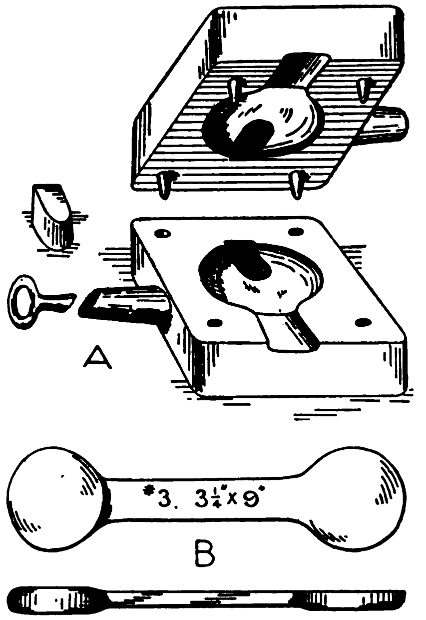

Fig. 47. FORMER AND BLANK FOR WRENCH FORGING.

is bad debts. All kinds of lien laws have been cited as a remedy, yet have helped little in bringing the cash. Consequently, some smiths endeavor to do business entirely on a cash basis, thereby losing worthy trade.

Bad debts oftentimes result from the smith being too easy with his customers, instead of impressing upon them that as the bill is small and the job really a cash one, it admits of little time being allowed. Where there is any doubt at all about the customer paying promptly, he should be "nailed to the debt" by applying business principles, rather than to allow him to depart, to pay when he gets ready—maybe not at all. While talking business to him the smith should employ language to "smooth down his feathers," rather than to "ruffle" them, something after this plan:

"I'll pay you next month," the customer may say, unconcernedly. He may mean this or he may not, and should be questioned.

"On the first?"

"About that time."

"That would be all right if I wasn't pinched for cash, having a good-sized bill to meet by the first."

"Don't believe I could pay that soon."

"While I don't mind giving credit—and everybody knows yours is as good as gold, yet just now it's a matter of cash with me, and I must have something to get money on. If you'll just sign this note I'll make the time two months."

If the customer has a friend with him he may be asked to sign, also, "as the bank likes to have two signatures on individual paper." Where a strong talk is made the customer cannot consistently refuse to sign, for to do so would show that he intended to be backward in paying, anyway. Notes endorsed are cashable at banks. They may be placed in hands of a collection agency and payment forced. It is best that they draw interest, even if the smith has to pay the interest himself.

An excellent plan in handling a poor-pay customer who asks credit, is to show him a drawer half filled with old bills, with the remark, "Would be glad to do it, but already have a drawer full of debts." Or he may barter his work for produce where the customer considers it an accommodation and is willing to make his prices lower than those of the store.

(To be continued.)

The Railroad Blacksmith Shop.—12.

W. B. REID.

Making Wrenches.

The method of making an ash pan shaker lever, shown in last article, can with advantage, be applied to a variety of standard forgings, such as brake hangers, spring hangers, brake cylinder arms, etc. For these, tools similar to those shown in Fig. 46, (see last article) with ball forgings of suitable proportions, would be required. Operations would be greatly simplified, however, by omitting the punching of the holes, which in forgings of this kind, are more properly machined.

The superiority of an article forged in this way is very evident. The compression of the iron successively in ball and forming dies solidifies the metal to a superior degree. Calculated of just sufficient stock, the ball adjusts itself accurately to shape of die without any preliminary cutting or trimming, (usual under other conditions) and leaves no superfluous stock to over-lap and destroy the edge of die under the impact of steam hammer.

The supply of wrenches for locomotive and general use, makes frequent demand upon the railroad blacksmith. With the proper tools and a little system, as outlined in the last article, we know of no method superior to the ball forging for making wrenches. The necessary outfit consists of a set of ball swages, and a set of forming and punching dies of suitable proportions. A, Fig. 47, shows the latter tool, easily and cheaply made of mild steel, the holes for punch, dowell pins and handles, being all the machine work necessary. The impression in tool is made under hammer by a correctly proportioned, smoothly finished pattern, see B, Fig. 47. The patterns for the different sizes of wrenches are preserved and used as those for other tools formerly described. Stamped upon the shank is the number of the ball swage required for the ends of wrench No. 3; also the stock required for entire wrench—¾ x 9 inches (round). This is for 1⅜ and 1¼-inch nuts. The ball is the same used for making the ash pan lever, shown in last article. The pattern for 2 and 1¾-inch nuts, reads (5) 4" x 10". For 1⅛ and 1-inch nuts, (4) 2¾" x 8"; for ⅞ and ¾-inch nuts, 2" x 8".

The method of making is very simple. A ball is formed on both ends of above stock, the stock left in centre being just sufficient to draw out shank to right length for each wrench respectively. With one heat the ball is forged, flattened and punched. The balls naturally flattening into discs with smooth, round edges, fit perfectly into the impression of punching tools. One blow of hammer, before inserting punch, checks down the neck of wrench in a smooth, perfect manner and clear of interference in drawing down centre, see A and B, Fig. 48.

To avoid a multiplicity of tools the same ball and punch are used for both ends of wrench; the adjustment of one end to the smaller nut being a very easy matter. These dies can also be

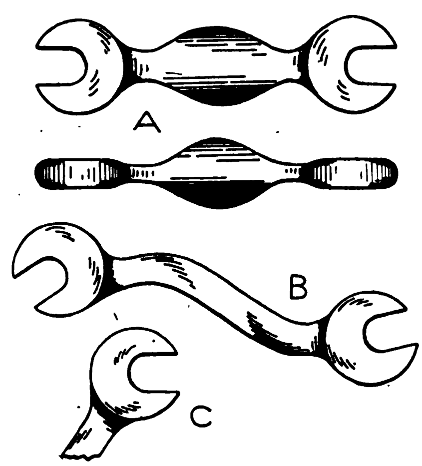

Fig. 48. METHOD OF MAKING WRENCHES FOR LOCOMOTIVE WORK.

adopted for side wrenches (C, Fig. 48) by having an additional impression of shank made in die at proper angle, the double impression in no way impairing efficiency of tool, except in dispensing with one of the dowell pins.

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Given the material of right proportions, (hammered iron or mild steel) the largest of these double side wrenches can be made in one hour, producing a clean, uniform forging at a low cost.

The smaller wrenches for $\frac{1}{2}$ and $\frac{3}{4}$-inch nuts can be stamped more advantageously out of $\frac{3}{8}$ or $\frac{1}{2}$-inch boiler plate, in a tool similar to B, Fig. 49. The cutting surface of this tool is a cast steel plate riveted into the grooved iron block. An additional guide plate for top, with dowell pins, being required to guide punch A. A $\frac{7}{8}$-inch rod screwed into side of block serves as a handle. The ends of these small wrenches can be finished in one heat, in small tools similar to B, Fig. 47; but more conveniently adjusted in spring swage fashion.

Grouping the nuts with sizes marked upon a handle as shown at C, Fig. 49, is a neat and convenient arrangement, facilitating the work of finishing the wrenches.

(To be continued.)

A Welding Trick.

BY B. B. B.

I know that a great many smiths, and good ones too, look upon steel welding with something little short of fear. The way I go about it is first to be sure my fire is perfectly clean, and then to take my heats very carefully, getting as good and even heat as possible without overheating the steel. After proceeding in this way, and using borax only for a flux, if one does not succeed, let him try mixing some fine borings with the borax and covering the weld with this. I find that borax and fine steel borings from my drill are a splendid compound for steel welding.

The Elementary Principles of Mechanical Drawing.—5.

How to Make Working Drawings.

In making a mechanical drawing the one aim should be, not to make a fine, artistic sketch, but to make a drawing every line of which has meaning that will help to explain the object represented and enable the mechanic to construct it from the sketch. Of course every draughtsman will endeavor to turn out as neat and sightly work as possible, but this is only a secondary aim.

In entering upon a description of how to make mechanical drawings, we must remember that little more can be done than to outline the general way of going about it. The best thing for anyone desiring a knowledge of the principles of drawing is to start in and make mechanical drawings of different things, rough ones if need be. Choose the simplest objects first and proceed from them to drawing more complicated forms, taking care that every line and step is well understood. Readers of THE AMERICAN BLACKSMITH are invited to freely question the editor as to any difficulties or perplexities which may arise.

In the following paragraphs will be found a general outline of procedure, and to illustrate we will choose an anvil as our piece to be drawn.

One of the first things to consider in making a drawing, is what point of view will give the clearest and most complete idea of the whole object. Or, when it is too complicated to be represented in a single view, the first step is to fix upon what views will show the object completely with the fewest number of views. In the case of our anvil, one side view, one end view and a top

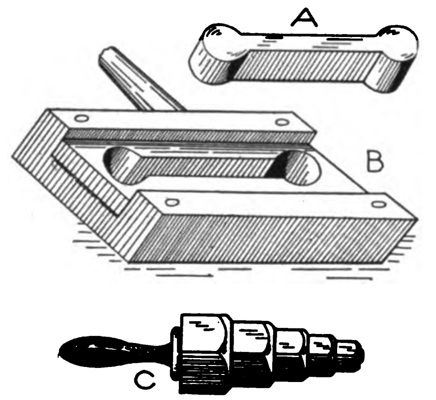

Fig. 49. A, B.—CONVENIENT FORM OF DIE AND PUNCH. C.—A NEAT ARRANGEMENT FOR GROUPING NUTS.

view or plan would probably be all that are necessary. Two end views are given here for greater simplicity. It is never well to complicate a view by trying to show too much in it. Having selected our views, the next step is to draw our center lines, the horizontal one AB and the vertical one CD, and upon these start to draw our principal view. As we assume our center lines to run through the center of the object, the top and bottom boundary lines are located by laying off to proper scale on DC on each side of the center O, half the height of the anvil, as OE and OF. A convenient scale should be chosen. Our scale will be one inch to the foot—that is, every foot of length or width of the anvil will be represented by an inch of length or width on the drawing. The scale should always be given on the drawing, so that the mechanic who has the article or pattern to make, can find the length of any line not dimensioned, by scaling it off, i. e., measuring its length on the drawing and multiplying by the scale. For instance, a half-inch line on our drawing represents a six-inch line on the anvil itself.

Using our T-square, we draw light horizontal lines through E and F, and then reducing our corresponding measurements on the anvil to scale, lay off with dots the distances EG, EH, EJ, EK, OL, OM, FN and FR. Locate the points P, Q, S and U.

Now, having all ready, sketch in lightly in pencil, the outline of the whole anvil, making the various lines pass through the points scaled off. Use the curves (described in article No. 1 of this series) or the compass to sketch in the curved lines of the boundary, and with the T-square and triangles secure the straight lines. As our anvil sketch is in elevation, and the hardy hole does not extend to the side surface, this fact is indicated by outlining it in lines of long dots. Every line on the anvil, i. e., every sharp junction of surfaces must be represented in the sketch. When these are on the outside and visible to the eye, they are shown in plain lines, but when an inside line is to be indicated, a dotted line is employed to show this fact, as in the case of the hardy hole.

Having made a complete drawing of this view (side elevation) of our anvil, we proceed to represent the other necessary views of it. The top plan must be given, and, in our case we will also show two end elevations. In drawing the top plan, we show it as it appears by looking down on it from directly above. First an additional center line will be required, assumed as dividing the top surface of the anvil into two lengthwise portions of equal width. The position of the lines or points gg, nn, pp, qq, rr, h, j, and k are obtained by projecting the corresponding point G, N, P, Q, R, H, J and K up from the figure below. These projections are obtained by use of the T-square and triangles. Placing the square across the board and triangle in position (as described in a former article) find the points vertically above on the plan that are to correspond with the various points on the side elevation. The lengths of these lines, as gg, nn, etc., are taken from measurements of the anvil, reduced to scale, and laid off. The hardy and bolt header holes can be located on this top view and drawn in.

After placing vertical center lines for the two end views, proceed to find the corresponding points as before, placing

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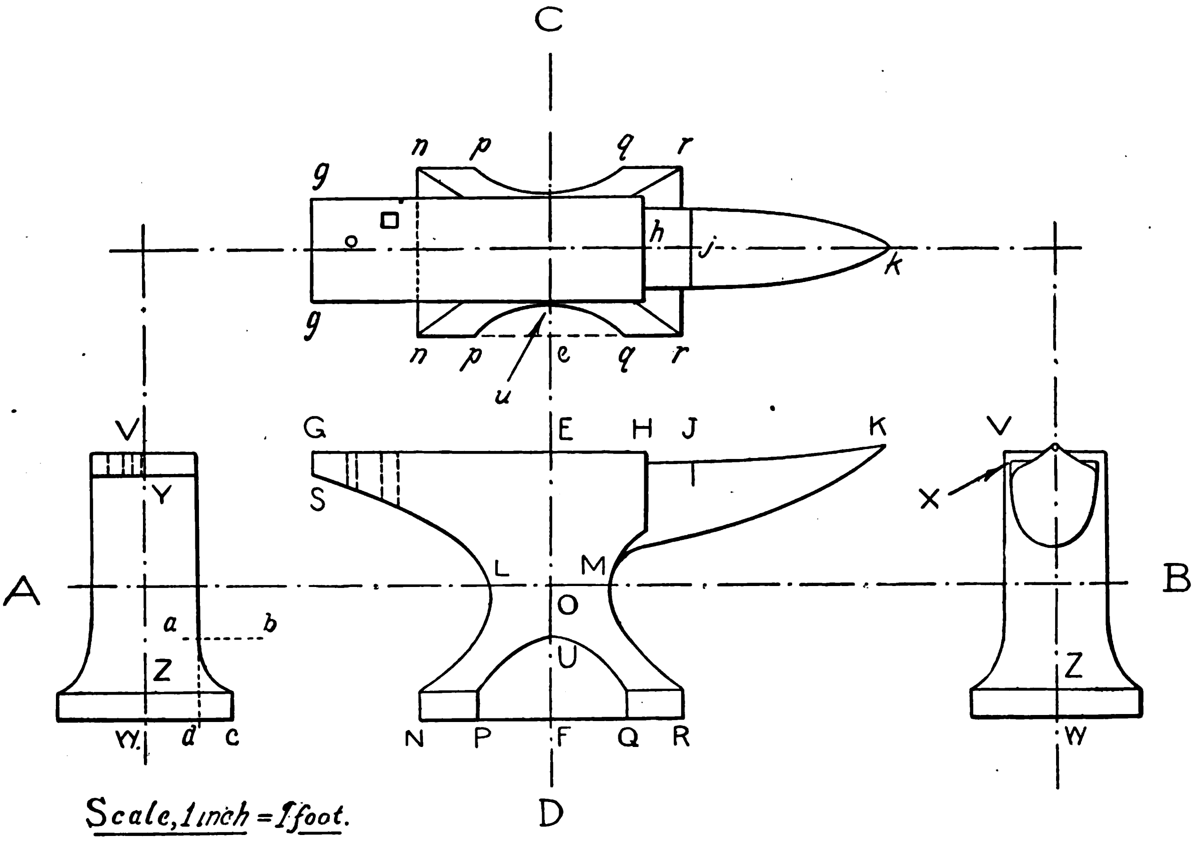
the right end elevation to the right and the left to the left, as shown. This position of all horizontal lines on these two figures can be obtained by projecting them from the side view first drawn. These horizontal projections will be done with the T-square. V is obtained by horizontally carrying over the point G. Y is obtained from the point S in the same manner, Z from T, W from N, X from J, and the height of the point of the horn in the right hand view from the point K. We have thus determined the horizontal heights of the various lines as points on the end views. As we have already laid off on our top plan view the lengths of these various lines, we can save time by taking our measurements direct from this top plan view. In other words, the length of the line V in either end view will be equal to gg of the top plan view, and similarly the length of the base line W in either end view will be equal to the distance nn. It will therefore simplify matters, instead of going through the process of taking measurements from the anvil and reducing them to scale, to take our dimensions from corresponding lines already drawn on the top plan view, as already explained.

Having determined the position and length of the various lines on the anvil, we are ready to draw them in lightly in pencil, in anticipation of inking them in finally if this is to be done. The various curves can be sketched in free hand first, and then put in more carefully by compasses, or by use of the irregular curves explained in former chapter of this series. In this way, the finished drawings of the anvil may be made. It will be understood that the letters on the drawings here given are only for our purposes of explanation, and would not appear on our finished drawing. It will be interesting in this connection to bring out the connection between the different views of the drawing by determining exactly one of the points of the curve on the side of the anvil in either of the end views. Referring to the side view, the point U of course lies in this face of the anvil, and in the top view the point u also is situated in this face. Project U to the left, drawing the line *ab*, lay off *cd* equal to *eu*. Project the point *d* up vertically and where it cuts the line *ab* will be located a point through which the curve of the side of the anvil must pass, as shown.

In the following chapter will be explained the use of the different kinds of lines, the principles of shading, dimensions, lettering and reading of drawings.

The succeeding chapters have already been outlined as to general treatment of the remaining topics.

(*To be continued.*)



COMPLETE PROCESS OF MAKING THE NECESSARY WORKING DRAWINGS OF AN ANVIL.

Practical Tire Welding Hints.

WILLIAM B.

In view of the long experience which I have had with tire work, both in factories and small shops, I feel that perhaps the following pointers may interest AMERICAN BLACKSMITH readers, though probably old to many.

There are a great many ways of welding tires, and not all are equally good. For instance some smiths will narrow down the width at the ends before welding it, or even cut off the edges after welding, so as to keep the tire from getting too wide. I do not believe in doing either of these things—the first increases the difficulty of making a weld, and the second is apt to produce weakness by sacrificing the amount of welded surface.

Then again there are different ways used for holding the ends together during welding, such as by splitting the tire, forking the ends together or even by riveting. I think the following method of welding is, however, greatly superior. After drawing the ends down to proper scarves, I spring the tire by pulling down on that end which is to be on top during welding,' and in this

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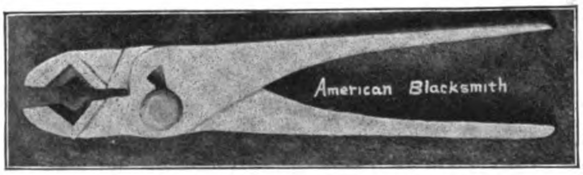
way get the two ends so they will remain pressed together firmly and steadily. Next I take a low heat and lap the swelled scarves on each side so that there can be no possibility of slipping out sideways. Also a few taps from the hammer over the body of the joint will serve to fix the end so there will be less tendency to pull out.

I then take my heat carefully. When bringing to the anvil to make the weld, the most important point to be remembered is that the point of the underneath scarf must be welded first. Strike right over this point just as soon as the tire is placed on the anvil, as otherwise the anvil will cool the thin lip immediately and make a perfect weld impossible. Next I weld the point of the upper scarf, and then complete the weld. While still with a welding heat, I turn the tire on edge and hammer it down well, until the tire is narrower in fact, at the weld than at other points. Then of course in the finishing processes it can be hammered to the proper width. By careful dressing the weld can be made to look like the tire at any other place.

In all welding work I take care that my fire is just right. Too old or too green a fire will not do, but make your fire up well beforehand; be sure you have it plenty deep enough with good clean, well coked coal. Regulate your blast so as to get an even hot fire. As to a flux, there are numbers of excellent compounds on the market, though many smiths can get the best of results from borax alone. I think the best way is to choose some good flux and stick to it.

A Novel Carriage Wrench.

We are indebted to Mr. A. L. Hamilton, of Kearney, Neb., for the photograph from which the accompanying engraving was made, showing a novel form of carriage wrench patented by him a few years ago. This wrench is intended for carriages, although it may be used for other purposes, such as for holding pipe, etc. It is adjustable in three different sizes and will take almost any size of nut.



A CARRIAGE WRENCH OF NEW DESIGN.

Steel and How to Treat It.—5.

JOSEPH V. WOODWORTH.

Annealing Processes.

The term annealing is used to designate a process through which tool steel and various other metals are required to pass, to allow of their being worked into shape and used for the different purposes required in the arts. The steel-worker must first learn that it means a great deal more than simply heating a piece of steel red hot and allowing it to cool; in order not to injure the steel during the process, he must have had experience in its use and have studied the characteristics of the particular brand of steel which he is to treat.

The annealing of steel is accomplished by heating it evenly to a high heat and then allowing it to cool slowly. This annealing increases the flexibility, softness and ductility of the metal; thus restoring to it the properties which have disappeared through excess of strain in rolling, drawing, twisting, hammering or forging, or other mechanical means; the same having caused the steel to become brittle. A fact that does not appear to be known by steel workers in general, is that the successful hardening and tempering of a tool depends greatly on the manner in which it was annealed previous to machining it. Thus it will be obvious that the correct annealing process must be understood in order for the succeeding process of hardening to give satisfaction.

First, always anneal any odd-shaped piece, or one with an irregular hole in it, after having roughed it down. The best way to anneal such pieces is to pack them in charcoal in an iron box, being sure to have as much charcoal at the sides of the box and the top as at the bottom, so as to prevent the heat from penetrating too quickly and unevenly. Keep the box at a red heat for an hour, and then leave it in the ashes to cool.

The proper heat for annealing the well-known brands of tool steel has been determined through experience to be almost a forging heat. By keeping the metal at a bright red heat for some time, all strains which may have a tendency to manifest themselves during the subsequent hardening process will be overcome. Never use cast-iron chips or turnings for pack when annealing, as they will decarbonize the steel to such an extent as to prevent successful hardening. Another thing that will decarbonize the steel is the packing of the parts too near the walls of the box. In fact the effect will be worse, as the decarbonization will occur unevenly, for the surfaces nearest the sides of the box will be affected the most, thus making any hardening that is possible unequal.

Of course there are a great many shops which have not the facilities to allow of using the above described methods. In such shops very satisfactory results may be obtained by heating the steel in a good charcoal fire to an even bright red heat. When the steel is at the proper heat, put a few inches of the fire ashes into the box and place on top of this a soft pine board, on which place the heated steel. As the wood will char and smoulder for some time, the steel will cool slowly, and the annealing will be thorough. Quite frequently a box of cold ashes or lime can be used to accomplish the same results, but to a lesser degree. However, the other method is by far the best, as the cold ashes, or lime, if used—both act the same—may chill the steel.

A sketch of a good annealing box for small parts is shown in the figure, half of which appears in elevation and half in cross sections, to show the manner of inserting the plug. To make it, take a piece of, say 3-inch iron pipe about ten inches long. Tap or thread both ends of the pipe and fit plugs to them; cast-iron ones will do. One of the ends may then be closed and the charcoal and parts to be annealed packed in, after which the other plug can be screwed in. With a box of this kind no sealing is necessary, as the plugs will prevent the entrance of air.

While most manufacturers of steel tools and parts have their steel annealed at the works where it is made, it will be found that the best results will be attained when the steel is annealed in the lengths which are to be used for the tools; as it will be found that most steel requires more care in annealing than the steel makers appear willing to give it. It is a well-known fact that more steel is spoiled through overannealing than in any other way. Steel heated too hot in annealing or kept at a high heat for too long a time, will shrink badly when being hardened; besides the life will be taken out of it. The steel should be heated to a cherry red; taking more time to heat it than would be taken were the same steel to be hardened. It should be heated slowly and given a uniform heat all over, through and through.

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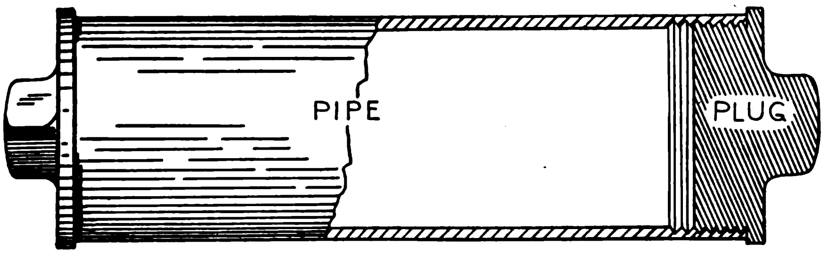
When only a small quantity of steel is to be annealed, heat it to a cherry red in a charcoal fire, and then pack it in sawdust in an iron box. Keep the steel in pack until cold. To anneal a large quantity of steel so that it will be very soft, pack it in granulated charcoal in an iron box, as follows: Have at least ½ to ¾ inch of charcoal in the bottom of the box, and add a layer of granulated charcoal to fill in the spaces between the steel parts; also have ½ to ¾ inch at the sides of the box; then add more steel and finally 1 inch of charcoal, well packed at the top. Heat to a cherry red and hold there for about three hours; then allow the steel to remain in the box until cold. There are some kinds of steel which will not anneal satisfactorily, even when packed in powdered charcoal in air-tight boxes. When you strike steel of this sort, cover it over with fire clay and heat to a bright red heat, and allow to cool over night in the furnace or fire ashes.



A GOOD FORM OF ANNEALING BOX FOR SMALL PARTS.

A very satisfactory way to anneal bars of tool steel is to heat them in red hot lead—chemically pure lead, I mean—keeping the surface of the lead well covered with broken charcoal. By this method the heating can be accomplished uniformly, and one can see the color all the time. I have annealed a great deal of steel in this way, simply covering it with sawdust when the proper heat was reached, and allowing it to cool there. All steelmakers realize the injurious effects of overheating steel, and of over-annealing; and many advise, as I do, heating in hot lead as the only way to insure against uneven heating.

Very satisfactory results in annealing can be attained by using granulated raw bone, the treatment of the steel, of course, having to be in accordance with its grade and use to which it is to be put. A brand of raw bone for this purpose which I have used in the past with the best results, is "Hubbard's Granulated Raw." To anneal with raw bone, use bone that has been burned a number of times until it is almost pure white. Pack the work in an iron box with the bone well around it, and then place in the furnace or oven, and heat to a cherry red. When the work has reached the required heat, stop the blast and allow the box to remain in the furnace and cool down with the fire. Do not remove the work from the boxes until all heat has disappeared; the slower the cooling is effected the better the results will be.

Quite frequently a piece of tool steel is required for a repair job or for some other work that is in a hurry, and there is not sufficient time to allow of annealing it in the regular way. Then again a piece which has been hardened has to be annealed and machined in short order. When confronted with these conditions, the steel-worker can fall back on the more rapid methods of annealing, first and foremost among which stands the "water annealing" process. After he has tried this process a few times he will be delighted with the results.

In my next chapter I will fully describe the different methods of water annealing, as well as other quick and reliable methods of annealing tool steel and self-hardening steel without in the least affecting their hardening qualities.

(To be continued.)

A Steadying Device.

C. C. HENDERSON.

In our shop, we have a great many arch bars to shape and bend. These run from 3½ to 1⅝ by 4¾, thus making it very hard to weld without a steam hammer. For a long time I bent them over the anvil, but this was a little too difficult to do. I therefore took a block, for which purpose a swage block will answer nicely, and made four straps, 3 by 3¾ inch, cutting a slotted hole in one end and punching a round 1-inch hole in the other. I then made two keys for the same, and after bolting them on the block as shown in the figure, had a very handy arrangement. The iron is placed in between the straps and the keys are driven in, which will give a good tight grip and will hold anything. In our shop we make skid jaws or hooks, cleat hooks and anything which takes bending to do. For the purpose of cleat hooks, fashion a mandrel the same size as the cleat to fit between the straps, and then cut off the iron, heat, place it on the block, keep tight and shape with the fuller.

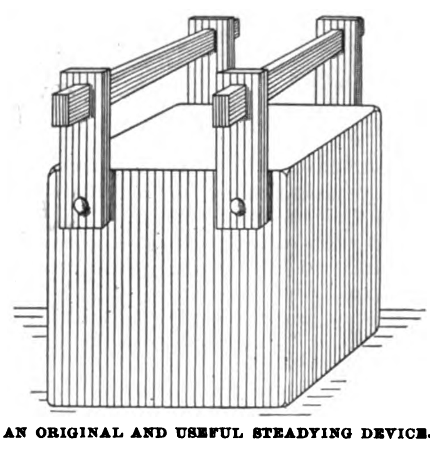
When a man has a troublesome line of work to do, the only way is to think out some device for doing away with the "troublesome" and leaving the "work" to be done handily and profitably. This device is as simple as it looks and costs little.

A Few Words on Shoeing Mules.

BY S. S. M.

The foot of the mule is round in front, but from the quarters back to the heels it is straight and perpendicular, having a form very like a contracted foot on a horse. The hoof should not be allowed to grow out too long. The heels should be pared down so that the frog is allowed to touch the ground. Sometimes the heels of mules grow together, causing lameness, by pressing against the navicular bone. Contraction and corns follow. Make a shoe the shape of the hoof and shoe just as a horse is shod. The shoes of a mule should be lighter and narrower than those of a horse. Five to six nail holes are generally sufficient for a mule's shoe. As the walls are very hard and tough use nails that are short but strong in the shank. Those with weak shanks are liable to bend in driving.

A little practice in shoeing the mule will enable a horseshoer to do the work as readily as shoeing an ordinary horse. There is one thing to be studied carefully, and that is the "mule nature"—which has become proverbial. Kindness and fearlessness combined are here the best devices, also. The mule is very like the horse. The peculiarity of construction of this animal's hoof should be carefully noted, but any smith attempting to shoe any animal whatever should strive to know something of its anatomy from a practical standpoint.


AN ORIGINAL AND USEFUL STEADYING DEVICE.

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The Wish of the World.*

EDNA MANNERS.

An old cripple looked up with a glance shrewd and keen,
From selling shoe-strings for a penny a pair.
His clothes were in tatters and not over clean;
All unwashed was his face 'neath his long matted hair.
As he sat on the curb, there was woe in his eye,
For he counted his pennies, and, counting but ten,
He sighed as he thought of the beer they would buy
If they only were dollars—then counted again.

A lawyer looked up from his big office chair,
And a crease in his brow told of care on his mind—
"With an income of two thousand dollars a year
Can a clubman exist who for pleasure's inclined?"
As he fingered his bank-book and counted it o'er,
Every hundred he numbered, he wished it were ten—
"To be worried and scrimped is a horrible bore,"
So he conjured up visions and counted again.

A millionaire wearily lifted his head,
And a bundle of telegrams 'gan to explore.
Of the panic in Wall Street he hurriedly read,
And he murmured "By Heaven! I wish I had more."
For he planned a financial stroke, daring and bold,
To buy up the world and the whole race of men—
What a grand, mighty corner! He counted his gold,
And he cursed each poor million and wished it were ten.

* Written for the October AMERICAN BLACKSMITH.

HEATS SPARKS WELDS

October—May it bring fall prosperity.

Any fault-finding customers? With whom does the trouble lie?

Keep the credit good by paying as you go, and you will have a better heart to push collections.

Ere we know it, winter will be upon us again, with the same old round of work—old and yet new.

Before condemning a recipe be sure you have followed it exactly. Small deviations often lead to great failures.

Cents make dollars. A raise of a few cents on each horse shod will count up into a nice little sum at the end of the year.

Just what we need is the journal that tells in a clear, interesting way how to do the things that have bothered us.

Care of tools will save buying new ones. With proper usage a good tool should last until it is out of date, or even longer than that.

A curious smith shop has just come to our notice through a subscriber, in which the blacksmith works under an apple tree. We are trying to obtain further particulars.

Letters all answered? It is a business-like man every time who keeps his business correspondence right up to date, and people have naturally more respect for such a tradesman.

About side lines—the blacksmith of the near future may have among his repair jobs the mending of air ships. Blacksmithing will then be a rising craft without question. Times are looking up.

Look at our typical shops in the prize contest articles, and benefit by the other fellow's virtues or mistakes. Can you not bring your establishment up to the highest pitch of excellence? Why not?

Good humor counts. Of two equally skilled smiths, the cheerful one with a pleasant word is naturally preferred. A good laugh is the best medicine in the world—and the easiest to take.

Worrying and toiling over one's work does not get it done either more quickly or better. The man who takes things coolly and pleasantly has more head for planning and contriving than the fussy man. Keep the mental mercury down.

The man of pride—that is he who takes pride in his shop, his work and his reputation is sure to be an able craftsman. There is always something behind this kind of pride. It inspires confidence in patrons at the outset.

Advertise! First insertion draws attention. Second shows that you mean it. Third that you are still advancing, and after that, each advertisement tells the public that you are among the leading tradesmen of the day. Don't give up after one or two trials but keep right on.

A new machine for utilizing energy during the hot weather was devised recently. It is an arrangement on the back of a chair, which, when the lazy or tired person sits down and rocks, utilizes the energy expended, to fan the operator. What shall we have next?

The wagon repair man has his turn now. Have you read about our prize offer for the best article on wagon work? It's good, useful information that will count, not fancy wording or faultless spelling. We'll put your article in shape. Do not fail to try at once for one of the ten prizes. Contest closes December 12th.

Don't give up. If the trade is not paying, try every way to make it more profitable. Raise your prices, adopt up-to-date methods, advertise and draw custom, before you decide that you were not meant for a blacksmith. It is sometimes hard to tell just where the trouble lies.

Expert craftsmen are at a premium but there is also great demand for sober, reliable men of a lower degree of skill. The man who is always at his post and ready to do his best is often put over the heads of men of greater ability, who lack these sterling qualities of dependability.

The up-to-date horse has developed a "sweet tooth." One of the latest articles on his menu is molasses. The subject of the use of this very cheap material as horse food has been scientifically investigated by some prominent veterinarians with the result that it is highly recommended.

Too good to keep are many of the things some of our folk of the ingenious kind discover in their daily work, and yet they keep them all to themselves. A few minutes, pen, ink and paper and the idea may be the means of benefiting a thousand brother smiths. Send it in as it occurs to you and we will do the rest.

In choosing paint the carriage man should obtain that which is least injurious to the painter. Some kinds of green paint which contain arsenic are very poisonous. Others, being made from, say Prussian blue and Chrome yellow are quite harmless and equally good. This point is worth attention, especially when much of this color is to be used in the paint shop.

The ignorant man who wants to learn is to be respected. The hopeless case is the man who does not know and yet is too stubborn to admit that he is ignorant. Such a man will go on for years, following antiquated methods and declaring that they are good enough for him. He has used them twenty years and guesses he'll stick to them for twenty more.

One great advantage of the blacksmith's craft over many others is that it is not affected by the weather. The farmer is entirely dependent upon the elements. The carpenter, the bricklayer, the teamster, and hosts of other trades are seriously affected by the state of the weather. It's a good plan to keep in mind the bright points of one's calling rather than to dwell upon the dull. Try this plan.

Tom Tardy was smoking leisurely as we came up to his shop the other day. It was during the recent convention of Master Blacksmiths, and, after exchanging "Good-day," we asked him if he had been attending the convention. "When?" he asked. We told him it was going on at that very minute, and he only said, "Well now, funny I hain't heard." Then he added, "No, I hain't no time to spare for them new-fangled things. There's so much of this here play goin' on these days. A heap o' talk about nothin' an' a whole week gone, you may say. No, I won't go." Then he smoked away with an air of satisfaction, and we left him still thinking.

An enterprising smith had an elaborate sign painted, and when it was finished it was so beautiful that he hung it up in his shop. People from all the country round used to go to inspect this work of high art, and the smith won great celebrity. "Why do you not hang it out?" somebody asked. The smith looked wise. "For two reasons," said he, "first, there is every chance that somebody would 'hook' it. Secondly, people would think nothing of it if they could see it without the trouble of calling at the shop. It's a great ad. as it is, you see for yourself."

There was much shrewd wisdom in this smith's head, although upon first thought it would seem an odd idea to have a sign that was too expensive to hang out.

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American Association of Blacksmiths and Horseshoers.

Every blacksmith, horseshoer and wheelwright cannot do too much thinking these days, upon the subject of craft organization. Some method is most plainly needed for doing away with the harmful results of craft jealousy and price cutting. Few classes of mechanics are more sadly lacking in unity, and no one but themselves, unless it be their families, suffer the ills due to it. We wish to strongly urge the advisability and more, the necessity, of individual craftsmen getting together and cultivating that spirit of unity and brotherhood which would, without question, result in better conditions all around. Mr. H. Stade, Flandreau, S. D., writes: "I am thankful to you for what has been accomplished. A friendly feeling is in existence among all of us in this town, which has never been before, and every night we are holding meetings and talking many things over for our improvement."

Get together with fellow craftsmen of town, township or county, form yourselves into a local, an association, an organization or not, as you will, but do not fail to meet together with your brother smiths, as men with men, at the earliest opportunity, to talk over your condition, the question of prices, the bad debt question, and methods for improving various existing evils. It is safe to say that such meeting of smiths in friendly spirit cannot but be to the advantage of all concerned.

The American Association most strongly advises for smiths in every section, the formation of associations, founded upon a brotherly spirit in the first place, as the greatest step in advance which they possibly could take. Plans for such associations will be cheerfully furnished to any by addressing Box 974, Buffalo, but by all means, take up the question of closer unity with your brother craftsmen.

You can aid in an endeavor to get a lien law in your state for the protection of blacksmiths and wheelwrights if you will. If you will drop a postal to the American Association, at the above address, you will be furnished full information.

Some Prices from Kansas.

KUETHER & DUKE.

Shoeing a span of horses	$3.00
Resetting a span	1.60
Setting buggy tires	2.00
Wagon tongues, put in	2.50
Buggy tongues, put in	2.00
Buggy shafts	3.00
Buggy shafts, single	$1.00
Cutting down wagon, bent rim	7.00
Cutting down wagons, sawed felloes	8.00
Spokes	.15
Felloes	.20
Half rims	.75
Buggy reaches	.75 to 1.25
Plow handle, put in	.50
Fork handle, put in	.25
Singletrees	.50
Doubletrees	.35, .50 and .75
Wagon reach	1.25
Neck yokes, buggy	1.00
Neck yokes, wagon	.75 to 1.25
Plow points	.65
Shovels	1.75
New lays plow lister	3.00
New shovels, set	2.50
Stubbing buggies, 1 inch	6.00
" " $1\frac{1}{8}$ inches	7.00
" " $1\frac{1}{4}$ inches	8.00
Patent wheels, set	12.00
Sharpening well drill bits	.75 to 1.00

On the Method of Drying Timber.

The common idea that wood may be thoroughly dried by being placed for a certain length of time in a drying room, at a heat of from 50 degrees to 60 degrees C. or 120 degrees to 140 degrees F. is quite erroneous. Even the expert woodmaker may be mistaken in this respect, unless he knows exactly to what processes the wood has been subjected from the time it is cut until the time of its leaving the drying room.

It is not commonly known that wood which has been floated in rafts or otherwise gives more satisfaction than that which has been carried by rail or cart to the mill. While lying in the water the wood undergoes a beneficial process. Its sap and albuminous and salty substances are dissolved and come out at the pores, the water taking their place. At the ordinary temperature of river water, the process takes place slowly, but the time of immersion is usually sufficient to insure its completion. In some drying establishments, especially in Germany, this process is brought about artificially by special apparatus. The boards or planks are piled up in a long iron box with narrow spaces between; the lid is tightly screwed down so that neither water nor steam can escape and steam is turned into the box at a continuous pressure of 0.2 to 0.3 atmosphere, this being continued from sixty to seventy-two hours according to hardness and density of the wood. The steam opens up the pores and kills the protoplasm still living in the cells. Next, the timber is placed in a bath of water for about a fortnight.

The drying is conducted as follows: The boards are placed upon a cart with narrow spaces between, and the cart run into the first drying room, which is heated to from 50 degrees to 60 degrees C. or 122 degrees to 140 degrees F., by means of steam or hot water pipes, placed on one side and underneath the floor. One side is provided with ventilators to admit fresh air. The air, becoming heated and charged with moisture, is forced out at the other side of the room by numerous openings connected with the outer air.

After this process has been completed, the wood is sometimes taken directly to the workshop; but a more complete drying requires a second drying room. This room is heated by a stove extending its full breadth, supplied by fuel—usually coke—from the outside and kept at red-heat during the process. The pieces of wood are, each one, given a certain rectangular shape at the end, and then loaded upon a cart and placed in the room, which is then sealed up for fifty or sixty hours. The wood is then taken out and carefully examined. If the end has retained its rectangular shape, the piece is known to be thoroughly dry. If not, it is subjected to further drying.

Although many workmen are afraid of the trouble and expense connected with this drying process, the superiority of results in reality justifies all expense in this direction. Imperfectly dried timber is liable to warp, split or bend soon after being made up. Again, regarding wood that has been thoroughly "washed out," it is far less liable to be attacked by micro-organisms, since containing nothing but cellulose and liquose (upon neither of which bacteria thrive) it is not susceptible to attack by fungi. Moreover, the salts and other substances native to the wood have been removed, and these tend to absorb moisture, to the detriment of the article manufactured.

The N. R. M. B. A. Convention at Buffalo.

A short account of the Eleventh Annual Convention of Railroad Master Blacksmiths was given in the September AMERICAN BLACKSMITH. In this number are shown a few engravings taken from photographs of members, and extracts from the reports presented are also read.

Among the various manufacturers represented at the Convention were B. M. Jones and Company, Firth Sterling

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Steel Company, The Crucible Steel Company of America, Ajax Manufacturing Company, the Cincinnati Railway Supply Company, Brown and Co. Inc., and the Ewald Iron Company. A very handsome souvenir was distributed by The Crucible Steel Co. The AMERICAN BLACKSMITH COMPANY presented to the members each morning, a complete printed report of the foregoing day's proceedings.

TWO BUFFALO MASTER BLACKSMITHS, RIGGS AND REILEY.

The Executive Committee for the ensuing year is as follows: T. J. Riggs, chairman; J. S. Sullivan; D B. Swinton; D. Fitzgerald, and J. Connors.

Mr. T. J. Riggs, Chairman of the Executive Committee, was born July 8th, 1855, in Warsaw Ontario. At the age of fourteen years he began his apprenticeship at the Great Western Railroad Shops, at Niagara Falls, Ont., and from this place was transferred to the Hamilton, Ont., shops, a year later. After serving four years there, he entered the service of the N. Y C. & H. R. R. at Suspension Bridge, N. Y., remaining two years in the capacity of foreman. With the hope of bettering his fortunes at the trade, he started for New Zealand, in the year 1876, but was obliged to return in the year 1881, on account of an impaired physical condition. After returning, he entered the service of the Erie R. R., at Buffalo, but left there three years later, to go with the W N. Y. & P. R. R. He remained in the employ of this Company four years, when he resigned to engage in the manufacture of switches and crossings until 1897, when he again entered the service of the W. N. Y. & P. R. R., now the P. R. R., as foreman of their Buffalo shops.

Mr. Harry Jeffery, one of the earliest members of the Association, went to work in 1848, at Newcastle-on-the-Tyne, serving seven years and working at one time in the shop of R. Stevenson, son of George Stevenson, of locomotive fame. Coming to America in 1857, he served for different companies since 1863, always as foreman. At the close of the war he was working for the Government at Chattanooga, Tenn., then going successively with the North Missouri R. R., the M. P. R. R., the Cincinnati Southern, and the Mobile & Ohio, leaving that position to go with the Pittsburg Locomotive Works. He has also been with the C. H. & D. R. R., and in charge of the Litchfield Car shops.

The following reports of committees at the Convention, will be of interest:

Repairs of Steel and Iron Frames; Best Method.

The repair of steel and iron frames is one of the subjects that should interest every master blacksmith, for there is no part about a locomotive that should receive more attention than the locomotive frame: it is the foundation; it belongs, first, to the forge and blacksmith, but of late years they come from the foundry, but for repairs they are obliged to go to the smith shop. The quality of the material used has a great deal to do with the success in repairs; first, the scrap should be selected with care, and none but good scrap bar iron used, and it should be double worked, care being taken not to overheat the slab. This done, you have iron good enough to put in any frame, steel or iron; if the slab is overheated, do not use it in repairs to your frame.

I believe a number of the fractures we find in the main bodies of our new frames are often caused by insufficient working of the material; it should be worked thoroughly to withstand the strain which a locomotive frame is subject to. We must bear in mind, a few short years ago the engines then in use were small compared with the engines of to-day. The steam pressure then was from 125 to 150 pounds, with 25 cars—which was a good load; the 225-pound pressure engines of to-day haul over the road from 50 to 60 cars, and the result is that we have more broken frames—they have increased the hauling capacity, and the question is, have they increased the frame proportionately?

On the Pittsburgh Division of the Pennsylvania lines they have a number of steel frames in service, and in the last two years we have repaired a number of them, and have experienced no trouble in doing so.

They break in the main section, also in the front section; in the main section they break in the top and bottom members at the back hole; this necessitates putting on a half jaw by increasing the top and bottom member from 4½ inches to 8 inches, which is forged from select scrap, as stated elsewhere in this paper.

We also experienced the same trouble with the front section and we increased it from 4 inches to 6 inches, welding in iron in place of steel. I have a blue print showing the frame as it was received from the builders and one showing the frame after being repaired. We have repaired 190 of these frames, both iron, and steel. In repairing, I use the "V" weld with the fibers lengthwise of the iron; this style of weld, made with a good clean heat, I do not think can be excelled, but it should be remembered that any weld with dirty sulphurous fuel is a counterfeit, and cannot be guaranteed. In some of the frames I have handled for repairs, I frequently find blow holes or sand holes, and in the repairs to one particular frame, in cutting it, I found a cavity in it large enough to put a hen's egg in; I also found it very porous and spongy. In welding the steel frame I take a very high heat on them, using a good flux. In repairing our frame we make no difference between the two metals, paying as much for one as the other, as all our frames are repaired piece work. The question of repairing frames on the engine is one that should be given some consideration, as I am informed they make a practice of repairing all their frames in this way on some of our railroads, having a man whose duty it is to go from shop to shop to make repairs to frames. My experience is limited in that particular line; I have repaired them in the brace, where you can build a furnace around them, and I believe they were thoroughly welded, but I look at those particular engines every time I go through the Round House if they happen to be in.

I am informed we have master blacksmiths, members of this association, who have been repairing frames by this method for some time, and your committee would be pleased to hear from those gentlemen at this meeting.

We all know that the cost of removing, repairing and replacing the frame on the engine is considerable, and if this method of repairing frames is successful, we, as master blacksmiths, should give it a fair trial with the approval of the Master Mechanic. JOHN S. SULLIVAN, Chairman

TWO VETERAN MASTER SMITHS, JAMES WALKER AND HARRY JEFFERY.

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The Advantages of Machine Forging.

We are living in an age of quick production, and to meet the demands of the present, it would be impossible to do so by the old method of hand-work. All work on cars and locomotives has been increased in size, in some cases more than double what they were before the method of doing the work with tools was introduced.

Any new job that comes in the smith shop, of any quantity, the first thought is to get up a tool or former to make it under a hammer, bulldozer, forging machine or the machine most suitable to do the work.

We make all our passenger, postal and 70-foot car bolsters and transoms on a forging machine and bend them on a bulldozer. This work is done for less than one-third of the cost of hand-work, and made in less than one-third of the time it would take to do it by hand.

All work done by machine forging is more correct than hand forging, if the dies or formers are made correctly and kept in good condition. There can be thousands of pieces made and all will be alike, whereas very often in the case of hand-work they will vary some, especially when two, three or five smiths are put on one job.

For fast work and correct work I report favorably on machine forging and tools.

H. A. FOLK.

Machine Forging. Its Advantages in Car and Locomotive Construction.

As a member of the committee on machine forging, its advantages in car and locomotive construction, I beg to report my experience in that line, as far as my experience goes. The progress in the last thirty years has been very great, when the greater part of the work, which is now done by machines, was done by hand, such as bolt headers, bulldozers, steam hammers and various other machines made to do certain classes of work for car and locomotive construction.

The bolt headers, bulldozers and forging machines are the greatest factors in producing forgings for cars, as one forging machine and a good man to run it can produce more forgings than ten fires can do in the same time; also it will of course, be more uniform.

You must get up the dies yourself to suit the forgings you wish to produce, as you know the machine is not of much use without them. It is the same way with a steam hammer. You can do almost anything under them if you have dies and formers to do the job. In a large shop it will take almost the entire time of a foreman in studying up dies and formers to do certain jobs that come to hand every day; not only that, but the tools for doing the work one year will be out of date the next, and as the time progresses, the engines built one year are not the same as they will be the next; and more so with the cars. They used to be 25,000 pounds capacity, now they are 100,000 pounds capacity. It is the same with engines. You take an engine built thirty years ago and put it beside one built today and see the difference; and so will all the workmanship vary on them, and the tools to produce these heavy forgings. If you have no up-to-date tools you cannot build cars or locomotives in a railroad shop and compete with the manufacturers. If the materials you make in your shop will cost any more than your competitors can buy them for, they will buy them, and the only way then for you to do is to get up tools so that you can make them cheaper than the manufacturers. For instance, when all cars had to have Janney couplers on a certain date and your company had a great many cars to equip, the same as ours, and were needing about two thousand draw bar stems per month, and you had no bolt header large enough to make them, like the case was here at that time. To weld a collar on them by hand was out of the question, as with one fire the best they could do was thirty-five or forty per day. I thought of making them under the steam hammer. To handle the bottom heading tool I put up a post by the hammer; the top header, forming the head, was a piece of round machine steel about four and one-half inches in diameter and five inches long, with the shape of the head carved in the center of it. After you drop your stem, with welding heat, in the bottom tool, you put the top header on the iron (your bottom header will keep the top in center of stem), you hit it two blows with the steam hammer, then turn it over and drive it out the same way, making a perfect head in center of stem. By putting four or five apprentice boys heating them in hollow fires, I headed up seven hundred stems per day and punched them in the same manner.

I inserted the punch in the top die, and the motion being so quick you can punch four or five thousand stems before you need to dress your punch. (I will send a blue

SOME MEMBERS OF THE N. R. M. B A. IN ATTENDANCE AT THE BUFFALO CONVENTION.

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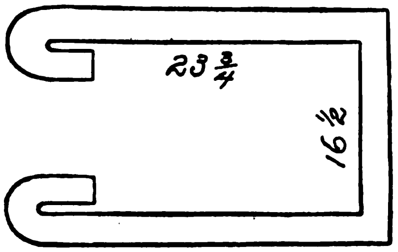
print of these tools to anyone who wishes it, upon application.)

After getting all these tools up a change was made in car building, to use nothing but yokes. I then had to study again the same as before.

The yokes we make here are made out of $\frac{7}{8}$ x 4" or 1 x 4" with lips doubled over the end, for a shoulder, as per sketch.

You simply take a round coupling link, weld a handle on one end, put a sharp fuller in the place where you want to make



MACHINE FORGING.

the bend for the hook, and press down with the top die, which will bend it over half way, then take your link away and hit one blow which will complete the hook.

To bend it on the other end, cast a pocket on your top die, on the front of it, make the bottom out of wrought iron as wide as you want the yoke and as high, and drill a hole in your bottom die and bolt it on to it, so as to meet the pocket in top die and lay the yoke. When straight across the bottom former, let the top die come down, which will bend your yoke the required shape. In this manner you can make about three hundred yokes per day. Will send sketch of this tool to any of the members, upon application, who wish to have them. I think this is a good tool, if you have no bulldozer.

I think it pays a railroad company to have up-to-date tools in the large shops, where you have use for them every day for car and locomotive work, as you can turn out about ten times the amount of work that you can by hand.

I simply illustrate these two items to show what good tools will do in turning out the work.

This is about all I can say at this time, as my time is very limited. J. GEO. JORDAN.

Repairs of Iron and Steel Frames.

I have a few remarks to make upon the welding of steel frames, having repaired and made alterations in upwards of 160, irrespective of iron frames, during the last 18 months. The alteration consisted in welding a lower limb to the front of the frame, on account of change in front section. See Figs. 1 and 2. A fork weld was made here, and I have to say that there have not been any breakages where this weld was made. On the other hand, many of the said frames were repaired in other places where defective, such as top and bottom or rail, legs, etc., and in the majority of instances repaired by that ever ready makeshift called the "V" weld. Several of these were broken after leaving the shop, and I noticed that all were broken in the same manner right across the center of the "V" weld, the iron showing a coarse, fibrous section, fine grained on the outside, but coarser as it neared the center where the fibre was lost and the iron resembled a piece of hard coke.

Some of my hearers will say, why did you not change the grain? This was done as much as possible, and I will make the remark here that it makes little difference how you cut or draw the V-piece. The result under certain conditions will be the same and is brought about by the heat and consequent hammering in the act of welding, inasmuch as the V-piece obeys the law that causes a fluid to seek the point of least resistance when under pressure. This places the fibre of the iron at right angles to the back of frame and the reverse to where it is wanted.

I will also add that but for the lamination caused by hammering, which reaches about $\frac{3}{4}$ inch, the weld would not be much stronger than cast iron. Let it be understood that this applies to the welding by sledges, not the steam hammer, on this class of work.

The weak point is as follows: The "V" is made too acute. It has also been heated up to the point of disintegration. The little work expended upon it is upon one side alone. I will digress a little and ask the question: Would you place a forging made in this manner with so little work expended upon it on any part of the engine? I believe not. And as regards the fibre I have this to say, it has nothing to do with the breakage. A piece of coarse, fibrous iron does not always indicate strength unless it has been well worked, and the heat given generally on this class of weld reduces the iron to about the same condition as it left the puddler.

Various plans have been formulated to get the grain the right way, as if this was all that was required; but so far as my experience goes the "V" should be much more than 90 deg. for a steel frame, from the fact that the iron "V" being of higher temperature will slip, owing to the iron pushing the steel after the steel reaches its welding point, and it will not weld until this is reached.

To neutralize this it is necessary to place or insert iron wedges on the angle of the scarf. See Fig. 3. This is to give stock and to facilitate the process of welding between the iron and steel surface. This is improved by welding the wedges in place by light beats before the main weld is made In regard to the "V" piece, it should be made from strong, close-grained iron, and should be heated sufficiently, but not high enough to burn the life and strength out of it. The least you depend upon the "V" heating the piece the better. Men in heating this class of weld aim to get it up to the point of disintegration, so that it will answer as a piece of putty or clay, so that there will not be much trouble to hammer it down on the outside, which will no doubt look well, but the material, when treated as above set forth, you will agree with me, is not first-class. T. C. LACE.

Case Hardening.*

At our last meeting there were misleading statements made as to the effect case-hardening had on the tensile strength of iron, some claiming it lost 10 per cent., others said $33\frac{1}{3}$ per cent., but the facts in the case prove quite a good percentage in tensile strength favorable to case-hardened iron.

*Continued from September number.

I have brought several test pieces of case-hardened iron with me, which can be found on the Secretary's table. Test No. 1 and piece No. 1, with a one-half square inch area, was subjected to red heat for five hours and shows a carbon penetration of $\frac{1}{32}$ of an inch, leaving 82 per cent of area not hardened and 18 per cent hardened. The tensile strength of this piece was 55,330 pounds per square inch. The tensile strength of No. 2 of same iron and dimensions, not hardened, was 54,420 pounds per square inch, which gives a percentage of $1\frac{1}{8}$ in favor of the hardened iron.

Test No. 2 consists of the pieces with one square inch area. Nos. 1 and 9 were subjected to red heat for ten hours and show a carbon penetration of $\frac{1}{16}$ of an inch leaving 76.5 per cent not hardened and 23.5 per cent hardened. The average tensile strength of these two pieces was 46,335 pounds. No. 4 same iron and dimensions, not hardened, had a tensile strength of 44,000 pounds, leaving 5 per cent in favor of the hardened iron. These pieces, Nos. 1 and 9, were allowed to cool gradually in the atmosphere and when cold were heated to a low red and quenched in cold water. Note how fine the hardened part appears.

Test No. 3, of pieces numbered 7 and 8 was identical with test No. 3 as far as time subjected to red heat, penetration, area of hardened and unhardened parts are concerned, but was quenched immediately in cold water. The average tensile strength of these two pieces was 54,185 pounds. Pieces numbered 5 and 6, not hardened, had a tensile strenth of 46,900, leaving 9 and 83-100 per cent in tensile strength in favor of the hardened iron. This also shows about $4\frac{3}{4}$ per cent in favor of quenching at the first heat, notwithstanding the refined appearance of hardened part of test pieces Nos. 1 and 9 in test No. 2.

FIG. 1.

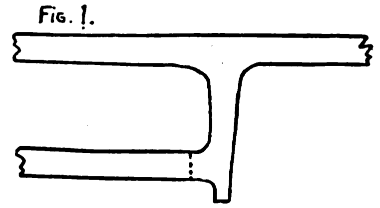


FIG. 2

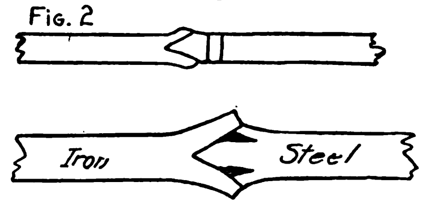
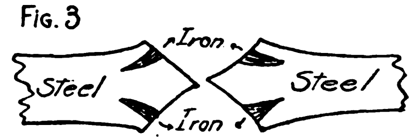


FIG. 3



WELDING STEEL FRAMES.

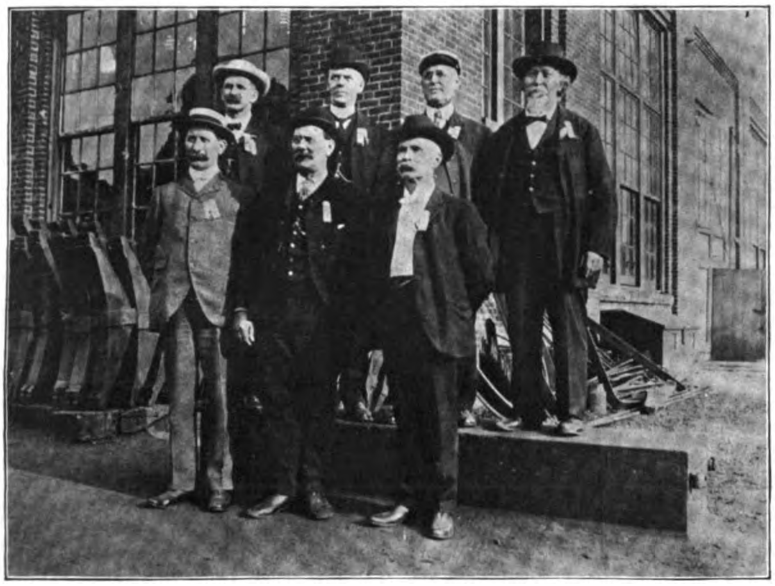
Test No. 4 pieces numbered 2 and 3, were subjected to red heat for 15 hours, and have a carbon penetration of $\frac{3}{32}$ of an inch, leaving 66 per cent of area not hardened, and 34 per cent hardened, average tensile strength 53,405 pounds. Average tensile strength of Nos. 5 and 6, not hardened was 48,900 pounds, which leaves 8½ per cent. in favor of hardened iron.

One would think the above four tests conclusive that case-hardened iron will show a greater tensile strength than will the raw iron.

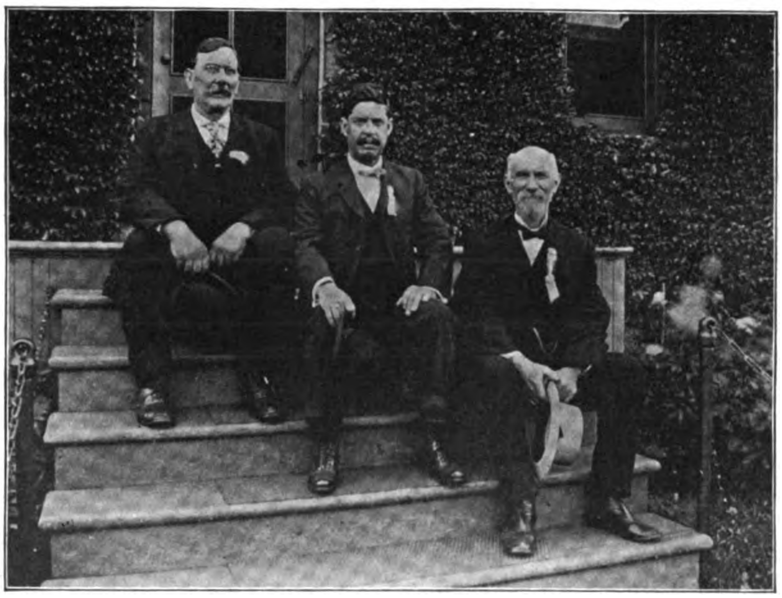
Case-hardening iron stiffens it, and will add to its tortional, shearing and bending strength equally as much as to its tensile strength; of course, when case-hardened iron reaches its limit of strength, it will check or crack, and sometimes break, but the same strain would disqualify raw iron in the beginning.

When we note that five hours at a good red heat will harden iron of a small sectional area $\frac{1}{32}$ of an inch deep, ten hours $\frac{1}{16}$ of an inch deep, and fifteen hours $\frac{3}{32}$ of an inch deep, we would think we have a rule of time when the iron is compact, and the hardening medium equal to raw bone in carbon contents, that would enable us to intelligently harden iron to any depth desired, or best suited for purpose intended, making proper allowance of time for heavier iron, such as guides, crosshead pins, etc. I would ask this question: If one square inch of iron hardened to a depth of $\frac{3}{32}$ of an inch shows 34 per cent of area hardened, and a gain in tensile strength of 8½ per cent, how deep can we harden a guide before its original tensile strength begins to depreciate? I will not answer the problem myself. It is for you; but I will say, you can harden a guide with a sectional area of 15 square inches to a depth of ⅜ of an inch and still retain 66 per cent of area not hardened, as in test No. 4, which shows 8½ per cent per square inch in favor of case-hardening.

The three test pieces, with tabs on them, numbered 10, 11 and 12, are common Merchant bar iron. They were all heated together for 18 hours, for the purpose of testing the virtue of annealed case-hardened iron. No. 10 was quenched when taken from the furnace; No. 11 was allowed to cool in the atmosphere, reheated and quenched; No. 12 was quenched when taken from the furnace, reheated and annealed in dry ashes, heated again and quenched, showing no depreciation in penetration or degree of hardness, but the hardened part has been refined very perceptibly. This would indicate that iron case-hardened to a considerable depth, and having passed through service that necessitated its re-machining, could be annealed, and after being trued up could be reheated to a low shade of red, and quenched, thus avoiding the necessity of adding more carbon, at the same time lessening the danger of the iron springing or winding, which we frequently have to contend with in case-hardening iron, as it requires a higher degree of temperature to qualify iron for absorbing carbon than it does to harden it in water after the carbon is absorbed. This is a scientific fact.



A GROUP OF MASTER SMITHS.
MESSRS. RIGGS, FENWICK, BUCKLEY, WALKER, KEANE, LINDSAY AND LACE.



GEORGE LINDSAY, E. & T. H. RY.
G. H. JUDY, PRESSED STEEL CAR CO.
BENJAMIN BURGESS, C. & E. T. RY.

If the subject had been "Hard Cases" instead of Cases Hardened, this paper might have been more interesting, but through fear of implicating the writer, I close the furnace. A. W. McCaslin.

Four Up-to-date Workshop Recipes.

The following recipes are recommended by practical and experienced men:

Hardening and Tempering Steel.

To one gallon of common fish or whale oil, take one pound each of beeswax and resin. Put into a kettle and heat till it comes to a boiling point, stirring it once in a while. When thoroughly mixed it is ready for use.

To harden in this solution, heat the steel till the scale rises a little, then immerse in the oil. When cool, heat over a clean fire till cherry red in the dark.

The foregoing, with a little practice is recommended as one of the best, if not the best, compositions for hardening steel tools for use in cutting iron or wood, or even steel. Care must be used as to the amount of resin in the oil, as resin hardens the steel, whereas beeswax and tallow toughen it. If a person prefer to temper in daylight, clean the steel or tool, polish it, and draw to a deep straw color, if for cutting iron or steel, and purple if for wood-cutting tools, such as plane irons, cutters, etc. With this composition, 'tis said, a better temper can be had for wood-cutting tools than with any other composition.

Cleaning Belts.

The next recipe gives a method of

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cleaning belting, as given by the Garnet Belt Dressing Company.

Either secure a tank with tight cover, or simply take a good strong barrel and saw it in two. Then place in tank or half-barrel, about ten gallons of naphtha—a tight covered receptacle saves evaporation. Take a dirty belt, regardless of amount of dirt, oil or cement and old dressing plastered on it. Coil the belt and place on edge (not on face) in tank, seeing that there is sufficient naphtha in tank to completely cover belt. Allow the belt to remain in this position about ten or twelve hours, then turn it over on opposite edges, allowing it to remain in the naphtha for the same time, or according to the dirt that is to be removed. Placing the belt on its edges allows the dirt to sink to the bottom, and, at the same time, the naphtha to touch every part of the surface. Remove the belt from the naphtha, allowing the naphtha to drip back into the tank. Lay the belt flat, stretching or shaking until almost dry. The naphtha will not affect the cement at the centre of the belt, but at the edges it will open a little. The old cement should be all scraped off, and the belt re-cemented. Next, place in a press to secure well. Anybody with a knowledge of belts knows how to cement and glue. Do not place the belt on pullies while hard, but rub it with the best material for softening and preserving leather. While dry the belt will readily absorb such material and become flexible and soft. Next use a good belt dressing.

Old belts may thus be restored to usefulness. Any man capable of looking after belts will be able to re-cement them.

THE SPICK-AND-SPAN ESTABLISHMENT RUN BY MR. JAY B. BAKER.—THE PRIZE PICTURE.

To Cement Rubber to Leather.

It is sometimes required to cement rubber to leather. The following is a good way:

Roughen both surfaces with a sharp glass edge, apply on both a diluted solution of gutta percha in carbon disulphide and let the solution soak into the material. Then press upon each surface a skin of gutta percha 1-100 of an inch in thickness, between rolls. Unite the two surfaces in a press that should be warm but not hot. In case a press cannot be used, cut thirty parts of rubber into small pieces and dissolve it in 140 parts of carbon disulphide, the vessel being placed on a water bath of 86 degrees Fahrenheit. Melt ten parts of rubber with fifteen parts of rosin and add 35 parts of oil of turpentine. When the rubber has been completely dissolved, the two liquids may be mixed. The resulting cement must be kept well corked.

To Prevent Rusting.

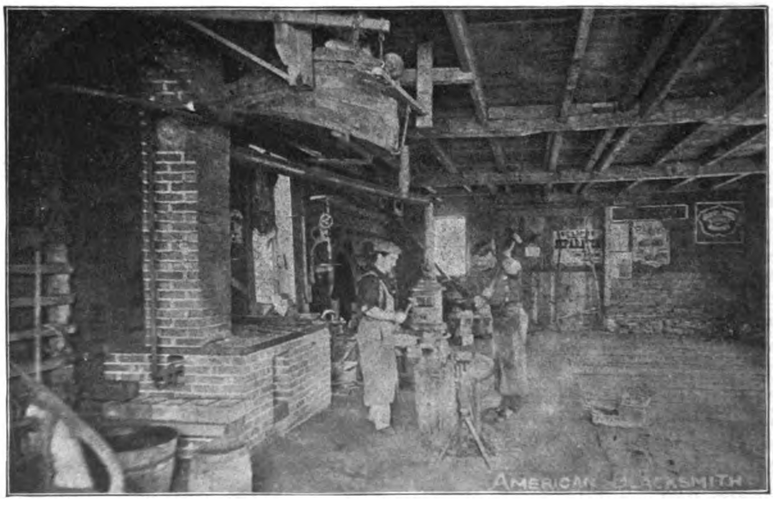
An excellent recipe to prevent rust, is as follows: Dissolve one ounce of camphor in one pound of melted lard. Remove the scum. Mix as much black lead with the lard and camphor as will give it an iron color. Clean the machinery well; smear with the mixture. After twenty-four hours rub off. Clean and polish with soft cloth.

Points on Brass Moulding.

BY B. E. B.

A common way of building brass furnaces for melting in crucibles, is with a cast or wrought-iron casing, 18 or 20 inches in diameter, and about 36 inches high, placed over an ash pit, through which the air is supplied. The casings are lined with fire brick. A small hole about 6 inches square is left near the top and connected with the flue leading to the chimney.

Regarding the actual moulding of brass, there is not a great deal of difference from casting iron. For larger castings in dry sand and loam, exactly similar moulds are made, but for very light castings in green sand, it is necessary to have a very fine silex sand, which contains a slight portion of clay. When sand contains clay in excess, it favors the production of the finest work, but there is always danger of blown spots when this is used, only to be remedied by drying the mould or by introducing more open sand to permit the gases generated at pouring, to escape. It is not necessary to cast brass any hotter than will result in clear, sharp outlines in the casting.



INTERIOR OF SHOP OF MR. NORMAN B. BIE, FORESTVILLE, N. Y.

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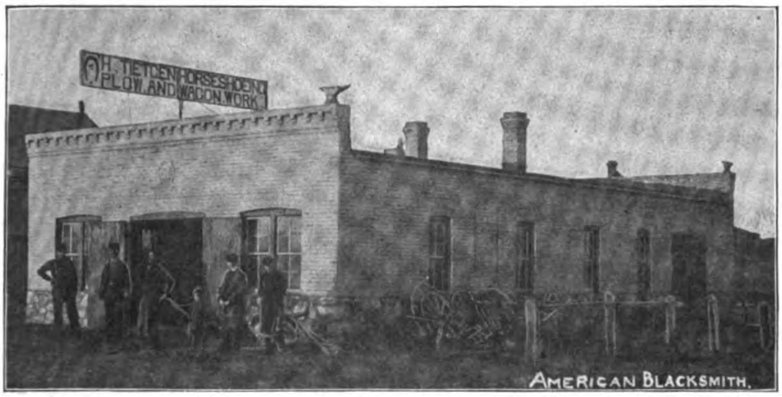
As a rule, most brass castings will be freer from honeycombs if the metal is forced in at the lowest part of the mould, care being taken to provide suitable vents for carrying off the gas generated.



A FINE SHOP, RUN BY MR. HENRY TIETGEN, DETROIT, MICH.

Conclusion of the Shop Picture Prize Contest.

Last spring we offered a prize for the photograph of the shop "standing nearest the high water mark of excellence." This condition was further defined as the neatest, most up-to-date, best-equipped and best arranged establishment to be found.

Of the many photographs we received in this competition, some were destroyed in our fire last June, and while in a number of instances we have obtained duplicates, in others we have not. Some of these pictures are of interiors, some of exteriors. Some of the candidates have given no account of tools or arrangement, and some have fully described theirs. Many good pictures had to be omitted on account of lack of space. Altogether, the pictures sent in represent a very excellent state of affairs in the craft. Prosperity and thriftiness as well as progressiveness are very evident on all sides.

Of the many fine shops pictured in our collection, we have chosen a few of those most representative of types—for example, we give reproductions of four exteriors and two interiors.

After carefully considering the various points of excellence of all the various shops and comparing them, the prize has been awarded, though it was difficult to make a choice, to Mr. Jay B. Baker, of Sanitaria Springs, N. Y. The accompanying engraving of this establishment, together with interior plans sent by Mr. Baker, show the spick-and-span, business-like characteristics which distinguish it.

Mr. Baker's shop has two stories and a basement. It is 20 feet by 30 feet, covered with novelty siding, and lined inside with asbestos roofing. The basement is used for a wood-shop and lumber room, and here Mr. Baker carries enough stock for two years' work, so as to have it well dried. The first floor is for horseshoeing and wagon ironing. The upper floor is used for painting and for storing agricultural implements, for Mr. Baker sells machinery, plows, harrows and tools as a side line.

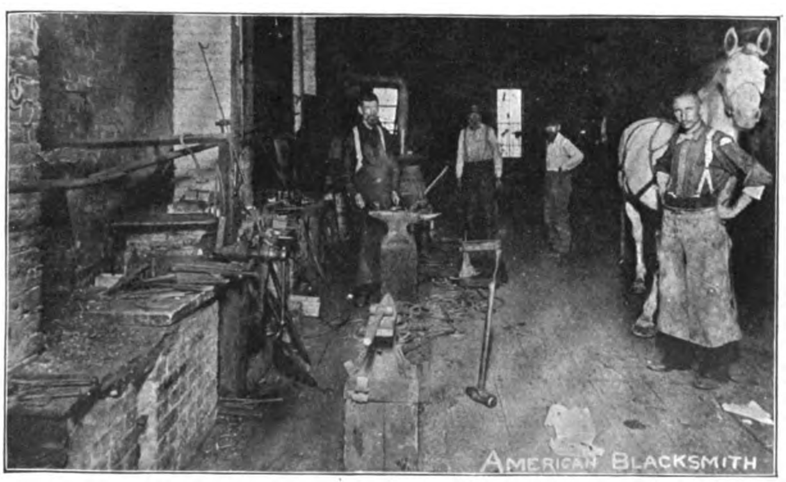
Most of Mr. Baker's tools are made by Wiley and Russel, Green River, Mass. He has a full set of hand tools for wood working, and in the blacksmith shop are a W. & R. No. 22 drill press, a machine for drilling and cutting threads in Neverslip shoes, a W. & R. tire bender, a W. & R. tire upsetter (setting 4 x 1-inch tires) a W. & R. lighting screw plates and emery stand, and also a foot-power hammer, made from an illustration in THE AMERICAN BLACKSMITH. A full line of small tools and a full set of swages are also on Mr. Baker's list. Of forges, he has two, a brick forge and a portable forge, but he finds that one fire, well-managed, will do a lot of work, and is sufficient except in the very busy time. Mr. Baker is about to put in a five horse-power gasoline engine, a bandsaw, planer and cut-off saw, and later, a power hammer.

Another exterior we present is that of the shop of Mr. C. Hall, Jr., McClure, N. Y. This shop is 40 feet by 34, and the owner intends adding 20 feet by 20 to it, and putting in more machinery. The engine shown in front of the shop is a Canfield gas engine, which he has just mounted himself. He has also a Canfield gasoline engine, three horse-power in the shop, with which he runs two line shafts, driving a 16-inch fan blower, wood lathe, iron lathe, emery wheel, drill machine, wood saw and a buzz saw for sizing timber such as sleigh and wagon woods.

A very fine shop is that owned by Mr. Henry Tietgen, of Detroit, Minn. This shop was built in 1901. It is 20 feet by 58 feet in dimension. The work employs three and sometimes four men. The equipment includes a gasoline engine, trip hammer, emery wheels and other tools. In the winter the work is principally shoeing and sleigh work, and in spring and summer it is plow work and machinery work. Mr. Tietgen is a German by birth, and has served three years in the light Prussian Cavalry. He has worked at the trade 33 years.

Mr. Norman B. Bie, Forestville, N. Y., sent us the photographic interior of his shop reproduced herewith. The building is 40 by 24 by 10 feet, and is only a horseshoeing shop.

The other interior is the shop of Mr. Fred Rickert, Lincoln, Neb.



AN INTERESTING PICTURE, SHOWING INTERIOR OF THE SHOP OF MR. FRED RICKERT, LINCOLN, NEB.

Among the many good pictures which, for lack of space, we cannot reproduce, are those of the shops of Mr. Ira A.

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Munson, Hoyts Corners, N. Y., Mr. B. B. Mallory, Racine, Ohio, and an interior of Mr. L. C. Noe's shop, Hartford, Ill. These are only a few.

A VERY ARTISTIC PICTURE OF A BUSY BLACKSMITH SHOP—OWNED BY MR. C. HALL, JR., MCCLURE N. Y.

In addition to the prize mentioned above, we offered one for the worst, most tumble-down shop, adequately illustrating what a smith shop ought not to be. The remaining picture is the one that takes the prize. We do not give this blacksmith's name.

We heartily congratulate Mr. Baker as the master of so fine a shop, and also as a successful prize winner. The sender of the other photograph of the Tom Tardy stamp of shop we also congratulate, though we cannot congratulate its owner.

Notes on Preparing the Hoof for the Shoe.

BY M. B. M.

About fitting the *shoe* to the foot rather than the *foot* to the shoe, much has been said; but this question, like every other, has two sides to it. It is only a matter of common sense, that the hoof, which is always growing and changing, should be pared to the proper shape before placing the shoe on it.

Just here comes in the point about which all controversy has been raised. It is wrong to suppose that all hoofs may be made to conform to a certain standard shape, and in trying to make them do so, a great deal of injury is done with the rasp. But judicious paring is a different matter. All that should be done for any hoof is to cut it sufficiently to secure proper proportions. There are scarcely two horses to be found with feet exactly alike, and the farrier must learn to observe the points of peculiarity before attempting to fit the shoe. Then prepare the hoof carefully, for much injury may result from the improper fitting of a shoe to an unpared foot.

A well-formed foot, when ready for the shoe, should present a symmetrical appearance—i. e., when looked at from in front, the two sides of the wall should appear of equal height, the line of the coronet should be parallel with the lower surface of the hoof, and the perpendicular axes of the legs should be at right angles to those lines. The height of the heels and toe should be proportionate when viewed from the side. From behind, the frog should be seen to touch the ground, and the lower surface of the hoof should present a level bearing surface wider than the wall, extending from heel to toe all around the hoof, and within this border should be seen the sole, concave, strong and rough.

If a foot has a naturally long toe, for instance, it is very injurious to rasp it off to give the appearance of a normal hoof, for the rest of the hoof has been formed to correspond and any effort to change nature must end disastrously to the animal. The only thing to be done in every case is to reduce the horn to a shape capable of most easily carrying the shoe, while still retaining its natural shape.

In preparing the foot for the shoe, the instruments required are a rasp, a drawing knife and a toeing knife. The rasp, which is the most indispensable, should be about sixteen inches long, for a short rasp will not permit the farrier to secure a level bearing surface on a hoof. The rasp should be used with greatest care, for a bearing surface may be spoiled by injudicious use of this instrument.

The drawing knife is formed with great skill for the purpose of paring out the concave sole of the hoof. This instrument is now little used, for any farrier knows that the stronger the sole and frog the better for the horse. Of course it is necessary to remove little uneven prominences of horn which are liable to cause uneven pressures or are in the way of a properly fitted shoe. The edge of the wall, for example, may have to be cut to make way for a clip.

The toeing knife is held and guided by one hand of the farrier whilst, with the hammer, the other hand drives it through over-grown parts of the horn. This knife is not objectionable on the large, strong hoof of the heavy draught-horse, but for light horses or those with

A SHOP THAT MIGHT BE OWNED BY TOM TARDY.

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weak feet of thin horn covering, it ought never to be used.

In paring any foot, the greatest care must be exercised. In the natural, unshod foot the friction of the ground wears down high heels or long toes, or other defect of growth, to the proper proportions, but the farrier who knows something of the anatomy of the horse will be able to produce the same effect with the rasp, for, when protected by an iron shoe, the hoof cannot possibly wear down proportionately, hence the folly of expecting to fit a shoe without first preparing the foot.

Another point—if a customer particularly desires his horse's feet shod in a certain way, or prepared in a certain way, do not openly fly in the face of his fads, but try indirectly to persuade him of the folly of his idea. A little tact in this way will often win a man to the right conviction, whereas if you refused flatly to do as he wished, he would probably take his horse elsewhere.

PLAN OF MR. BAKER'S SHOP AT SANITARIA SPRINGS—GROUND FLOOR.

Some Prices from Tennessee.

J. A. GRAY.

Setting wagon or buggy tires.....$ .50
Filling wagon wheels.....$2.00 to 3.00
Buggy wheels............ 2.00 to 3.00
Shoeing a horse all around with plain shoes.................. 1.00
Shoeing a horse all around with toes ....1.25 to 1.50

QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

How to Melt Brass—I would like to ask some brother to tell me how to melt brass and cast it. JOHN S. SCHAEFER.

A Hopping Horse—Will some one please inform me how to stop a horse from hopping? I have tried several remedies and all have failed. S. W. SALISBURY.

A Drop Forging Query—I would like very much to hear from someone in regard to drop forging hand hammers—what kind of dies to use and how they are operated. BART JOHIE.

Wood—In answer to Mr. John Tieking's question, would say that the holes get smaller when the wood is dry. At least the wood of our neighborhood does. O. W. TAYLOR.

A Question on Wood Axles—I wish some brother would tell me through these columns the proper way to work wood axles, so as to get the proper gather and pitch by gauge, without guess work and trying in the wheels. J. R. MCDONALD.

Method of Removing Old Spokes—To remove old spokes from hub, I notch the spoke on top, set a stick on the floor under the notch and then with the hammer hit a few smart blows at the notch and the spoke will draw. G. H. RICHARDS.

A Chain Puzzle—The following puzzle may be new to some smiths, and if so, may cause them to do some thinking.

A man carries five pieces of chain, each of which is composed of three links. How can he put the parts together in a straight pulling chain with only three cuts and three welds? S. W. SHORT.

A New Shop—Lee Richardson & Company, Vicksburg, Miss., intend to construct at once an up-to-date repair shop, where they will do blacksmithing, horseshoeing, wood work, painting, etc., of all kinds, and ultimately work into the manufacturing of light spring wagons, buggies, etc. The lot on which they intend to build is 300 by 100 feet. ED.

Interfering—I have several horses to shoe that interfere very badly. These horses interfered before they ever had a shoe on, and I wish that some one would give me the best plan for shoeing horses of this kind.

I also have a pacer that throws his toes out, and strikes the left front foot with the right hind foot under the fetlock. Will some one give the best plan to prevent the action of this horse? D. W. CRYCE.

Self-Sharpening Calks—Having seen on several occasions articles relative to a self-sharpening horse calk, I would say that such a calk has been made by a well known factory, but said factory was asked to discontinue, the horseshoers being very much opposed to such an article, as it dispensed with so much of their earnings in winter time. A PRACTICAL HORSESHOER.

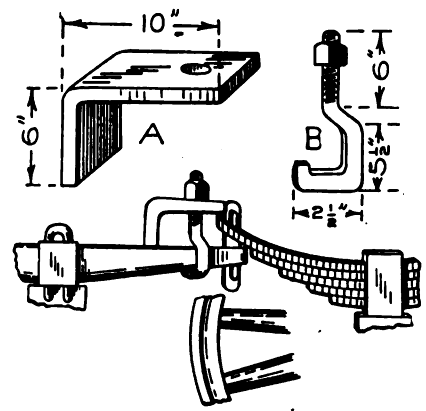
To Harden Files—I harden files as follows: Dip the file in red hot lead, handle up. This gives a uniform heat and prevents warping Run the file endwise back and forth in a box of salt water. Set the file in a vise and straighten it while still warm. Apply water to the part straightened until cold, and you will have a good file. ED. MARSH.

Shear Handle Funnels—I would like to know where I can get funnels which are used on factory tobacco shear handles. I make a number of shears each season, and have to buy fork handles and saw them to the length I want them and put the funnels on again. If I could buy the funnels, I would have the handles turned and save a great deal of work. Can some one give me this information? O. W. TAYLOR.

Welding Heavy Tires and Axles—First get a good coke fire. After placing your iron on the coke, put across the fire a piece of pine board one inch thick by four or five inches wide, cover your iron with three inches of green coal, wet down, blowing up slowly. Leave a hole in the front so that you can watch your iron and you will be surprised to see what a nice clean heat you will have. If you have to take a second heat, don't break up your fire, when taking out the irons, and you will have a good fire for a long time. MICHAEL LAMB.

Tempering Steel—In answer to B. I. Davis in the August issue as to tempering steel, I will give my experience as I had the same trouble. If I have no charcoal, I coke my coal, and if bad coal, I wash it first. Then sharpen and temper in one heat. Plunge the temper at a dark red for hard steel and cherry red for machine steel. I let my machine steel cool before tempering, as bits are liable to break off. For flint rock, I use cyanide of potassium in water. FRED RICKERT.

A Handy Tool for the Round House—In the round house, there are many new springs to be put in, and also there are engines which are low in the front, back or one side. This, as every one knows, is quite a job, and to help the machinists in our shop, we made the tool which is shown in the accompanying illustration. Every smith



USEFUL TOOL FOR LOCOMOTIVE REPAIR WORK.

will understand its use and operation from the drawing, and can make one. It is placed on the equalizer and spring, and by tightening up the nut pulls the equalizer up and pushes the spring down. This is a good device we think. C. C. HENDERSON.

Warping—In case hardening links, particularly those of the solid kind forged from wrought iron now being somewhat extensively used on locomotives, I find that they do not retain their shape after

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being case hardened. They convex on the block faces, starting from a point about one-half an inch from either end and increasing toward the center. I have known them to convex $\frac{1}{16}$ of an inch on both faces. This condition also exists on old links which have been annealed and trued up and hardened. I find this also in sectional links, but not to such a pronounced degree as in the solid kind. Can some one enlighten me as to the cause and remedy of this trouble? GEO. FROST.

One Man's Method—In my methods, I am neither old nor new-fashioned. I heat my steel slowly and often where much forging is done, and draw my temper in oil, grease, water or brine, as the work of the tool requires. About once in five or six years I miss a temper. I always heat back well and dip only a little farther than temper is needed in the tool. In this manner I manage anything from the heaviest oil well tools to three-fourths inch cold or chipping chisels or less. Light tools I harden and draw temper over fire after the old-fashioned method.

In my line a man is called on to do anything from making a pair of 300-pound drilling jars to putting in a set of boiler tubes, and this generally with a fire made in the ground. L. R. SWARTZ.

Springing When Case Hardening—Relative to engine motion links springing out of true, will say that I do not think the carbon or case hardening has any part in such trouble. They would spring equally as much, if heated red and quenched without being case hardened at all. In fact it would only be once in many times, should we heat a piece of straight iron red and quench it, that it would remain dead straight and true. We, as blacksmiths, worry over these contraries, yet the fact remains, that iron and steel will spring in quenching. To avoid as much as possible this trouble in engine motion links and in all work requiring case hardening, I will mention four essentials. First, uniform heating for forging; second, uniform heating for annealing; third, uniform heating for quenching and fourth, dip on end, and quickly that the bath may cover all parts of the work at once.

Engine links, or any case hardened work may be heated to the limit of black hot and straightened under a press. Such is general practice. A. W. MCCASLIN

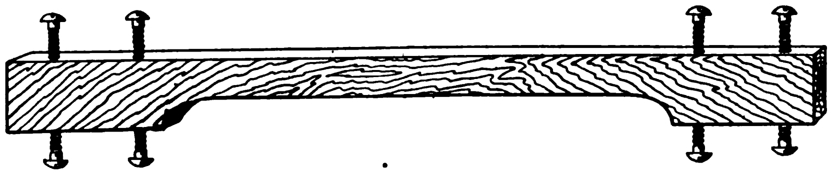
A Good Tire Bolt Holder—I should like to give my method for making a tire bolt holder, which we have been using with much success. Before I made this tool, we had a great deal of trouble in getting the tap from loose bolts. But when a fellow gets worried with such, if he has any wit, he will put it to work and try to invent a new scheme so that he can do his work much more easily and quickly. Take a piece of ½-inch round iron. Bend one end back in the form of a hook 2½ inches deep, 2¼ inches wide and 1½ inches deep from the bend of the handle. A stud of tool steel is welded on 1½ inches from the bend and is ½-inch long after welding. File this to a bevel edge, harden and draw to a blue temper.

To operate the tool, put it on the wheel, with the stud on the bolt head and the left knee on the lever. With this device I have held bolts tight enough to twist them off. I am the son of a blacksmith who takes THE AMERICAN BLACKSMITH, so I think I am justified in trying to help make it more interesting to its many readers. C. M. JACKSON.

Shrinkage of Green Wood—In regard to Mr. John Tieking's question in the August issue, I am glad to inform him that I have had considerable experience in house-moving wheels. To be sure when the wheels shrink, the holes would naturally be smaller. If nothing was inserted in the hubs to prevent it, they will shrink and tighten on the boxing. But give yourself no uneasiness about the boxing breaking. As the pressure is even and alike all around, it would be almost impossible to get pressure enough to break the boxing that way.

The following is one of my experience. In 1895, I built a large wagon out of the same sized wheels, only I used sycamore. This wagon was for use in hauling a crusher for the Kansas City Boiler and Construction Company. The road crusher was said to weigh eighty tons. This wagon was built out of green wood. I was called on to do some more work for them in two years and the wheels when I examined them were in good condition, the thimbles having become loose from shrinkage of the green timber. I have had many similar cases come under my notice. At this time of the year the sun is generally very hot, so that I would advise you to paint the sides of the wheels to prevent seaming and cracking and it is little trouble. M. A. FOSTER.

Simple Axle Set—In answer to E. A. Lockhart's question in the June number would say take a ⅞-inch board and cut out for bent axle. The top screws are for the gather line. Three of the bottom screws are on line and the end screw a scant $\frac{1}{16}$ of an inch less. I have used this set for years and find it just as accurate as any other. Of course, the screws may be adjusted to any desired set. J. S. STEELE.



INGENIOUS DEVICE FOR SETTING AXLES.

Handling Vicious Horses—I paid ten dollars to learn the following way, and will give it to my brother smiths for what they think it worth. If they will write to me and ask for information, I will be glad to write to them. In handling vicious horses the first thing to know is that you can do more with kindness than by abuse. If I have a very bad horse, I get a ¾-inch cotton rope, twenty feet long, tie it around the neck, bring it forward, pass it through the mouth over the upper gums, then over the head just back of the ears, down the side of the head over the gums again, and back through the rope on the neck. Now if he resists you jerk him; if he minds you pat him. Pick up the foot, not forgetting that there is more in kindness than abuse, handle the foot a few times, then go all around him the same way for you must break each foot. Do not try to hold him by the foot, that is the old way of shoeing. Drive a nail and let the foot down. Take your time, and I will assure you that you will never fail. I learned this twelve years ago and have never failed yet on horse, mule or pony. I have not used the rope for several years. I just use the bridle hitching strap. Take the rope or strap back to the hind foot and wrap it around the pasterns of the foot two or three times and he cannot kick you, try as he may. J. A. DELONG.

Putty—Will some one give me directions for making a putty to fill up joints on wrought iron frames for fancy doors? The ordinary putty will not harden and remain in the joints. I. PETERSON.

In Reply—A very good recipe for repairing damaged places in cast-iron tanks, cisterns, etc., is to melt together five parts brimstone, two parts black lead and two parts cast-iron filings (previously sifted). In melting, take care not to allow the brimstone to catch fire. Have the damaged place perfectly dry and heat well by placing a piece of red hot iron upon it. Heat the cement in a melting ladle till it becomes soft and apply to the hot surface.

Another recipe recommended to make a permanent and durable joint between rough cast iron surfaces is as follows: Mix asbestos with a quantity of white lead sufficient to make a very stiff putty. This putty will resist any degree of heat and is not affected by steam or water.

Still another putty or cement may be made by mixing coarsely powdered iron borings (5 pounds), powdered salammoniac (2 ounces), sulphur (1 ounce) and water sufficient to moisten it. This cement hardens rapidly, and if time can be allowed, it sets more firmly without the sulphur. It must be used as soon as made, and rammed tightly into the joint.

In all cases see that the surfaces are absolutely clean, and bring the cement into very close contact with those surfaces.

Painting Blackboard—Will some one kindly tell me how to paint a blackboard? I have painted several, but the chalk does not rub off easily. GEO. E. BRIERLY.

In Reply—Regarding the painting of blackboards so that chalk will rub off easily, the following recipes will be found practical and useful. It may first be remarked, however, that many boards are found difficult to clean off for, say, a fortnight after first using them; then they become all right. Prepared chalk will rub off best.

Paint the board with ordinary black paint that dries glossy, then give it a coat of lampblack mixed with turps instead of oil. This will give a dull, dead black.

2. Soak one-half pound of logwood twenty-four hours in sufficient water to cover it. Strain and apply to the board boiling hot. Boil the solution again, and apply a second time as before, letting the board dry in the meantime. Dissolve one-fourth pound of copperas in about one pint of boiling water and apply it boiling once or twice, as necessary to secure the required degree of blackness. Rub over with rushes, straw, ferns or shoemakers' heel ball before using.

3. Heat one-fourth pound of lampblack on a flat piece of tin or iron until it becomes red. When sufficiently cool crush it with the blade of a knife on a flat board, quite fine. Mix with one-half pint of spirits of turpentine, and apply the mixture to the board with a size brush. On a new board it may be necessary to give one or two coats of unburnt lampblack mixed with boiled oil, adding one-half pound of patent driers. Then apply the burnt lampblack and turpentine very quickly.

4. Mix soda silicate (water glass) with an equal bulk of water, and add enough lampblack to color the mixture. The lampblack should be ground and mixed with a *little* of the water and silicate before adding the whole of the liquid. E. E. M.

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THE AMERICAN BLACKSMITH

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Regarding Our Advertisers.

The "Honest Dealings" paragraph is printed in the advertising columns of THE AMERICAN BLACKSMITH, every issue, and guarantees the reliability of all firms whose announcement there appears. Our readers can depend upon it that our advertisers are all responsible houses. Advertising is not accepted from any other kind.

Readers can do the publishers of this paper a great service by mentioning THE AMERICAN BLACKSMITH whenever they write to any advertisers. We shall always endeavor to protect our subscribers from unscrupulous firms, and in turn would much appreciate it if our name is mentioned when any of our advertisers are communicated with by readers.

A Special Long Time Rate.

Believing the time has come with the beginning of this volume to favor our regular subscribers for their support of the journal, we have adopted a schedule of subscription rates for two or more years at a reduced price. Our subscribers know the value of the paper, know that it is a fixture, know that the publishers desire to cater to their wishes, and hence they will appreciate the saving which the new schedule will enable them to make by paying for several years' subscription at one time. These rates will be found on one of the advertising pages of this issue.

We can afford to make these discounts on account of the saving which it means to us in not being obliged to send a notice of expiration each year and to go through the clerical work of crediting each subscription as it comes in yearly. We already have a number of two, three and even five year subscriptions on our books, so that we believe our friends will be glad to take advantage of the special offer above referred to.

Special Contributions of Unusual Interest to Horseshoers.

The many readers of THE AMERICAN BLACKSMITH among the shoeing craft will be glad to hear that a series of articles upon Interfering has been arranged for from the pen of the well-known authority, Mr. E. W. Perrin.

Interfering in its many phases, presents one of the most interesting yet difficult problems with which the farrier has to deal. A practical treatment of this complicated subject by a man of deep theoretical knowledge and wide practical experience, will be found of great interest and value to our horseshoers. The first article of the series is to appear in the December issue. THE AMERICAN BLACKSMITH is very glad to have secured these articles, as there have been numerous requests from readers for information on this topic.

Carriage Repairmen's Prize Contest.

The prize article contest announced in last issue is still open. This is a chance not to be missed by any reader of THE AMERICAN BLACKSMITH whose work is in the carriage repairing line. The contest closes December 12.

Remember that ten prizes are to be awarded for the ten best articles on carriage repair work. We have already received some very good ones, but we feel that many of our ablest craftsmen have not yet responded.

Our object is to secure the most useful, practical information obtainable upon the subject. Another thing to be borne in mind is that the prizes will be awarded according to worth of the articles, without regard for spelling, writing or such points. If you have any ideas at all in this direction your chances of securing a prize are good.

Send in your article as soon as possible, for remember this contest closes on December 12.

Jobs That Clash.

A great many smiths, when they promise to finish a job by a certain date make some sort of mental note that it is to be done by such and such a day—and that is all. Another piece of work comes in which is promised for another date, and so on. The man who could keep all these dates and items in his mind without confusion or forgetting any would be little short of a genius. The trouble is that the average man is not capable of this great mental exertion, and many patrons are disappointed, either because the smith has forgotten or is unable to fulfill the numerous promises all made thoughtlessly for the same date. By this carelessness, many good patrons may be lost, and the smith's reputation for promptness and reliability is soon gone.

All this might be avoided by the simple use of a system of memoranda. By reference to such, the busiest smith can tell at a glance just where he stands, and how much work he has on hand. He will not promise that Jones' tires will be set by Tuesday if he sees that already he has enough work on hand to keep him busy till Wednesday without touching Jones' job.

It is an excellent plan to cultivate the memory, but not at the expense of waiting patrons. Besides, any methodical establishment, in these days of system, should have books to show all information of every description connected with the current business. Such system may

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be of the simplest description—merely a collection of neat, methodical notes, or it may be elaborated to a complete set of books.

The Fate of Photographs.

Many contributors, when sending photographs, ask us to return them after printing. We are always very willing to do this, but it should be remembered that the picture, after going through the various processes of reproduction, is often unfit for anything but the waste basket.

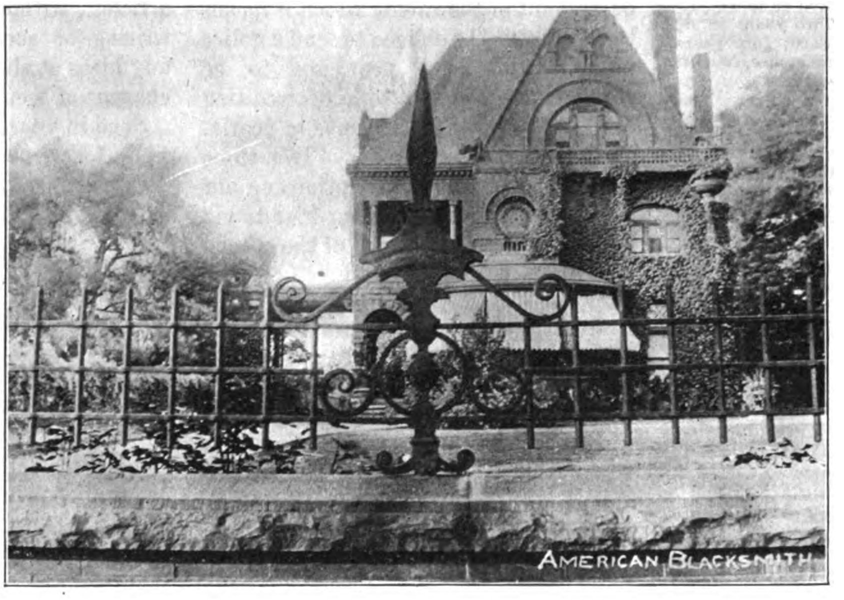
In the first place almost all pictures received must be "retouched," i. e., the surface must be touched up with paint to bring out the sharpness of outline that is always more or less diminished in printing. Secondly, the *whole* photograph is seldom available, so that a margin of varying width must be pencilled in, and dimension lines and figures as well as an imprint placed on the picture. Lastly, the photograph undergoes considerable wear and tear at the hands of the engravers, and all things considered, the wonder is that there is anything left to tell the tale when all hands have finished with it.

If your photograph is late in arriving or fails to arrive, or if it reaches you a disreputable wreck, please bear in mind the above facts, and try to believe that we have done our best to return it to you in good condition. We fully appreciate the fact that many of the pictures sent us are of peculiar value to their owners, for in many places it is no easy matter to obtain a picture of the shop. However, though you may not have the original, you always have the copy as presented in THE AMERICAN BLACKSMITH.

Two Very Good Examples of Buffalo Iron Fences.

Buffalo once more yields specimens of ornamental iron work that are both unique and beautiful. Unfortunately the pieces are somewhat old, so we have not been able to secure the names of the forges from which they have emanated. However, ideas may be had from them, in the line of designing for wrought iron. All three engravings are from photographs of fences—or, more correctly speaking, they are from two different fences. The first two pictures show views of the same piece, the one in detail, the other a general aspect. The spear points alternating with the points in leaf effect are very pleasing while the series of plain straight lines between the posts form a happy relief to the more fancy portions. The remaining cut shows an exceedingly effective fence and gate. The hollow box posts are here worked in to good advantage. This style of fence always suggests utility rather than ornament, the spikes on the top giving the impression of menace.

The best effects in wrought iron are sometimes secured by simplicity. It takes a master of design to work out complicated ideas to advantage, however attractive these latter may be when done.



DETAIL OF SPEAR-HEAD DESIGN SHOWN IN FENCE.

Timely Talks on Carriage Repair Work.—2.

A. J. YEAGER.

Welding Carriage Springs.

Having explained my method of treating carriage axles both as to welding and setting, we shall now proceed to repair carriage springs. This is the part of carriage repairs that will at times wrack the brain of the best mechanic in the world. I shall first give to your readers my way of welding springs. I have tried, I think, about all the ways there are. I take the pieces and scarf them to a point by hammering them on the sides and scarf the end down to a thin edge, using Cherry Heat welding compound freely on the sides that are to be put together when welding takes place. I take separate heats on the pieces, and when I am ready to weld, I have the helper strike on the parts to be welded. In this way I never miss making a good weld, as the adhesion takes place from the centre out towards the edge and when the weld is finished up it takes an expert to tell where it is. I have had very good success in making springs stand up in welding them this way. Understand that I do not advocate the welding of carriage springs as a general thing, for they will often break again in or near the weld. But sometimes we are placed in such a position that we have to weld them. I always advocate new springs where I can get them, but we have so many different kinds of springs and also so many different styles that it would sometimes puzzle a Philadelphia Lawyer to find a duplicate spring to replace some that come to be repaired.

I have in view a job that came to my place to be changed over to an easy riding wagon, as the fellow expressed it. The description of the wagon is as follows: ⅞-inch tread wheels; 4-foot track; body 16 inches wide, 56 inches long, side bar hung on one and two plate Brewster springs, and only two of those—none at the ends of side bars. It was a one-passenger wagon used by a veterinary surgeon, and was shipped from Long Branch, N. Y., to South Dakota. Of course there was no give to those springs, and it had on steel tires which did not make it ride very easy. Now one of those springs broke and the owner wanted something on the wagon that had some spring in it and would ride nice and easy. This was a puzzler,—how to make springs ride easy and only a space sixteen inches long to do this in and to carry only one person at that.

Now for the benefit of AMERICAN BLACKSMITH readers and for the carriage repair men in general I will explain how I repaired this job so that it suited my customer, and he got just what he wanted.

I took a one-half set of Thomas coil springs and cut each in two. I then cut them off at the end where the eye is turned and shortened them up to the length needed, then turned new eyes on

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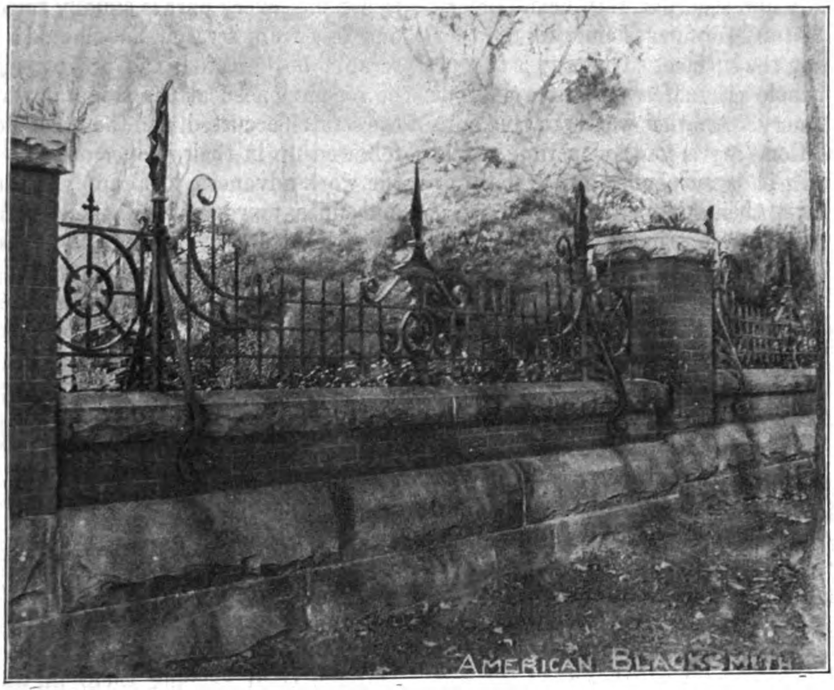
them and used them singly. In place of having two coils on the side I had only one. I turned the end that bolts on body and turned them at right angles about three inches to make the bearing come even as nearly as I could over where the spring hung under the side bar. I then bolted springs to the body, first making blocks to fill between sills of body, and bolting through both with one bolt and one bolt clip. This completed the job, and it did just what the doctor ordered.

(To be continued.)



A VERY ATTRACTIVE BIT OF IRON FENCE—ENCLOSING A BUFFALO RESIDENCE.

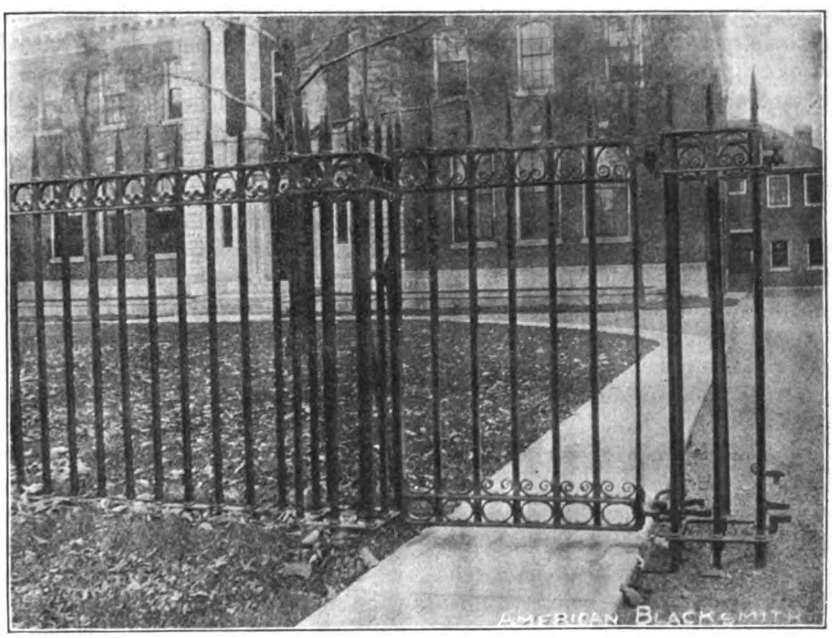
Hanging Up a Platform Spring Wagon.

L. VAN DORIN.

If you will kindly indulge me with a little space in your valuable journal, I will try to tell how I hang up a platform spring wagon—I saw a self-made smith recently trying it and he had so much trouble, I thought I would tell the craft my way. There are so many such wagons built now-a-days and they are very awkward to hang unless done in the proper way, and then they are easy.

When the body is ironed I lay it upside down on two trestles, then put each gear in proper place on the body, and put the wheels on the axles. Now measure from bottom of body to a straight edge placed on wheels. You will then see how deep to make the top platform to make the wagon hang level. After the top platform is made and bolted on body, then line up hind axle from king bolt hole and bolt hind gear to body. If the job wants a brake now is the time to put it on as well as the rub or wear irons. It is so much easier doing all these things, while upside down than to crawl under the wagon to do it. When the job is turned rightside up it is about ready for the paint shop.

It is said that a hint to the wise is sufficient, so I have just hinted at how to handle a platform wagon at a point in the stage of construction that is liable to give some smiths trouble. The wood worker has been getting much instruction lately on platform gears, but the poor blacksmith is left to work out his own salvation. I hope this may interest some of the boys.



A NEAT, PLAIN STYLE OF WROUGHT IRON FENCE.

Notes on Boiler Flue Work.

BY ALLAN.

The blacksmith is very often called upon to put new flues into boilers to replace those which have become leaky or otherwise defective, and the progressive smith will always know how to go about the work when it presents itself.

In the first place, to get the flue out it must be cut off at each end just inside the crown sheet or boiler plate. A simple but serviceable tool for this purpose is made by taking a 12-inch piece of steel about ½ by 1½ inches, bringing one end down to a sharp chisel point, and then making a right angled head of just sufficient length to allow it to enter the tube and bring the cutting edge to the proper point. A good leverage may be obtained by using a piece of pipe for a handle to the tool. The cutting edge should be hardened and drawn to a dark yellow.

Having cut out the old flue or flues, the next step is to cut off as much as may be defective and prepare to weld on a new end to make the tube long enough. To do this, clean the ends to be welded thoroughly—an old rasp being handy for this purpose if there are no better facilities. Scarf for a lap weld, driving the scarf of the new piece on over the old. The weld can be made with the tubes in the fire, turning and striking lightly till welded. Borax is good as a flux.

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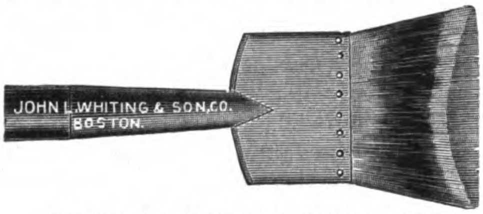
While the hammering is being done, a mandrel or rod should be inside the tube to preserve the shape, and it will also be found useful to put up some kind of a stop to push the end of the tube against and prevent pulling apart. The best results on this kind of work are to be had with welding machines and oil or gas fires, but the job can be done in an ordinary forge with a coke fire. Whenever possible the weld should be tested.

The welded tubes or the new ones, as the case may be, are then cut to length,



EXAMPLE OF BADGER-HAIR FLOWING BRUSH.

allowing in the neighborhood of ⅜ inch to extend beyond the sheet. Place in the boiler and expand the ends snugly to the boiler plate, for which purpose a roller expanding tool is the best. The next operation is to turn back the ends and bead or calk them up tight with boot or calking tool and hammer.

The Process of Polishing Steel Tools.

Grinding is the first stage of polishing. For flat surfaces large grinding stones may be used, but for grinding small articles or concaved surfaces, like razors, small ones are required. While grinding, keep the stone wet with water and revolve *away from* the operator. It is very important that grinding stones should run true. Truing them is termed "hacking," and may be done as follows: Run at a speed of one hundred revolutions per minute. The operator rests his hand upon the saddle and holds a piece of coal or chalk in contact with the wheel, just so that it will touch the highest points. Marks will thus be left upon the high points, and these may be levelled down until the surface is uniform. Having ground down the outside surface of the tool, the next step is to polish it.

Polishing wheels are made in sections of wood, such as pine, well seasoned. Fasten the sections together with glue and wooden pegs instead of nails, and allow to stand two days before turning. Next cover the circumference with sole-leather one-fourth inch thick. Do not harden the leather by hammering but put it on soft, flesh side to the wood. Make the joint diagonally across the circumference with a chamfered edge. Apply the work so that the action tends to smooth the joint down rather than to rub it up. The wheel may be slightly soaked in water before putting on the leather, then apply the glue very rapidly, bind the leather around the surface quickly and secure it until firm. Emery No. 60 to 120 or flour of emery is used for coating the surface. One way is to glue the whole circumference and roll it in the emery. Another way is to glue only a portion (say a foot) at a time, while the wheel is suspended on a shaft or mandrel, then apply emery to the glued portion, pressing it tightly on by means of a board. The board should be slightly wider than the wheel and rocked from end to end upon the surface. The coarser grades of emery perform a cutting function as well as a polishing. A good machine-finish is secured by the finest emery, while for a fine polish or glaze, emery flour is necessary. The process of burnishing consists in rubbing down all minute roughnesses by a highly polished steel or agate tool—no metal being removed. The harder the material to be burnished the brighter will its final luster be. A burnisher of hardened steel is harder than almost any other metallic body. The degree of luster obtained depends also upon the pressure applied and the intimacy of contact of the burnisher. The burnisher polishes only those surfaces that have been rendered smooth already. A file mark or scratch will not be removed by burnishing but only polished up in detail. If the burnisher is pressed too hard the surface is said to be *full of gutters*. The burnisher should be cleaned on a buff stick immediately before using. Apply with least possible friction. To clean a burnisher for steel, use finest emery flour. If rubbed first with oil the burnisher will, in case of most metals, yield best results, but in case of gold or silver this is not necessary.

Buffing may be done by hand by rubbing the metal with soft leather charged with a fine polishing powder. It is more often done, however, by a wheel held in a lathe, the work being placed in contact with it. Crocus and rouge are the best polishing powders for steel and brass. A good rouge powder may be made by exposing very pure, clean crystals of sulphate of iron to heat. The hardest part of rouge must be selected and kept clean and free from dust that might scratch the surface.

To polish in the lathe, turn and file smooth, polish further by fine emery and oil applied with a stick as described above. In the case of rods and cylinders a clamp is used so that great pressure can be brought to bear on the part to be polished. Examine from time to time to see that every part is equally smooth and free from scratches. Should a file scratch be detected, the process must be recommenced at the stage at which the scratch occurred, and the other steps followed up in their proper order. As the work advances, keep applying finer and finer powder, until the required finish is attained. The following is a good recipe for a polishing solution for steel: arsenious acid, 1½ drachms; elutriated bloodstone, 1½ drachms; antimony trichloride, 6 fluid drachms; alcohol (90 per cent.) one pint. Digest at a gentle heat, shaking frequently.

Talks to the Jobbing Shop Painter.—8.

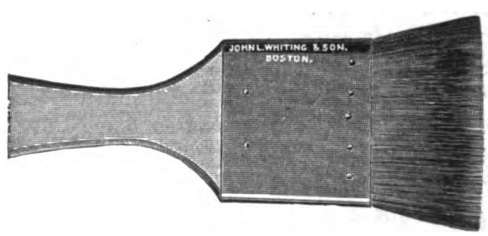
M. C. HILLICK.

The Brush Equipment and How to Care for It.

A reader of THE AMERICAN BLACKSMITH desires to know how to take care of brushes when not in use. He writes:—"I have tried keeping them in water which makes them work like a rag on the end of a stick. Also turpentine which takes all the elasticity out of the good ones.

The best way which I have found is to rinse all the paint or varnish out of them with turpentine and leave dry, but this is quite a "job." In fact, the question of brushes and their care is of such general interest that it has seemed appropriate to devote this month's talk to the subject.

The assertion has passed beyond the limits of argument that in buying brushes the best is the cheapest. Brush



A GOOD CAMEL'S-HAIR COLOR BRUSH.

making affords an opportunity for the substitution of a large per cent of shoddy and the unscrupulous manufacturer has not been slow to take advantage of the chance to enrich himself at the expense of the consumer without having given value received.

It therefore behooves the brush buyer to buy the best, regardless of the speech of the just-as-good-at-less-price salesman.

The eminently good brush has a hang,

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poise, quality and general usefulness which the shoddy tool is a total stranger to, however fine the manufacturer may have dressed it up for selling purposes.

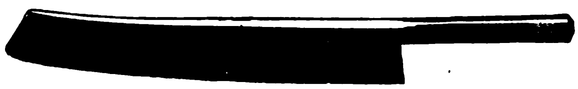
FLAT BRISTLE VARNISH BRUSH.

Coming now to our correspondent's question, and assuming that his brush equipment is first class, it may be said that all paint brushes before use should have a little oil paint dropped in at the heel of the brush and set away, bristle end up, for a few days before using. Round or oval bristle brushes intended for use in the application of lead and roughstuff coats had best be "broken in" putting on priming coats. This gives them additional elasticity and saturates the heel portion of the brush with a percentage of oil that fits it for good service. Such brushes may then be suspended in clean, soft water when not in use, and instead of rendering them to a dishrag buoyancy, the water should keep them elastic, fresh and full of vitality. Camel's hair brushes, when not set in glue, may also be kept in water. All camel's hair brushes, before use, should have a bit of lead, mixed oil and turpentine, equal parts, dropped into the heel of the brush. This will serve to settle the stock more securely and seal all interstices against the effect of water. Brushes set in glue should preferably be suspended in raw linseed oil when not in use. This, of course, necessitates washing the brushes out in turpentine before using, and to the carriage painter it has many disadvantages.

As a general proposition all paint and color brushes, outside of the glue set ones may with entire safety be kept suspended in water when not in use. Suspend the brushes by the handle into the water sufficiently to immerse the bristles or hair completely. Never permit brushes to rest upon the point of the bristles or hair. Change the water often enough to insure fresh, clean water at all times. Store the brushes in covered cans or pails in order to maintain cleanliness. Upon removal from the water give the brush a generous, but not harsh, rubbing out on a smooth board kept in place on the side of the shop wall for that purpose.

All brushes used in color-and-varnish, or clear varnish, either rubbing or finishing, are best kept in varnish, and for this purpose a varnish, minus the addition of driers, should be procured through the good offices of your varnish manufacturer. Varnish keepers, also paint brush keepers, have in earlier issues of THE AMERICAN BLACKSMITH been illustrated, and it only remains to say that if all brushes, after use, are properly cleaned and hung away in dust proof receptacles with bristles or hair immersed in clean water, oil or varnish, as above advised, they should give an entirely satisfactory account of themselves, provided, of course, the brushes have the quality of the thoroughbred at the outset. No amount of skilled handling will suffice to keep the brush of inferior quality in workmanlike shape or condition.

Brushes should never, under any circumstances, be kept in turpentine. To keep brushes in good condition they must be cared for properly. Good brushes are rendered useless by careless usage, where they might be made to yield the best service with care.



CONVENIENT FORM OF LONG HANDLE SPOKE BRUSH.

(To be continued.)

The Progressive Smith as a Business Man.—2.

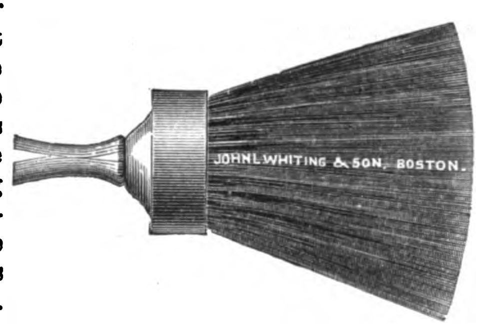
BILLY BUNTZ.

Credit—Giving and Securing.

The progressive smith understands the basis of credit, more especially from his own experience in asking time. The Commercial Agencies show his capital as, say $500, and his credit usually as second-rate, simply because his funds are limited, although he may pay his debts more readily than some firms who are rated at $10,000. Should he ask a manufacturer or supply-house for time they are likely to assure him that they would be glad to extend it were their prices not so low that they were compelled to sell for cash—that it was not a matter of credit at all, simply one of money in hand. Were his rating higher, the smith could more readily obtain credit. "You do not appear to be rated by the commercial agencies!" is the way some smiths are refused credit. As a general thing the smith is little known outside his home town and his ability to pay a debt is judged more generally by the strength of his financial rating, however honest he may be.

The smith may establish confidence among those with whom he deals by having his business friends speak a word for him to agents and supply men. He may have his rating established by visiting his home representative of the commercial agency, and by producing letters from folk who have extended him credit he may be able to convince him that he is prompt in paying his debts. In seeking credit, it is best for the smith to cite his references—the home bank and several prominent business men who know him to be a man of his word. By their permission, these references may be printed on his letterhead. Having a letterhead is in the line of progression because it looks businesslike, whereas to seek credit by scratching a few lines on a sheet torn from a work-book, looks as though the writer had little business ability. Where the smith has a bank account he may readily obtain a letter from one of the bank officials certifying that he does business through their institution and has never allowed any commercial paper to go to protest, and usually has a deposit ranging from $100 to $300 during his busy season. Credit may sometimes be obtained by giving a note endorsed by a couple of responsible men of good commercial rating. Where the smith has funds, but wishes to buy on time, he may give his note endorsed by the cashier of the bank, certifying that a certain amount is held in escrow by him for payment of the debt at maturity.

Where the smith understands the business principles of obtaining credit and the difficulties he sometimes meets in this direction, he is not quick to trust his own customers merely on the assertion, "I'll pay you next month," especially when they are not very well known to him and he doubts their sincerity, so he protects himself accordingly by taking their note with endorsement, or



A GOOD BRUSH TO USE AS A DUSTER.

their produce, rather than trust to any lien or judgment he might be able to get against them should they fail to pay.

The credit business in other lines of trade is on a like foundation, and the smith may learn much by observing how different tradesmen handle their customers, invite trade, extend credit and obtain it for themselves from supply houses. His grocer, butcher, baker, coal or feed dealer, and others, may teach him methods which he himself could adopt to advantage.

In buying new goods, however, the progressive smith purchases only in small quantities at first, to satisfy himself that they will meet his requirements, regardless of any flowery assurance from the salesman that the goods are exactly what he needs or that he could buy twice as cheap by the carload. In matters of this kind he uses his own head rather than to take things for granted on assurances that he will not regret his purchase. In buying iron, he may agree to give 100 pounds a trial, buying it if it meets his requirements or rejecting it if it does not, which is a proposition entirely fair. Where one house refuses to do this, another may be glad to accept it, knowing that the quality of their iron speaks for itself.

(To be continued.)

Trials of a Blacksmith.

BY ANVIL.

"Good morning John, where do you hail from? Shake. I have not heard from you for a long time, are you still at Flashtown?"

"Yes, Thomas, I am still there, but I wish I had never seen that place."

"Well, well, what's the matter? No work, or what seems to disagree with you?"

"Well, Tom, when I left your employ and hung out my shingle in Flashtown, I thought I would be in clover. The town was surrounded for many miles with well-to-do farmers and I soon had all the work I could manage."

"Well, what's the trouble? Didn't that suit you?"

"Oh yes, that part was all right, but you know I wasn't the only pebble on the beach, for my fellow competitors soon made things disagreeable for me and among the hard-fisted farmers they were more than successful."

"How was that?"

"Easy enough. They simply cut prices so much that I found difficulty in keeping my own and giving honest value for the work entrusted to me."

"In what did they do the most cutting?"

"Chiefly in horseshoeing. They would shoe a horse on all four feet for one dollar for new shoes, and for resetting shoes—they did it for the ridiculous sum of ten cents per shoe."

"And what did you do?"

"I had to follow suit or quit."

"And do you find it unprofitable to work for such starvation prices?"

"Of course I do, and therefore I'm disgusted. When I see the customers, chiefly farmers, getting such good prices for their produce and making money hand over fist, while I must toil on and on and make a pleasant face for a comparative pittance, I sometimes feel as though I ought to quit and go at something else. I could do much better working in some factory or go to the city and do journeyman's work—I should at least get decently paid. What do you advise me to do?"

"Now look here, John, as I understand, your chief complaint is that prices are too low, and you blame your competitors for that. Now, John, let me tell you plainly that it is your fault as well as theirs. The trouble lies in the fact, that instead of you and your competitors being friends, you talk and belittle each other's work, which on being repeated to them causes bad blood. Can you truthfully say that on starting your shop you didn't criticize the work of others and sometimes unfairly with the selfish object of diverting custom from their shops to your own? Answer squarely."

"Well, I admit I did my best in getting customers, but that didn't justify them in cutting prices beyond a point which makes it unprofitable to continue."

"Now, John, as you have told me your tale of woe, let me give you a few words of advice. The experience you have undergone is to me an old story. I have made similar mistakes, but with age and experience comes wisdom and if you will take sensible advice I will give it to you free, gratis. There is work enough for you and all the others in Flashtown for all of you to make a good, comfortable living, besides enabling you to lay up a nest egg for a rainy day. Then why don't you do it? You say that prices are too low and costs of material and living are too high to do that. I know that your competitors are in a similar fix. So why not remedy these conditions? No one cares to work for unremunerative prices and I will simply tell you what I did when I once labored under similar conditions."

"Well and what did you do? I tell you, Johnny, I put my false pride in my pocket and took the first opportunity to call on my nearest brother smith and talked to him in a friendly, brotherly way, asking him if he didn't think that it was time that we came to some sensible arrangement with a view to improving the present conditions of things. I must confess that I was agreeably astonished to see how much he was in sentiment with what I proposed, only expressing the fear that some of the others might not fall in line. We then jointly agreed to interview the others, he canvassing some while I saw the others, and in one week's time we had prices somewhat where they ought to be, and later on adjusted other grievances. At the same time we stopped our faultfinding of each other's doings. We frequently met and exchanged ideas and we found life once more worth living. Now, John, try that plan and report to me again in a few months. I have little doubt that you will be fully reconciled to your business."

"Thanks, Thomas, I believe you're right. I will try your plan."

The Elementary Principles of Mechanical Drawing.—6.

The Finishing and Reading of Drawings.

When working drawings are to be preserved, inking in is necessary. The usual way, where it is desired to preserve the drawing and also to be able to make a number of copies of the same rapidly, is to trace the original pencil drawing in ink on tracing paper or linen tracing cloth. The latter of course is much stouter and stronger. From the tracing then, as many copies as desired may be made by the blue printing process, and these blue prints (in which the drawing appears with white lines on a blue ground), are used by the mechanic to work from. When it comes to inking in the drawing, it will be found best to put in all the curves first, beginning with the smallest, because it is easier to join straight lines to curved ones already drawn, than to make our curved lines conform to the position of straight inked lines. Care should be taken to keep lines of the same kind all of the same thickness.

For center lines a thin dot-and-dash line, as A B or C D, is employed. To represent lines not visible on the surface of the object, a dotted or broken line is used as at E or F. In this way, inner parts may be represented, and the amount of information given by the drawing increased. When this method of dotting in the interior parts is carried too far, complication is apt to arise, and to avoid this a sectional view is employed. The right hand half of the accompanying drawing is "in section," that is, the view is made as if the object were cut in half, thus laying open the interior. The surfaces supposed to be cut

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are represented by "hatching" them, as shown, and such a view is called a "section." The surface is traversed by thin parallel lines, usually obtained by placing the 45-degree triangle in contact with the T-square, and drawing in lines at the required distance apart. When the surface is small these lines should be close, when large, farther apart. When the surface is very large these lines may be made to end at a little distance from the boundary. But this is only done in the case of very large surfaces, to diminish the work. When two different parts come together, in a section, it is shown by hatching them at different angles, as shown at G. If three meet, the 60-degree triangle may be used, in addition to the 45-degree triangle, to obtain different slants. Another way is to vary the distance apart of the hatchings of the different pieces.

Very often a drawing is made clearer by showing one piece in section and another in elevation. For instance the piston H and its spindle are shown in elevation instead of imagining it cut through also, thus bringing out more clearly the fact that it is a different piece from the shell which is sectioned.

Generally speaking then, the lines of the object itself are put in with solid lines, and dotted or broken lines are used for invisible lines, center lines, construction lines and the like. Dotted lines are sometimes used to indicate the connection between the same part on two adjacent views, as the line K.

If a drawing were made simply in lines of the same thickness throughout, the sketch would present a flat appearance, and it would be impossible to distinguish a depression or hole from raised or projecting parts without referring to another view of the object. To render a drawing more easily understood a system of shading has been established. It is supposed, for convenience, that the light falls upon the object from the upper left hand side, thus throwing shadows from the lower and right hand edges of all except depressed surfaces or holes, these casting shadows from the upper and left hand edges. These shadows are indicated by thickening the lines upon these sides to about twice the thickness of the original lines. The figure illustrates these principles. Referring to the left end view, the shading shows L and N to be holes and M to be a raised surface. Examine carefully the shading on the figure. This shading is best done by drawing all the light lines first with the pen regulated to the required width and then the heavy lines with the pen altered to double the width. In shading a circle, two methods are in common practice. First, draw the circle with the bow-pen regulated to the fine-line width, then moving the needle a trifle to the right and below the original center (for shading the lower right-hand side) begin where the new circumference cuts the old, and trace the new circle from that point downward and over to where the two again cut. The other method is to draw the circle lightly first, and then with a broader line, go over half of it again, grading the extremities of the shade line by springing the bow-pen. The width of shade lines must always be placed *outside* the boundary lines of the object so as not to alter the proportions.

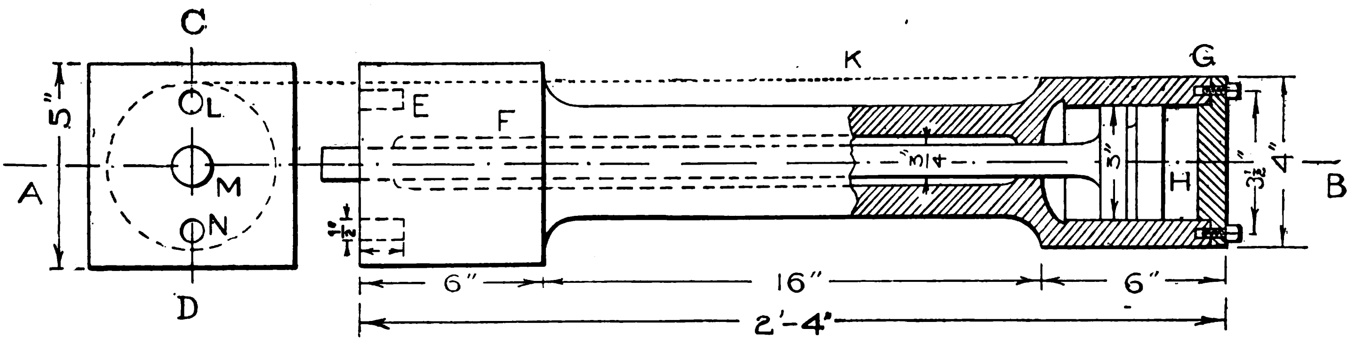
When drawings are made rapidly and in quantities it is not usual to draw them accurately to scale, but instead, each view is completely dimensioned so that the length of any important line or distance may be read directly from the drawing. Dimension lines may either be put in with lines of long dashes or more quickly by very thin solid lines. Dotted lines show from what points the dimension is measured. It is always well to give the various sub-dimensions fully and then an over-all dimension. Err on the side of too many rather than too few dimensions. Up to 24 inches, give dimensions in inches, above that in feet and inches. Thus 30 inches would be given—2′-6″, while 36 inches would correctly appear as 3′-0″ on a drawing.

In some cases it is customary to letter the drawing, that is, put letters in place of figures, and then in the corner make a list of dimensions, as A, 24″, B, 6½″, etc. This is especially useful in the case where the drawing is to answer for different sizes of the same object, a table of dimensions then being given. Take care to make all letters and figures perfectly clear and readable. They should always be so placed as to read from the bottom or right hand side,—that is, the figures should always be right side up when viewed either from the bottom or right hand end.

Finally every drawing should have a title and should also show the date and name of the draftsman. There are other marks and conventionalities used for indicating various things on a drawing, as for instance, "finish marks," and some of these will be dealt with in considerable detail in a succeeding chapter.

The reading of drawings intelligently implies a thorough knowledge of the principles which have been given before. In other words a clear understanding of how to make a working drawing, brings with it the power to read drawings understandingly, and to conceive, by a connected inspection of the different views, what the object looks like.

(*To be continued.*)



END ELEVATION, AND SIDE ELEVATION, PARTLY IN SECTION, OF A CYLINDER—ILLUSTRATING THE USE OF DIFFERENT KINDS OF LINES.

Best Method of Making Car and Locomotive Springs, and the Best Bath for Hardening.*

JNO. W. SMITH, CHAIRMAN.

On the road I am connected with, we make all our engine springs, and do the repairing for several small branch roads connecting with ours.

The making of a spring in my opinion requires the very highest type of mechanical skill, and close application to the small niceties that, by some spring makers, are considered non-essential.

In the selection of steel you want a mild, tough steel, and not a high carbon steel. I think it bad practice to use old

*Read before the Buffalo N. R. M. B. A. Convention.

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steel unless you are reasonably sure that the steel is of the same make as the rest of your spring; if you are using a low per cent carbon steel for your main plates, and get a high carbon steel in your short plates, the life of your spring will be of short duration.

We prefer wide springs whenever we can use them and use not less than 4-inch by ⅜-inch steel in our truck springs, and in our driving springs we use steel from 4 to 5 inches wide; our experience, from close observation, being that a long and wide spring has greater elasticity, and consequently longer life and better service than a short, narrow spring.

I am an advocate of uniformity in spring work, the same as everything else in connection with our engine work; we have sheet iron templates for every class of spring, and have plates that we use for setting the main plates of our springs to, and we can thus take a spring plate that has been in service for years and place it alongside of its original partner, and in a moment by clamping with a light pair of tongs, get an accurate account of its performance; in the same manner, without any measurements, we can make a main plate or a second plate by using our sheet iron template, which is made of Russia or galvanized iron, with the slot cut out in each end 4 by 1⅛ inches, the same as the spring plate, and if we make fifty of them there will not be an eighth of an inch difference in the length of any of them.

There is one thing I desire right here to call your attention to in this connection, if you will pardon the digression. Why do you continue to tip the main plates of your driving and truck springs? Don't they break there? Don't you know to nib or tip your plates in the center necessarily weakens them at the very point where you desire strength and uniformity? In over twenty-five years' practical experience as a spring maker, I have never nibbed, or put any tip or device of any kind in the center of the first five main plates of my driving springs, or anywhere else, and I don't have any trouble with them either, and I will not have to make a dozen main plates for repairs in a year, and we have springs that have given us good service for six or seven years. I advocate and practice exclusively the end cross bar; for instance, take a driving spring; we use three full length plates, the third plate drawn, and the other plates graduated to the short 9-inch plate, which we never temper. Commencing at the fifth plate about 1⅝ inches from the ends we place a cross bar or nib ¾ inch wide, and allow the end of the next plate to barely touch it, or butt against it, and so on until we get to the 9-inch plate, which is perfectly plain with the ends drawn; this can be center tipped if you wish to hold your band, but it is not necessary, as the band should be put on hot and closed and shrunk on its place.

In our engine truck springs we use a round end, and by making the ends of our center plate overhang 1 inch and after the plates are all set and tempered and ready for banding, we heat in the forge clamps with a pair of tongs and bend this over-hanging end down over the round ends of our main plates; we next take our third plate and do the same way over the second, nibbing with end cross bar the third plate, and so on until the 9-inch plate is again reached.

In our double elliptic spring for engine tenders all eyes or inside spirals are made without drawing down, using the full size of the steel, the cuff leaf or outside spiral is drawn and made to fit closely. You will be surprised to see what excellent results are obtained by following the above form, and as soon as you become accustomed to it you will never want to change.

Perhaps some of you prefer to nib the ends of your spring leaves; you can use the same principle by simply breaking the continuation of the nib back from the point. Say you make your nibbing tool 1 inch long, then a blank for ¼ of an inch, then a small tip on exactly the same principle as the slot and tip in the end of spring leaves, that were in use some years since, and I suppose some roads are using them yet under small capacity cars.

I should like in this connection to state that all of the slots in the driving springs for the spring hangers to pass through, on our road, are of the uniform size, 4 by 1⅛ inches, and it not only saves spring hangers, but gives the spring a chance to vibrate.

In advancing these ideas, gentlemen, I wish to state that nearly all over the State of Georgia there is not a road that tips the center of main plates, and it is no experiment, but practical experience has proven the wisdom of our action, and it has saved our roads thousands of dollars in labor and material, and we hold up a record for twelve years. We have not had a freight or passenger train delayed by a broken spring on our division of nearly 400 miles.

All main plates for springs in our shops have the palms welded on in a simple tool under the steam hammer (we use a flux, common fire clay); we have a punch we use under the hammer that punches out the slot 4 by 1⅛ inches in one blow, in our driving springs (in the same heat that we weld the thickening palm on.) We weld a thick palm on the main plates of our truck springs, in a tool which gives it the correct shape under the hammer, in the same manner. The ends of all spring plate that are drawn to taper are drawn under the hammer with a tapering tool made for the purpose; the cross bar nib is placed in a small tool that fits the square hole in the anvil.

We have a hand roller for setting the hot plate to the cold one, but our spring maker claims he can work faster by using the clamp tongs, especially made for the purpose, with the ring made fast in an eye at the end of the handle. These clamps are made of cast steel, and extend the full width across the spring leaves, and are about ¾ inch square; we use seven pairs of clamps or tongs on our long leaves, one pair in center, one pair on each end, and the rest intermediate. A good spring maker can easily set and temper from 10 to 12 driving springs in a day of 10 hours.

Our furnace is 12 feet long, 5 feet wide and 6 feet high, and burns either wood or soft coal; it has a bridge wall 4 feet 6 inches from the fire door end, extending within 5 inches of the top of the furnace, so as to throw the blaze to the front, and will give a perfectly uniform heat. The floor of the furnace is made of fire brick, as is all the inside lining in this furnace, which can be utilized for any purpose, almost; we have seven feet of working space, and do, besides spring work, all our case hardening, and heat arch bars, brake beams, and all our heating for bending on our bulldozer, which is situated conveniently near.

In setting up springs the spring maker selects the two springs he wishes to set at the same time and places them in the front of furnace, parallel with it; he takes the first two main plates of each spring and places them inside of the furnace, No. 1 on the right hand side and No. 2 on the left hand side, as the helper, with a pair of right angle tongs made for the purpose, places the main plate of No. 1 on the spring table to be set to proper shape; he places the next leaf in the furnace, and so on until both springs are set up to standard. The spring-maker now places entire No. 1 spring in the furnace, separating the leaves so as to better enable them to heat evenly, and by slow firing brings them up to a good red heat, which generally takes 20 or 25 minutes, when it is removed from the furnace, and as fast as removed the

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helper carefully places it in the vat of raw linseed oil.

The gather or camber between the plates of a spring should be carefully given, commencing with about $\frac{1}{4}$ of an inch between the main plates and gradually diminishing up within four plates, including the short one; these four short plates, being mere supports for the main plates, should not be given any camber, as they are practically non-elastic.

While the tempering of a spring is a very important operation, and one that should be done very carefully and not hurriedly, it is not the only requisite for good service, as the leaves should lie closely and evenly to each other, otherwise, if they bear only in spots, it will be useless to put such a spring in service when banded; these should be so close that you cannot insert the point of a pin anywhere between your leaves. The proper heat to place the leaves of the spring in the tempering bath can be determined very quickly and correctly by placing a long plate in the furnace and bring it up to a good red heat, which I will define as the heat just previous to the forming of scales. A spring plate should never be allowed to scale, as it undoubtedly pitts it in spots; while it may not be discernible to the naked eye they are there, and have a tendency to shorten the life of your spring. After you have raised the temperature of your spring plate to the above heat, remove and temper in hardening bath; when perfectly cold remove, and place a piece of iron about 6 inches wide, $\frac{3}{4}$ of an inch thick and 4 feet long under your steam hammer, place your plate thereon, measure the height from the iron to the top of your spring plate, descend the hammer, straighten out your spring plate, raise the hammer and measure your plate. The deflection should not be over $\frac{1}{8}$ of an inch; now let the hammer descend again as before, and repeat the measurements; the leaf, if at the proper temper, will not go down after the first depression. If you find your leaf is too soft, replace in the furnace, and go through the same operation until you determine the exact heat at which to place your spring in the hardening bath.

In spring work, as well as in everything else connected with the locomotive, don't have any guess work, in the broad field of mechanical genius, which is luring into her fold the brightest minds to-day in our lands, with our technological schools and our institutes of learning and correspondence schools and railway journals doing so much for the railway service, and particularly our branch of it, and in view of the rapid advance that has been made in the art of blacksmithing since the formation of the Master Blacksmiths' Association. We are now entering upon a new era, and we hail the coming of the steel king and realize that, if we are to be his honored guests or servants, we must be advanced on practical ideas as well as faithful in good work. The hardening bath stands first and above all of perfectly pure raw linseed oil. I have used fish oil, and cottonseed oil, and various compounds, but for a first-class tempering bath the pure, unadulterated, raw linseed oil leads them all. Our hardening bath consists of two sheet iron tanks 15 inches wide, 4 feet long and 2 feet high, placed in a wooden trough 10 feet long, so as to allow a good circulation of water all around; we have an inlet water pipe at one end of the water trough, on the bottom, and the outlet at the top of the water trough in the other end; we keep our oil tanks full to within three inches of the top, replenishing as it is used out.

The bending of your spring is next in order; when after removing all dirt and oil with a piece of waste, place your spring upon spring table, where you can either clamp your spring with a screw clamp, or a very simple arrangement for banding springs can be made by taking two "I" beams, clamp upon one end, 12 inch cylinder, and then bolt a 4-foot face plate thereon, which will not interfere with your doing other work on it, as you can have an angle plate that can be easily removed; make a frame of light iron 36 inches long, in the form of a figure H, with the ends cross barred, upon which you can lay your spring plates; let your piston from air cylinder press your leaves together when you can place your screw clamp in position so as to hold your spring while you slip your band in place, when you again turn the air on your cylinder, causing the piston to press your band firmly to place. Then you can close the sides down with a set hammer and light sledge, and cool off the band with hose, on the machine; a good spring maker can easily band three springs an hour with this arrangement.

I have tried in as simple a manner as possible to give you an outline of the manner in which springs are handled in the shop under my charge. I consider it the very best practice in use to-day, and it is used in the different shops of our company; if I thought there was a better way I would abandon mine and adopt the other, as I want the best, which is always found to be the cheapest.

Now, I want to say something that I want you all, as practical railroad men, and having the very best interests of your companies at heart, to ponder over; take it home with you. I think it a serious mistake for railroads to have to give their spring work to some other concern to do; I should think it a reflection on my ability if I could not handle the springs for my company, so as to give them satisfaction and save them money; one thing is certain, no one is going to give us anything, nor are they going to let their product go out without a good safe profit, as manufacturers have to make from 25 to 40 per cent. profit to do business. I should like to have my company, and I think it would pay all our large systems, to select some point and establish an up-to-date spring plant, where all car and locomotive springs could be made, both elliptical and spiral, and in this age, when you can purchase combined punch and shear, eccentric rolls for tapering, both round and flat steel, power rolls for coiling springs, with a capacity of 600 drawn bar springs per day, furnaces with thermometer attachments, showing what temperature of heat your furnace contains, and every facility to expedite your work, testing machines that will show the slightest defect in the finished product; in other words, gentlemen, let us reach out, expand, and see how we can increase the value of our services, and accomplish greater results. Finally, before closing this report I want to impress upon you, in the selection of a spring maker, get a first-class man; don't let pay stand in the way; you don't want a cheap man. make him feel the responsibility of his position and give him to understand that efficiency of service alone will make him secure in his position. In my shop the spring maker is the highest paid man, and I guess he receives as good pay as any man in the country—$3.60 per day and I consider it a good investment; he feels that he has something to hold on to, and as soon as he fails to give satisfaction, why he must stand aside and make room for one more competent.

A good spring maker who has the interests of his company at heart is a gem beyond price in the railroad shop, and should be valued as such. By any wise firm he will be paid accordingly. This branch of railroad blacksmithing needs particular skill, and even the most competent men should be always ready to learn and to improve in the art. By exchanging ideas this good end may be furthered.

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The Evolution of the Tire.

By Courtesy of The West Tire Setter Co.

In these wonderful days of accelerating progression in the arts, it is surprising, when we note how soon the old way of doing things is forgotten after the new is adopted, and how few of those interested in tiring wheels for the millions know that it was not always done in the way they are doing it, with a tire in one piece, and that that way was new and a great invention in its time.

In the writer's boyhood there was an old cast-off cart wheel lying in his father's shed that was tired in the good old-fashioned way, the best that was known at the time it was made, the tire being in pieces, same length as the (sawed) felloes, and nailed on, with the ends of the tires in the middle of the felloes, "breaking joints," and the nail holes being punched in oblong form, similar to those in horse shoes, only much larger, the longest way across the tire, three at each end, and others along the center the entire length, the nails being forged to fit, with a cutting edge across the grain of the felloe. It was common for the teamster to be furnished with nails on starting out on a trip, to replace those that might be lost on the road, thus becoming his own tire setter. But an improvement was made, claimed by many, but who the real inventor was is uncertain.

A smart smith thought of a hoop for a tire,
Welded it up when the boss was gone,
Heated it well in a circular fire,
Doused it with water and shrunk it on.
Many a smith would not believe it,
Many a head was shaken "no,"
Many a one would not receive it,
Nevertheless it was a "go."
It was a great thing, 'twas a wonderful day,
When tires were shrunk on in this new-fangled way.

HEATS SPARKS WELDS

How is the fall trade, and what are the prospects for sleigh work this winter?

A fine day in the rainy season is like a customer who pays without being dunned.

Try to persuade your neighbor to read a trade journal. He needs it—convince him that he does.

One fire under the management of an able smith will accomplish as much as two less carefully managed.

A little glycerine in the water in which paint brushes are kept will prevent its freezing and will not injure the brushes. Ever tried it?

When a man goes on advertising it is safe to suppose that his wares are reliable, for nobody will keep on laying out money in this way if it is not bringing him trade.

Now is the time to prepare in earnest for winter's work. Have shop and tools ready for sharpening, sleigh repairing, and the profitable odds and ends of work

A good fire is the blacksmith's best friend. Any smith should make a study of his forge, his blower and his coal and how to manipulate them to obtain the best results at the least expense.

How many horses have you shod during October? How many odd jobs done? Add a little to the proceeds from each, and think how much more you might have if only you had raised your prices.

Manufacturers and dealers who sell to shop-owning blacksmiths or wagon builders highly favor a better scale of prices, because they know it means better buyers and better conditions all around.

Try something new. In your stationery—in your advertising—in your methods—in every department in fact, strike out in an original way, and do not imitate. Something new attracts people every time.

Find time to read and think! Make time. The busiest man is always able to crowd in a little more, where the easy-going, shiftless man who wastes hours every day will say he has no time for reading or such things.

People need managing. Treat patrons in such a way as to bring out all their best and most agreeable qualities and leave the other uncomfortable traits sleeping within. Any business man with the proper amount of tact can do this. Cultivate tact.

A rubber stamp with your name and address on it finds innumerable uses in your correspondence, billing and the office end of your daily work. It insures a neat, legible signature and address even when you are in a great hurry and somebody is waiting.

The farrier has much to do with the winnings and losses of the race track. At Memphis, Lexington and other places this fact has been proved recently, when renowned racers have failed to win just because their feet become sore and lame from improper shoeing.

A special file for catalogues received from leading firms, is almost indispensable in the blacksmith's office. It is so convenient to be able to put your hand on the information you want when you want it. Many smiths are too careless or too lazy to even save their catalogues.

One reason why America has such a high class of mechanics is that the workmen of America consist of the most enterprising men from all over the world working in a prosperous country with favorable conditions of food, clothing and the like. No workmen are better off.

Tom, Dick or Harry does so, but that is nothing to you. The man who tries to build a reputation upon other men's faults has a poor foundation. Never run down a fellow-craftsman, but go ahead and build up a name upon your own fair dealings and excellent work. This is the straight way.

The care of horses is carried to the extreme in Norway and Sweden. In these countries the farmer and his wife and children will walk miles to church on Sunday, just to give their horses a rest, and many of them will not hire out their horses for money. These working horses are the best cared for in the world, and as a consequence are very strong and high spirited.

Two distinct horse species exist at the present day in common use. Scientific research leads to the theory that the heavy draft horse, with his thick feet and flat nose is derived from the ancient Celtic stock, while the light harness horse, the race horse and such are from ancient Egyptian.

Progressiveness is shown by many smiths in purchasing typewriters. Every few days letters from blacksmiths come in, written on typewriters. The best machines cost in the neighborhood of a hundred dollars, but good serviceable typewriters can be bought for much less, and their purchase displays both progress and progressiveness on the part of the smith.

"Afraid of the cars" is a term which applies to many blacksmiths. So write some of the many men who are striving to have the prices of blacksmith work increased in their counties. Every one of these timid craftsmen is free to admit that he is doing work too cheap, sometimes below what it actually costs him, especially when he takes into account his bad debts, and yet they are afraid to raise their prices for fear some other blacksmith won't raise his prices and will get a little more trade. They do not stop to consider that some business men in large institutions feel that it is a great privilege to let contracts and orders go to the other fellow when the work has to be done at a loss, when there is no money in it, or when the account is doubtful. These blacksmiths forget too, that even the dealers and manufacturers of the material they use are with them for better prices. These dealers and manufacturers are charging more money for their stuff and yet many blacksmiths have not the nerve to ask more money for their work. There has been an awakening in many a county and town through the good work of the American Association of Blacksmiths and Horseshoers. It is steadily growing day by day. Are you with it?

Tom Tardy was thinking hard as usual. He was at last trying to make up his mind to begin to think about getting an engine The necessity had pressed itself upon him since passing a neighboring smith's shop and noticing a crowd of people all eagerly watching an engine. The smith was "making it saw wood and do a number of other stunts," as Tom explained. So at the end of the month Tom began to consider that if he had one, he too could make extra money. "But," said he with a troubled expression, "I don't know whar to get hold o' one."

"Why don't you consult some manufacturers' catalogues?" we asked him. "Well," he replied, "I used to have some o' them thar little books, but I never kep' 'em, an' the trouble is I don't know whar' I could write for more. I don't seem to mind the name o' the feller what makes 'em."

We told him that there were a great many good engines made and suggested his getting a current trade journal of good standing to obtain names and addresses.

"Well now, I'll have to think about that, too," he mused, and proceeded to think accordingly.

Perhaps Tom will install a gas engine in the year 1920 or thereabouts—there's no telling what seeming impossibility may come to pass in this rapid age.

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American Association of Blacksmiths and Horseshoers.

One of the aims of the above named Association is to secure lien laws in as many States as possible to aid blacksmiths in collecting their bills. Low prices and unwise competitors have narrowed down the margin of profit so small, that few smiths can make a just living if any of their work is done without pay. The blacksmith, the horseshoer or the wheelwright must buy his stock at prices fixed by the dealer, and must pay for it within a certain time or no more stock will be forthcoming. How then is he to carry on his business if his own customers pay when they please, or not at all? Some craftsmen are fortunate enough to have such a superabundance of trade that they can turn away poor-pay customers, or demand spot cash. Hosts of mechanics find it necessary to take all the trade that offers, spend their good money for material and their good time in labor, and then take chances as to pay.

Certainly the laborer is worthy of his hire, and none more so than the smith, contending as he does with heavy, grimy work, and extremes of heat and cold. Other crafts have their laws to enable them to collect their bills, and prevent losses from bad debts. They secured such protective legislation by agitating the need of it, by asking their legislators for it, by working together for it. Are not blacksmiths and wagon builders entitled to similar lien laws? They can be reasonably certain of securing them, but it will require their active support. If our blacksmith craftsmen sit with folded hands waiting for lien laws to be inscribed on their statute books, they will be apt to wait for a long time. Other trades have secured favorable legislation by actively working for it, and so can our crafts.

The American Association has perfected plans for getting these State lien law movements under way and is sending out a great amount of literature and printed matter to awaken interest in them. The point it is desired to make here is that each individual shop-running smith whose eye this meets, should aid in the good work. The American Association will lend its labors to secure the drafting and introduction of the necessary bills in various State legislatures, and will also lend its influence towards their passage.

The influence of the craft itself must be enrolled. The plans for doing this have been perfected, and you are earnestly requested to give your hearty support to the movement in your State. Write to The American Association of Blacksmiths and Horseshoers, Box 974, Buffalo, N. Y., for further information. The support asked of you amounts simply to writing a few letters. Will you give this support?

Steel and How to Treat It.—6.

JOSEPH V. WOODWORTH.

Water Annealing—Other Methods.

There are several methods of water annealing, and in the following I describe the best; the worker may adopt any of them, according to the results he secures from each. The first method consists of heating the steel slowly to a dull cherry red, and then removing it from the fire and trying the heat with a soft stick. When the steel has cooled so that the wood ceases to char, plunge the steel quickly into an oil and water bath. When the steel is worked it will be found to be as soft as could be desired. Another method consists of heating the steel slowly to a red heat, and then allowing it to lie in the ashes for a few minutes until it becomes almost black. Then drop it into soapsuds and allow to cool there.

When a piece of steel has been water annealed it will prove much easier to work than if annealed in the regular way by packing in powdered charcoal or in old bone and allowing to cool over night. A good way to make sure of the time to quench the steel in the bath is to allow it to cool until almost black, and then touch it with a file. If the steel does not brighten for an instant and then turn blue repeat the experiment, and if upon this second trial the blue appears and then a bright spark afterward, drop the steel into the bath instantly.

Not infrequently a piece of steel which is to be used for a fine cutting tool, say for instance a cutting die blank or a forging, proves hard and brittle, although it has been annealed. When this is the case, do not attempt to finish it, but simply rough it down and anneal it over again.

Of course, it may appear strange to some, but it is a well substantiated fact, that results possible to attain in steel by means of the water anneal can not be had through any other known method. Water annealing seems to give a certain texture to the grain of steel, which, while not exactly softness, is quite different from that obtained through the pack processes of annealing. A piece of steel that has been properly water annealed upon being turned in the lathe, using soap-water as a lubricant, will present a strange dead-white appearance, and the turnings will be short and come off in little bristles. On the contrary, steel that has been annealed in the usual manner will turn off in long, close curled lengths, and the surface of the work will present a more or less torn texture, even when a very sharp tool is used. This tearing comes about through the steel being too soft, so that it gives way and crowds up into little lumps just slightly ahead of the cutting edge of the tool.

This unpleasant feature is overcome, however, when the steel is water annealed, as this process seems to give the requisite stiffness of texture to the steel to prevent tearing. Considering the results, the water anneal will contribute to the best results being attained in a large variety of work.

I am unable to state just what chemical or molecular action takes place in steel that is water annealed. I know that it is not a softening action, as compared with the effects of ordinary annealing, but instead an action that stiffens and tightens the particles, which allows the cutting edge of the tool to creep beneath the shell and peal it off.

For emergency jobs, where the steel has to be annealed quickly and thoroughly, use any of the following methods: (1). Cover with tallow, heat the steel to a cherry red in a charcoal fire and allow it to cool by itself: (2). Heat the steel to a cherry red and allow to cool in a dark place until black appears, and then quench in the juice or water of common beans. (3). Cover with clay, heat to a cherry red in a charcoal fire and allow to cool slowly.

To anneal steel in the open blacksmith's fire so as not to injure its grain and to prevent hard streaks, make a clean fire with a good body of coke. Bank the fire well on the sides with green blacksmith's coal and then place the steel on the fire and cover it with live coals. By using a gentle blast and turning the steel frequently from side to side, even heating will be assured. When the red color appears shut off the blast for a few seconds to allow the heat to reach the center of the piece. Then the steel may be taken out of the fire and placed in an iron box and surrounded with clean, thoroughly pulverized lime, to be left there until cold.

The reason why lime and ashes when not cold make good packing material for annealing tool steel is because they contain no carbon. A quality that makes the lime valuable is the dense way in which it may be packed, holding the heat in the steel longer than any other

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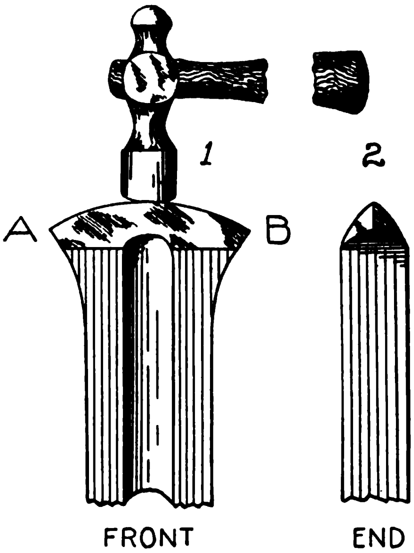
substance used for the same purpose.

In annealing steel in the manner described above, when care is taken to heat evenly, no hard streaks will occur. Use



Figs. 1, 2. AN EXCELLENT MODE OF SHAPING A DRILL BIT.

steel in which the carbon is evenly distributed, and heat thoroughly and evenly.

A very good and satisfactory way of annealing at the forge consists in taking a piece of pipe and plugging one end. Then place it in the fire and cover over with damp coke. Have the open end of the pipe toward you and when red hot check the blast and insert the article to be annealed. By turning the pipe at intervals the heat will be equalized. As soon as the steel reaches a blood heat remove it and bury it in sawdust, which must be dry and *not damp*. Remove steel when cold, and not before.

Self-hardening steel is now being used generally for cutting tools of all kinds, and as this steel has often to be worked into difficult shapes it is well to understand how to anneal it without affecting its self-hardening qualities. The method applies to any of the well-known brands of self-hardening steel.

Pack the steel in cast iron chips in a cast iron box, and heat up in a furnace to a bright red heat. Leave box in the furnace over night and the result will be that you will be able to work the steel as readily as a piece of machine steel. This annealing process *will not destroy the self-hardening qualities*, and the steel may be re-hardened by heating to a bright red and cooling in an air blast, when it will be found to be as hard as it was before the annealing process had been applied.

Always remember that the principal thing in annealing is not to overheat the steel. When steel *is* overheated it is permanently ruined, and cannot be restored to its former condition. Another thing, do not hold the steel at the annealing heat any longer than is necessary. Although it is required to heat the steel that is to be annealed to a very high temperature, and to hold it there until all portions of it are thoroughly heated, it is not well to keep it there too long, or decarbonization will occur; so that when it is hardened and tempered it will not be found satisfactory. This will show principally in the tempering, as a piece of steel that has been kept hot too long will not show true to the temper colors; in fact it may be only drawn to a light straw temper and then may be readily filed.

In conclusion let it be understood that the principal requisites to successful annealing are uniform heating and thorough heating; the use of packing materials which will not decarbonize the steel; non-exposure to air during cooling and in water anneal, care and practice.

To be sure, the method employed when annealing steel will depend on the facilities which the shop affords; and it rests with the individual whether he shall succeed or not, as the methods described here are in number and variety sufficient to allow of annealing successfully in any shop, however meager the facilities may be.

(*To be continued.*)

Dressing Drill Steel.

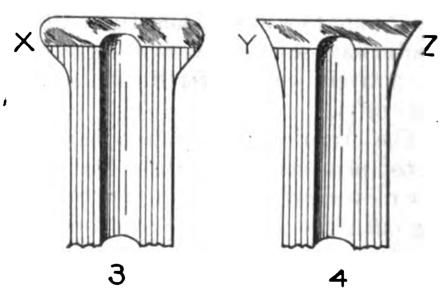
BY L. R. S.

Having noticed in THE AMERICAN BLACKSMITH, frequent inquiries regarding the dressing of steel for rock drills and well drilling bits, and tempering the same, I will endeavor to give the readers of your paper the benefit of my experience of twenty years' practice in that department of the smith's craft.

In regard to materials, do not attempt that class of work without the best coal to be had, and plenty of it; next comes the fire, which needs to be deep and kept as clean as possible. In connection with this, it is necessary that you should have a good, even and steady blast. Above all else, after having placed your steel well into the fire, avoid rushing your heat—give the heat a chance to thoroughly penetrate the steel and to run back three or four inches from the point at least.

Forge the steel at as low a heat as it will work under, which is at or about a bright red—bear in mind that the better the steel the less heat it will stand. Having raised your heat, you are ready to forge the bit which consists of two operations: 1. Forming the cutting edge. 2. Bringing the bit into gauge. In forming the edge, begin in the centre of your bit and drive the steel well back, and then work toward the corner A. Having reached the corner, begin again in the centre and work to the corner B, turn the bit over and repeat this operation on the other side, being careful to keep the edge well centered so as to evenly divide the strain throughout the bar above the edge. Right here comes in a very important part of the job, and that is to make the angle at the cutting edge greater than a right angle; say 95 or 100°, which is a little blunter than the corner of a square. This last is necessary for two reasons. First, to enable the tool to drill a round, straight hole; second, to furnish a sufficient body of steel back of the edge to stand the strain of driving the high tempered edge into the rock. I might also state another reason, which is this; in every piece of steel which is tempered on the end (as a drill) there is a zone of annealed steel just above the tempered part which is softer than any other part of the bar. Right there is where the steel will crush and finally break, under a succession of heavy blows, and this is the point where the greatest body of metal is required.

After having shaped the edge so that it centres well with the bar or shank of the bit, and is also square across, like the edge of a chisel, the next step is to renew the heat and bring the corners in to gauge. You will probably notice that the wings of the bit above the edge are bulged, or as drillers term it, bull-nosed, and the bit larger than the gauge.



Figs. 3, 4. PROCESS OF FORGING SHANK OF BIT TO PREVENT COLD SHUT.

The proper way to bring the corners in to gauge is to begin forging at the shank of the bit and work toward the point of the corner formed by the cutting edge. This is the only way to prevent a cold shut forming where the wing flares out from the shank of the bit at Y and Z, Fig. 4. This shut is the cause of corners breaking off the bit in the hole.

In gauging bits some gauge with

calipers, others use gauge rings. The ring gauge is the best—it should be $\frac{1}{16}$ inch larger than size of bit when cool.

The proper way to gauge a bit is to make not only the corners of the cutting edge, but also the corners where the bevel of the edge leaves the flat side of the shank conform to the circle of the gauge which is the circle of the hole the bit is to cut. See Fig. 5. If calipers are used, the measure of cutting edge S should also be the measure from M to S, and from N to R. This prevents the bit from bulging over and going crooked and also keeps the hole round. The thickness should be a little over one-third the diameter of the hole to be drilled.

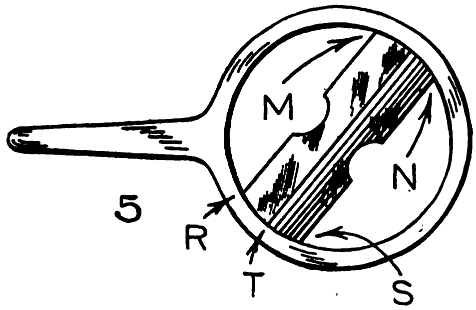


Fig. 5. GAUGING A BIT WITH CALIPERS.

All bits of $1\frac{1}{2}$-inch and upwards, should be fluted as indicated in cuts, to bring a more even temper and to give a better clearance in the hole. Bits of this pattern, in most rock, work faster and as well as the three and four-winged star bits on air or steam quarry drills, and are the best for hammer and hand use. They are also the most reliable for well drilling machines. All they need is a good temper and they will cut anything it is possible for steel to cut.

When nearly cool and before raising to the hardening heat, sprinkle a little powdered resin over the face and wings of the bit, or better still, make a groove in a piece of rich pine and press it against the edge and wings of the bit until the resin forms a coat over the steel. Then place the steel in the fire and raise to a good even heat on the cutting end for three or four inches back. This heat should be a dark cherry red for good steel; poorer steel requires a higher heat. Dip end into warm salt water until the water reaches $\frac{1}{2}$ or $\frac{3}{8}$ inch above the level. Agitate the water with a stick until the edge is chilled.

Remove the bit and with a file, piece of brick or sandstone, rub off the scale on the wings and edge. If the steel is properly hardened the rubbed places will present a silvery lustre, and as the heat in the shank runs out, it will draw the temper. When the color of the rubbed steel near the edge reaches a deep copper color the right temper is had and the bit should be quenched in cold water or in salt water, as is most convenient. The salt water clings to the steel better than pure water, and hardens better. My rule has always been to temper for the hardest rock. Almost any kind of drill will cut slate or smooth lime stone, but when rock harder than cast iron must be drilled one has no time to experiment. It often happens in dressing $5\frac{3}{8}$ or 6-inch tools or over, the common smith fire is too light to make a good heat, and the corners get a little singed. In this case the resin or rich pine tends to toughen the steel and restore its carbon. Bits treated in this way wear longer than when no resin is used.

$1\frac{1}{8}$-inch or $1\frac{1}{4}$-inch octagon steel should not be driven with over a 6-pound hammer. Often the fault is in the hammer rather than in the smith or the temper—of course the smith gets the blame.

Drilling bits over five inches in diameter of gauge are more satisfactorily handled in a fire made in the ground and forged on a rack and billet than on the anvil. See Fig. 6. This method saves much lifting, and the bit is easier to manage in forging.

Classification and Treatment of Tool Steel.

JOHN L. BACON.

The following method is used in a large manufacturing shop to give certainty of results in the treatment of the various grades of tool steel used in making a variety of tools:

When a lot of tool steel is received a sample piece is broken from the end of one bar and drawn down to about $\frac{1}{2}$ inch square. Several small cold chisels are forged from this sample and one of them is hardened at a heat thought to be below the hardening heat of the steel. If too low, the chisel is again hardened, this time at a little higher heat and this is continued until a heat is found which hardens the steel properly and gives the proper grain (determined by snapping of the tip of the hardened chisel).

The hardening heat being fixed, the chisels are hardened and then experimented with for the proper "temper." This is done by drawing the temper of the hardened chisels to different degrees in heated oil, the temperature of the oil being indicated by a thermometer. The chisels are tested and tried in different ways until the temperature is determined which leaves the steel in the best condition.

The above is assuming that the lot of steel tested is to be used for cold chisels; if to be used for other tools the experimenting for temper would be done somewhat differently, the object being to determine the exact temperature giving the temper that will best enable the tools to meet their working conditions.

This experimenting being finished, the information gained is written on a ticket which is kept in the rack with that particular lot of steel.

When an order ticket comes into the shop the man who fills the stock order notes down on the back of the order ticket the information gained as above. The hardener notes the proper hardening heat as shown on the order ticket and does his hardening accordingly. The man doing the tempering places a quantity of tools in a wire basket, dips this into a vat of heated oil, waits until his thermometer shows the proper temperature, which he has learned from the order ticket, and then draws them out, finished.

The above method insures uniformity of results and a reasonable certainty that the steel is being properly treated.

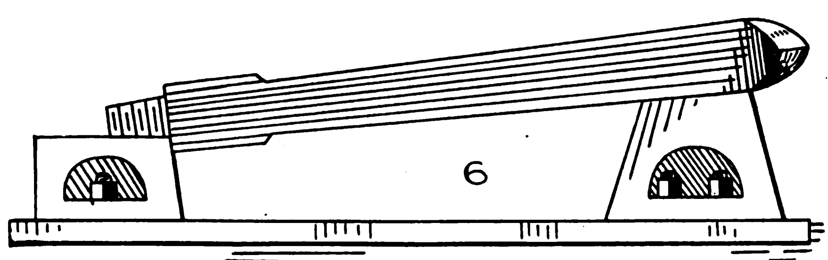


Fig. 6. A CONVENIENT WAY OF HANDLING A DRILLING BIT IN PROCESS OF FORGING.

Blacksmithing Hints from a Practical Standpoint.

J. M. FIX.

The Art of Welding.

Good coal and good materials generally, are among the essentials. A good fire is indispensable, if you wish or

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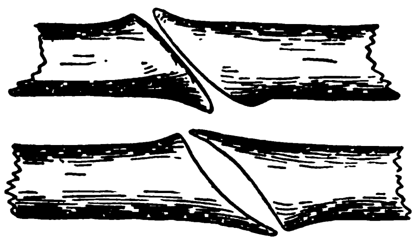
expect to attain to the highest degree in the art of welding.

Have your tuyere iron from 4 to 8 inches under. In other words have 4 to 8 inches of coal on your tuyere iron depending upon the character of the work



THE RIGHT AND WRONG METHODS OF MAKING A WELD.

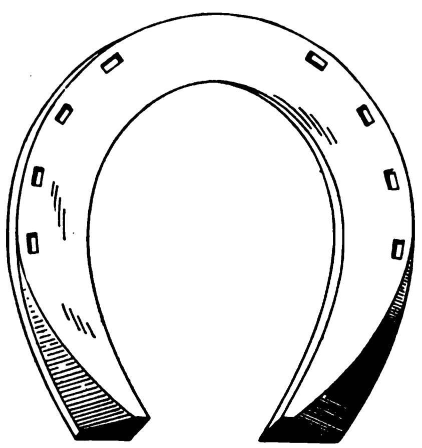
you are doing. Coke your coal and beat it down solidly around your fire. Now heat your iron to the welding point—upset and scarf. In order to make the most perfect welds, you must scarf your iron properly. Upset well to allow for wasting away. Have your scarf full in the center, so that the two pieces to be joined will touch in the center first. If there is a hollow in the center, foreign substances are liable to collect in there and cause a very imperfect weld. When they have reached a good, clean, white heat with the scarf down in your fire, take them out and give each one a good jar on the anvil while the scarf is still down, so as to jar off any dirt which may be on them. Reverse or turn over the one you have in your left hand, get them together as quickly as possible and hammer rapidly so as to get them united before the heat gets below the welding point. The cold anvil will reduce the heat below the welding point in a very short space of time. In case of failure to weld perfectly at first heat, in most cases a second one can and ought to be taken. However, in a majority of ordinary welds, one heat is sufficient to make it nearly enough perfect. Judgment must be used as to whether a perfect weld is required. No sign of the scarf ever shows on a perfect weld. But there are very few jobs that actually require an absolutely perfect weld. To make a weld with the least labor and the greatest assurances of a perfect job the scarfs must be short. If the scarfs are long the laps must be long and consequently too much time is required to reheat and too much labor to weld. Some of the most difficult welds you are compelled to make at one heat, and it is impossible to reheat. Then how essential it is to be able to do so when required.

To weld steel is a different proposition, there are so many kinds that the same rule will not apply to all of them. Cast tool steel is a most difficult kind to weld, likewise spring steel; various methods are used in accomplishing this. It is impossible to enter into details upon the various steels. Heat in a clean fire with borax or some welding compound and experience will tell you to weld at as low a heat as it is possible and stick perfectly. Most axles can be given a high heat and use nothing but sand on them. Some use sand on iron. In some cases it is very important. Don't be continually poking at your fire. Let the clinkers gather at the bottom.

Criticisms on a Method of Shoeing Contracted Feet.

C. W. METCALF.

In a recent issue a brother smith gives a method of shoeing contracted feet. He says he uses a Burden shoe and punches extra nail holes in the heel and then after the shoe is driven, with a pair of tongs spreads the shoe until the horse flinches.



AN ORIGINAL FORM OF SHOE FOR CONTRACTED FEET.

According to my experience, I would say that this method is wrong. When you spread the hoof $\frac{1}{4}$ of an inch it is held direct in one position by the extra nails and the hoof has no chance to moisten itself at all. If you want to spread a contracted hoof properly, take a shoe and make it fit the hoof, bevel the shoe from the first nail from the heel on the outside and leave the inside as high as you can. Then with a knife cut the heel each side of the frog so that when you place the shoe on it will fit the shoe, and drive the shoe solid. Every time the horse places his foot solid on the ground, it will spread itself and when you get the hoof to working it will open the pores of the hoof; it will then furnish its own oil, become soft and will stay to its proper shape. The shoe is made like the figure herewith, and every time the horse sets his foot down it is bound to spread, and when it is raised it will come back, which will break the horny scale of the hoof, after which the hoof will commence to moisten. You never saw a moist hoof contracted. At least this has been my experience for the past fifteen years.

A New Article of Food for Our Friend, the Horse.

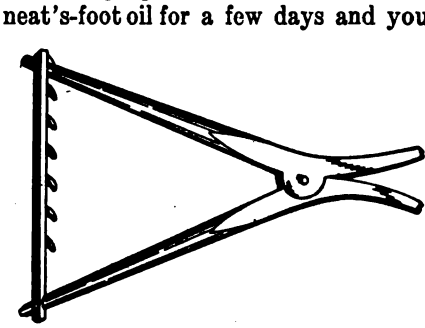
The breakfast cereal craze seems to have descended to the brute creation. A new article on the list of stock foods is a composition known as molascuit, says a contemporary. This substance was introduced by Mr. George Hughes in the West Indies.

For some time now, experiments have been made with molasses as food for animals, but of course it would be neither convenient nor practical to present it to them in the sticky, liquid state. The new invention overcomes this objection. The molasses is absorbed by the cellular matter of sugar cane that sifts out of the bagasse. The substance resulting may be packed in bags for transportation purposes. The chief value of the new food lies, of course, in the molasses, but the bagasse also has some nutritive qualities of its own.

A Few Words About Contracted Feet.

C. G. BURDICK.

The first thing to do with contracted feet is to place the foot in warm water for about three or four hours, after which pare the foot out well. Make a shoe one-half inch wider than the foot, convex the shoe on the top side, put the nail holes just as far back as the foot will stand. Then with a foot spreader open up the foot; nail the two toe nails, draw them up, and with the spreader open the foot as much as it will stand, from $\frac{3}{8}$ to $\frac{1}{2}$ of an inch, keeping the foot well oiled with neat's-foot oil for a few days and your



A NEW KIND OF SPREADER FOR USE IN HOOF CONTRACTION.

horse is cured. This at least has been my experience for twenty years.

With regard to the spreader which I use, the sketch herewith shows the same. Opening the handles closes the tips and vice versa. They are fine and the boy should try them.

The treatment for contraction must be persistent, and the cause, as far as

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possible, removed. The spreader I have described is a simple device that any smith can make.

Origin and Nature of Sand Cracks.

BY S. H. M.

When a horse is first noticed to have a sand crack in his hoof, every precaution should be adopted to prevent its growing larger, and every means employed to favor its healing. The horse should not be driven fast nor allowed to jump. There are two kinds of sand cracks—toe cracks and quarter cracks. The toe crack runs from the toe generally to the coronet. A quarter crack is on the inside quarter of the hoof, which being thinner and receiving more weight of motion than the outside, is therefore more liable to the disease. Although cracks usually extend upward in the grain of the hoof, they are occasionally found to run transversely for an inch or so.

There are several causes which conduce to sand cracks. Some hoofs are poorly nourished, and consequently brittle by nature, others are brittle from travel on wet roads, which wash the natural elasticity out, leaving them brittle, and both these causes may lead to sand cracks. It is also generally conceded that the use of shoes with toe clips, and large nails (which stop up all the minute nutritive canals in their course, and so render the hoof brittle) lead to sand cracks. Cracks also sometimes follow other diseases as suppurative corns, canker, grease and quittors. Even in healthy hoofs fast running on hard roads, pulling an overload, or a blow on the coronet may bring on this disease. The lameness is greatest at a fast pace and least at a walk.

Having once developed toe crack the animal will keep growing worse and worse unless carefully attended to. In the case of toe crack, the horse, in placing his weight upon the foot, closes the crack, and when he raises the foot, the crack opens. The exact opposite is the case in quarter crack. The horse's shoes should be removed, and the walls of the crack trimmed off to take off the bearing from both sides of the crack. The sides of the crack must be cut off the whole length. A transverse cut burned through the crack at about one inch below the coronet favors the growth of new hoof. If the flesh comes through at the crack, it is liable to be bruised at each opening or closing, so a good veterinarian should be called in.

Many devices have been introduced in the way of plates and shoes for sand cracks. The one aim of all is to keep the edges of the crack rigid and to prevent spreading. The crack may be closed with nails, which are clinched. The plates and clips for this purpose may be had anywhere that veterinary instruments are made. A shoe should be used that has weight enough to keep the hoof from spreading. In the case of toe cracks a bar shoe with clips at the sides of the crack should be used. For quarter cracks the clips should be at the quarters. Another device is to shoe with a bar shoe furnished with bands that approach each other over the hoof and through which a bolt is passed to bolt the hoof together. If provided with toe clips, I consider this shoe the best that has been made for sand cracks. In order to prevent concussion it is well to shoe with sharp calks.

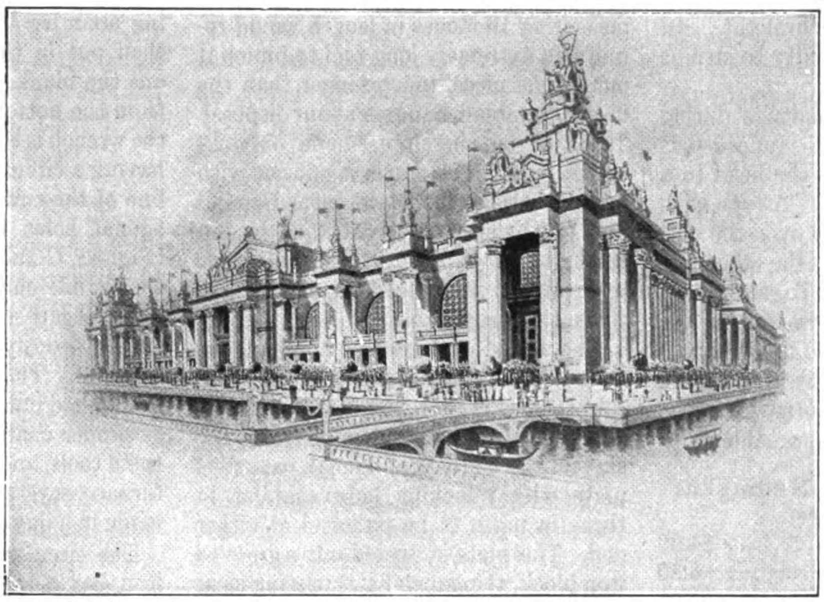
A Simple Method of Removing Rusty Screws.

A contemporary recommends the following method of removing rusty screws by applying heat: Heat a piece of iron —a rod, poker or any other object available, to redness, and apply to the head of the screw until the latter is hot. The screw may then be removed with ease by an ordinary screw-driver. Screws that are greased before inserting are more easily removed than those driven without greasing.

The Electricity Building at the World's Fair.

A very good example of the bigness of some of the structures at the World's Fair may be had from the report that the Electricity Building alone consumed 185 tons of iron and steel in its construction.

The accompanying half-tone shows this building when complete. The design is a bold, classic one and was planned by Walker and Kimball of Boston and Omaha. It is situated on the main central avenue, and forms a very important, in fact, one of the chief elements in the main exposition picture. The doors are of immense proportions, being 11 by 18 feet. The whole structure possesses 176 trusses, the largest span being 82 feet in length. The building is well suited to represent this important branch of modern investigation.



THE ELECTRICITY BUILDING AT THE WORLD'S FAIR, ST. LOUIS.

The exhibits in this building will be most interesting to the scientifically inclined. It is reported that Mr. Edison, the "Wizard" will exhibit some of his newest inventions in electricity. In the western bay will be a tremendous traveling crane, which will be used in the installation of the big electrical machinery to be shown in the building.

Something About Shoeing Oxen.

B. PHILLIPS.

In the foot of the ox, the long pastern, short pastern and hoof bone are all double. Thus the whole foot consists of two parts—two claws or hoofs distinguished as outer and inner. The ox has no frog, the hoof consisting of wall, sole and bulbs. On the ox the wall is much thinner than that of the horse and the sole is thinner. The bulbs are low.

The shoe for an ox's claw must be thin but wide. The holes must be fine, and short, strong nails used. A tongue-like piece is attached to the inner side of the shoe and bent up and outward over the hoof. Also, a small clip may be used on the outer side of each toe, and drawn up close to the toe of the hoof. Although these shoes are not easy to make, they

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are, I think, the best in the end.

Some shoers use undivided shoes for oxen, but nature has made the foot of the ox with two claws for a reason, and this kind of shoe prevents the free movements of the two claws. The only good that I can see in such a shoe is for use on rough roads with heavy draught. In this case there is less liability to strains of the joints of the foot.

Oxen are difficult to manage during the operation of shoeing. Indeed it is often necessary to fasten the head to a tree or other solid object. A rope with a slip-noose is then passed over the fetlock, across the withers to the other side and held by an assistant. To raise a hind limb, place a round pole in front of the hock and let two men hold the leg backward and upward. Light taps with a stick at the base of the horns will often effectually quiet an unmanageable ox.

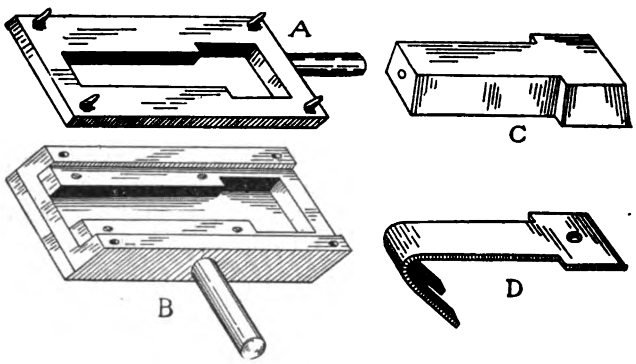

Fig. 50. TOOLS USED TO ECONOMIZE TIME IN MAKING A LOCOMOTIVE BRAKE SHOE SPRING.

Prices Charged in Nebraska.

M. W. MATTISSON.

Plow work 16-inch lay	$4.00
" " 14 " "	3.50
Sharpening plow lay	.25
Pointing cultivator shovels, per set	2.00
Sharpening cultivator shovels, per set	.50
Horseshoeing, new shoes, each	.50
Setting discs	.25
Sharpening discs, 18-inch, each	.30

The Railroad Blacksmith Shop.—13.

W. B. REID.

Tools in the Blacksmith Shop.

Many of the lighter, standard forgings can be made very economically, in quantities, by simple tools adapted for the purpose. Although seemingly trivial in character, tools of this order are invaluable in keeping the work of the shop ahead, and securing thereby a surplus margin of time for doing work of a promiscuous kind which must necessarily be done by hand. Fig. 50 shows a locomotive brake shoe spring largely used. To make this simple article "by hand" would occupy a blacksmith and helper one hour at least. Heating the plates in a small furnace and using the tools shown in Figs. 50 and 51, from eight to twelve could be made in the same time, a much superior job resulting.

The cutting tool (Fig. 50, A), is a cast steel plate, cut out to shape of the spring (Fig. 50, D), and riveted into a grooved iron block. At B, Fig. 50, is the guide plate, for the punch shown at C, which is adjusted in position when punching by dowell pins, upon top of part A.

The straight stock of spring (Fig. 50, D), measuring 16 inches in length would require an extremely long tool to punch it out in one piece, much longer than the dies of the steam hammer at our disposal. The tool is, therefore, made only 12 inches long. This much is cut out with one operation, the piece turned round and the balance of it cut with second stroke of the hammer. The tool is left open, it will be noticed, at one end, to make this practicable.

The round and oblong holes at the ends of the spring are punched in a separate tool, (Fig. 51), the construction of which will appear plainly from the sketch. It consists of a small cast steel plate with punching holes, similar to those in parts to be punched at either end. This plate is riveted into a grooved iron block, the punch holes passing clear through both. The U-piece of iron riveted on top is simply to guide the end of the spring while the oblong hole is being punched. The square recess at the opposite end serves the same purpose in punching the round hole. With the guide plate (B, Fig. 51) in position on top of the part shown at A, each end of the spring can be alternately slipped in freely and punched with perfect accuracy. The bending of the ends of springs is done quickly, in a simple "former" fixed in the anvil.

Locomotive oil cup wrenches have to be made in large numbers in many railroad shops. These vary in style on different roads. Those made by the writer are of ⅜-inch or ½-inch boiler plate stamped out in shapes as shown in Fig. 53 at A and B. The style of tool used is shown in Fig. 52, consisting of a hardened, mild steel plate around which an iron band, with handles attached, is shrunken to strengthen the cutting plate and facilitate handling. This band, extending sufficiently high above the plate, also holds the guide plate of the punch in position, dispensing with dowell pins. The boiler plate from which the wrench is made is placed in the cavity of the tool, the guide plate at A resting upon it. The punch seen at B is then put in the guide plate, stamping out the blank wrench, which drops out from the bottom. With the same heat the wrench is completed in separate tools having a circular recess to hold the outline of the end of the wrench, and hexagonal holes for punching the same, (Fig. 53, C and D). The two holes in the double end of the wrench being so close together, have to be punched simultaneously with one stroke of the hammer. The wrench (See B, Fig. 53), is stamped out in the same way, in tools of proper conformation. By means of these tools, and heating the plates in the furnace, several hundreds of these can be made in a day.

The circular end of the top plate of iron has a steel shear plate of proper proportion riveted into it, which, guided by the dowell pins into the part at A, shears the end and forms the offset. The punch inserted and driven through, completes the piece. The drawing will, I think, make the operation of the tool perfectly plain.

The time spent in forging such tools as those described will be more than repaid by the time saved in operating

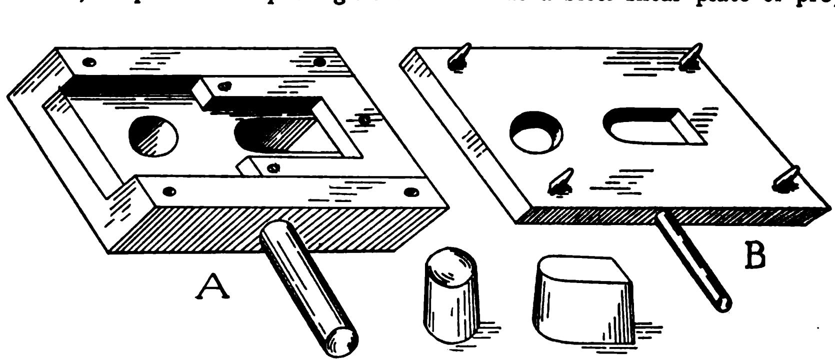

Fig. 51. TOOLS FOR PUNCHING THE ROUND AND OBLONG HOLES IN THE SPRING.

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them. Other devices of a similar nature may be invented by the ingenious man who has the time question in consideration. This point is of no small consequence in these days of rush and hurry when tools must be turned out with the greatest possible speed.

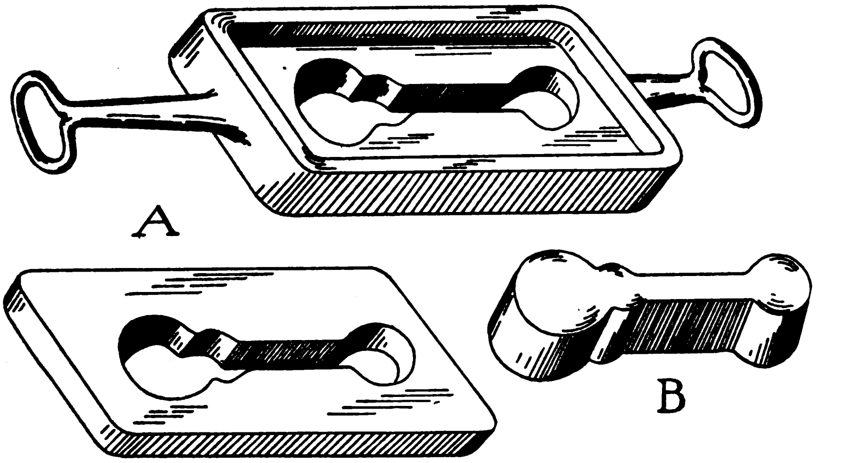

Fig. 52. DIES FOR PUNCHING OUT LOCOMOTIVE OIL CUP WRENCHES.

Building Farm Wagons.

F. W. PRICE.

There is no smith that cannot, if he turns out wagon work far superior to the factories, get as much of such work to do as will profitably fill up all his dull times. I sell all I can build at odd times for as high as seventy dollars each, whereas factory wagons are selling at $53.00.

He Needed It Later.

At Cornell all the mechanical engineering students have to learn seven trades. One of these trades, that of blacksmith, is very distasteful to some of the students; but it has to be learned all the same. One young fellow, who was unusually averse to soiling his hands, begged hard to be exempted from wearing the leather apron; but the professor took special care that there was nothing lacking in the thoroughness of his training at the forge.

Last fall the student went to the professor and thanked him for being compelled to learn blacksmithing. "You see," he said, "I am now superintendent of a mine away back in Colorado. Last summer our main shaft broke and there was no one in the mine but myself who could weld it. I didn't like the job, but took off my coat and welded that shaft. It wasn't a pretty job, but she's running now."

"If I couldn't have done it, I'd have had to pack that shaft on mule-back and send it three hundred miles over the mountains to be fixed; and the mine would have had to shut down till it got back. My ability to mend that shaft raised me in the eyes of every man in the mine, and the boss raised my salary."—*Selected.*

Setting Heavy Tires.

E. C. FAY.

Having had 32 years' experience in ironing heavy wagons, it might benefit some of THE AMERICAN BLACKSMITH readers to let them know my way of putting up heavy tires, as I use mostly 3½ x ⅞. I will explain how I manage that size. Lay the four bars on the floor. Take one wheel and carefully run it on a bar and get the exact length for tire for that wheel. Then mark the bar 1¾ inch longer than the wheel measures, as it takes up that much in bending. Mark wheel and bar alike, as the wheels generally vary in size. Mark off each tire the size of the wheel it is to go on. Heat the tire at mark, cut off, scarf both ends, and punch ⅜-in. hole about the middle of scarf. When the four are ready to bend, use a short pattern of the felloe and as you begin to bend the tire on the pattern see if the circle is just right for the wheel. When bent the ends should come nicely together. If the tire should twist and not come in line, lay it on the floor, place the end of a lever under the lower end, have your helper place another lever under the first near the tire. By both bearing down, take out the twist. Be sure and have the ends come nicely together or you will have trouble when you come to weld. Place the tire in a large, clean fire and heat to nearly welding heat. Remove to anvil and set the scarfs together; tighten the rivet, return to fire and keep it well covered, frequently sanding the edges to keep from burning. Take a good heat, then have your helper sledge it down. Run the tire and give ½ inch draft with heat for a well built wheel. I have put up eight sets at one time and did not make a miss on one. Now to end, be very careful of the minor details if you would succeed.

American Horseshoes in Philippines.

It is reported that there are about 30,000 American horses in the Philippines, and that American shoes are used on their feet. Plain flat shoes, hind and front are employed, and the horseshoers get in the neighborhood of seventy-five dollars per month. The shoeing in Manila is done mostly by the natives, and many of them are quite intelligent.

Reading for the Employe.

One movement in some of our large business houses is towards the establishment of reading rooms for employes. Many large concerns have adopted this system and the results are evidently found to be satisfactory. Reading helps to make people intelligent, and good reading tends to make intelligent people brighter.

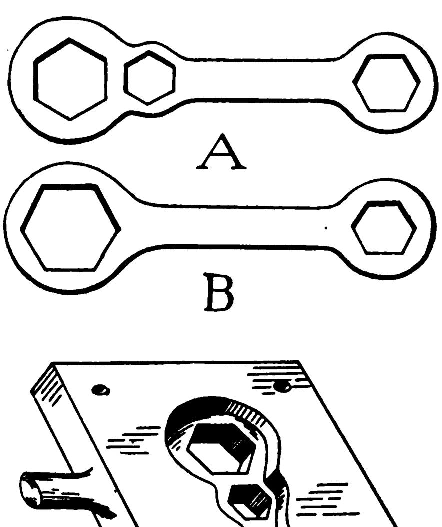

Fig. 53. THE FINAL PROCESS OF PUNCHING THE HOLES IN THE WRENCHES, AND TOOLS USED.

Of course reading rooms are hardly to

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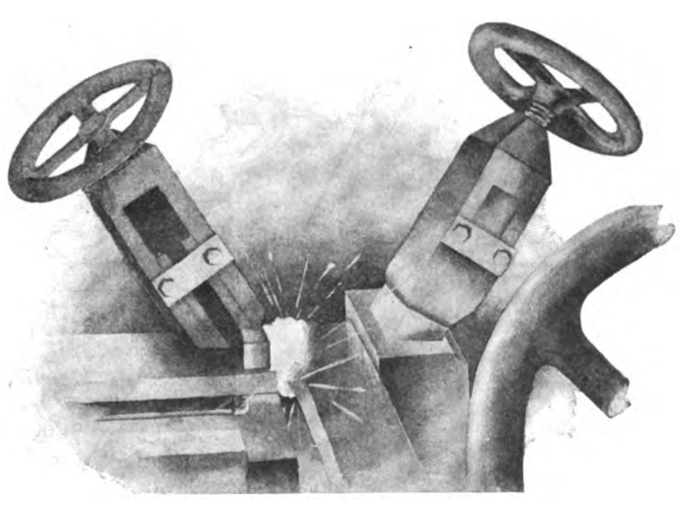
be thought of in a blacksmith or forge shop, but at least the smith or foreman may exert a considerable influence over his apprentices or assistants by encouraging them to read good books and papers. A supply of the current craft journals should always be on hand and accessible to every employe during lunch hour. When a number of people all read the same papers, they are led to criticise the contents and to think more about them. Many new ideas and helpful suggestions are thus interchanged and a new interest created in the daily work.

The Advantages of Electric Welding.

Welding by electricity is accomplished by placing the pieces in close contact at the welding point and causing a current of electricity to pass through the ends. These ends form the point of greatest resistance at which is generated a high degree of heat. At the same time, pressure is applied to force the two pieces together, and as the process goes on, the softening ends are pressed closer and closer until a perfect weld is secured.

In the ordinary mode of forge welding, the heat is applied from the outside and gradually reaches the interior. Hence, the outside is welded before the inside and there is no true method for ascertaining whether the interior has been welded or not. Also, the heat travels along the piece, often injuring the metal adjacent to the weld.



CORNER OF CHASE IN PROCESS OF ELECTRIC WELDING.

On the other hand, in electric welding, the heat is developed first in the interior and works outward, so that the inside is perfectly welded before the outside, and when the exterior has been united there is no question about the inside. Another point of advantage of this process is that the whole operation takes place directly under the eyes of the welder, and with experience he is able to accurately gauge and regulate the heat applied. By being able to see just what is taking place, he can also detect and prevent flaws in the weld.

This mode of welding has been very successfully applied to chase making. A special saw is used, that cuts through the tough steel with great ease and rapidity. The corners are then held in position in the jaws of a ponderous clamp, and welded, one at a time. The current is generated in a specially wound dynamo. While cooling the bars are held in a right-angle vise to prevent warping. The surplus steel is then cut away in milling machines and the cross bars, if desired, are adjusted.

The accompanying half-tone for which we are indebted to Barnhart Bros. & Spindler, Chicago, shows the corner of the chase in process of welding by electricity.

Errors in Nailing.

Careless nailing may result in any one of several injuries to the horse's foot. When the nail is driven too close to the quick or into it so that the horse flinches, it should be immediately extracted. This is not a serious case if so treated.

It occasionally happens that the nail is driven still deeper and approaches the soft parts of the hoof, when the nail should, of course, be immediately withdrawn. Another error is in driving the nails somewhat too deep, so that when they are clinched they tend to press inward upon the sensitive parts, and pinching is the result. The cause should always be removed.

It sometimes is the case that the horse does not evince lameness for two or three days after shoeing. When lameness becomes apparent, the foot should be carefully examined and felt to detect heat if present. Then a few light taps around the several nails will allow the smith to detect the offending one, and withdraw it. In ordinary cases, simply leaving this nail out will be sufficient treatment.

QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

Polishing Wheel—Will some one tell me the best way of making a polishing wheel of emery and canvas?

W. H. MONTGOMERY.

High Speed Steel Bath—I should like to ask what kind of oil is best to use as a bath for high speed steel.

W. J. KINCH.

Rubber Tire Machine—I should like to know how to repair rubber tires of buggies, and what kind of a machine is used. Will somebody kindly let me know.

FRANK TEUBER.

Tempering Oils—In reply to Mr. Kinch's question, would say that we use linseed oil but any of the tempering oils can be used with equal success. H. W. RUSHMER.

Shoeing Racks—I should like to ask the experience of brother smiths with shoeing racks, and which they find to be the best, as I have a great many mean broncos to shoe and need a rack.

B. Q. DAVIS.

Tempering Plow Lays—I should like some brother smith to tell me the best recipe for tempering plow lays. I am in a stony country where it is hard to get a plow to stand the rocks.

F. W. NICHOLS.

A Wire-cut Foot—Will some reader of THE AMERICAN BLACKSMITH tell me how to shoe a horse that has been cut on a wire and has a quarter crack, the back part of the hoof being loose and when it grows down to the shoe it makes him lame. Will some one tell me how to stop it? J. D. H.

A Shoeing Question—I should like to ask some of the horse ironers of this big country what is the latest and best way of cutting down the foot, and what kind of nippers or hoof shears are the best. The floor work to me is the hardest and there is less said about it than other points taken up in these columns. O. W. DILTS.

Power in the Shop—I have been working at the trade for five years and like the work. I expect to rebuild this winter and put power in my shop. What would be the proper size for a small repair and horseshoeing shop? I now work in a shop 20 by 38, and find I have no room for a vehicle inside when I have horses to shoe.

D. H. KEENER.

Cash Payments—Mr. A. C. Green, of Boylestown, Ill., writes that in his opinion the principle of cash dealings, if adopted would be of greater benefit than would any lien law. This is a question which is open for controversy, and we should like to hear from

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some of our readers as to whether they consider a cash basis the best on which to conduct their business. [EDITOR.]

Paint Brushes—Can any of the carriage painters tell me how to take care of brushes when not in use? I have tried keeping them in water, which makes them work like a rag on the end of a stick. Also turpentine, which takes all the elasticity out of the good ones. The best way which I have found is to rinse all the paint or varnish out of them with turpentine and leave dry, but this is quite a job. Can some one suggest a better way? J. W. LAMBERT.

Rule for Calculating Length of Iron—I should like to know a good rule for calculating the length of iron to cut off to make a hoop or ring. If any one will inform us as to this it will greatly oblige us.
THEODORE S. MELANCON.

In reply to the question of T. S. Melancon, a method which I use and which I find is strictly accurate is to take the inside dimensions of the hoop and add to it the thickness of the iron, which is to be bent to make the hoop, and multiply this result by $3\frac{1}{7}$. B.

Drop Forging Dies—These are usually recommended to be made from crucible steel of from 40 to 80 points carbon, the greater the strength required, the greater the carbon needed, or else out of open hearth steel of first class quality. The greatest care must be taken to get a uniform heating and a quick, even cooling when hardening. The temper should be drawn but very little. Several hours in a kettle of boiling water is often recommended. I would like to hear one from some of experience about operating such dies. B. C.

A Clean Fire—I wish some one of the craft would inform me how to get a clean fire. I am using a Sutton's tuyere iron. I used to plaster it with clay, but the clay here is no good for that purpose, so I bought a Goshen fire-pot, and put it in. That does not help the matter any. The fire is very difficult to weld in, being always dull and red instead of white, and when I stop blowing, the fire will die out in a little while. My bellows are in good condition. The coal, however, is not of the very best quality to be had. F. O.

An Interesting Letter—The paper has been a great help to me, in many instances, and every smith should have it to read. I am very much interested in the ornamental iron work, because I worked at the same kind of work for about six years in Germany. I have done some ornamental iron work, in the past, but now I have all I possibly can do of all kinds of work, and my business is increasing every day. I started here only two years ago and I must say that sometimes I thought I should have to put out a sign like the one in the poem in the September AMERICAN BLACKSMITH. But I am satisfied now with the business and need not use that sign. ABRAM ROSKAMP.

A Pennsylvania Letter—Last April fifteen or twenty of the blacksmiths met and organized a union, of which eleven became members, since which time we have been sailing along smoothly. On July 1st, we raised the price of shoeing which was $1.40 at most of the shops, while a few were shoeing for less, up to $1.60 at all union shops. There are some eight or nine shops that would not join the union, but we hope to get some of them in shortly.

I might say that I have a shop 22 by 68 feet and have a large business, having had as high as 26 horses standing there at one time for shoeing. S. G. HEVERLY.

Two Questions—Will some brother smith tell us how to make a tool to bore a cylinder to an engine? We have a lathe and think we could make such a tool, and would like some information as to how it can be made, as I believe such a tool would cost a neat sum of money.

We should like some one to tell us how to build a trip hammer. We should like to make one and have it ready for our spring work.

We are readers of THE AMERICAN BLACKSMITH and value it very highly, and would not do without it for five times the price it costs. We think the paper cannot be beaten as a paper for blacksmiths and allied crafts. S. J. PEMBERTON.

Wooden Axle—In answer to Mr. J. R. McDonald's question on wooden axle, I shall endeavor to state my plan. First get your wood dressed up in perfect shape and proper length, then measure from the ends back the entire length of your thimble in side. I take ¼ inch off the bottom if wheels are straight, but if dished take off less. If badly dished have the axle perfectly straight on the bottom, then get your inside measure of spindle at the small end. Measure from bottom of axle, up, the size you want your spindle at the small end. Take your compass, lay off the size of the spindle. For the gather take off ⅛ inch front and ⅜ at back. If this does not seem clear to you, I will try to give you a more clear explanation in a later issue. M. A. FOSTER.

Making Stifle Shoes—I have been waiting for some older smith to answer the question of a brother on a plan to make stifle shoes, but as the same has never been answered, I will give my experience. First take an ordinary horse shoe or mule shoe, as the case demands, weld a piece of ⅜-inch rod iron across the heel about one inch from the calk. Next take the same size rod and circle from toe to the center of the heel piece, and weld to both heel and toe with a four-inch circle, placing it on the well foot. There are various ways of making this shoe, but this is one I have tried and it worked successfully for me. S. W. SHORT.

An Interesting Letter—I received your valuable paper to-day and see that you have given the prize to my shop, and I must say that I am both pleased and surprised, for I thought mine was but a common run of the shops throughout the country and I also think that more shops would be up to date, and look better, if the owner would put in a few of the dull days in picking up old truck that is sure to collect, and making a bonfire once in a while.

I can say to all blacksmiths that they can not invest a dollar any better than to subscribe for THE AMERICAN BLACKSMITH, for I find recipes and directions every month in it that are worth the price of the entire paper per year. JAY B. BAKER.

Emery on Cloth Polishing Wheel—In answer to Mr. Wm. Exline in the September number, would say that the blacksmith under whom I learned applied his glue and then sprinkled on the dust, but, by experience, I have found a better way. Empty a quantity of emery dust, of the desired number into a wide shallow vessel, and having the wheel off of the shaft, apply the glue to the wheel about the space of four or five inches; then roll in emery dust with some pressure on the wheel. Repeat until around the wheel. Let dry and give a second coat. I use Irish glue cooked in double cooker, sufficiently hot and thin. Some experience is required. Don't use glue too thick or the surface will crack. MELVIN BARNETT.

Replacing Tires After Shrinking—A plan which I use for putting on tires may be of use to some brother in the craft. I make the ordinary stand or bench out of two pieces of board placed on end running side by side and two others placed side by side at right angles to the first, making a sort of tit-tat-toe figure. I place my wheel on this bench and by means of a rod coming up through the center I screw the wheel down until the dish is nearly all out. Then I heat, put on the tires and as I cool the tire, drive the spokes with a hammer, setting them in the hub straight. I find this a very quick way and a good one for the amount of work put upon it. It prevents the wheel from dishing, and I have put many a badly dished wheel in good shape in this way. J. L. FIELDS.

To Make Butcher Knives—It may benefit some brother smith to know how I harden and temper butcher knives. I take an old file and file or grind off all the scratches, taking care that all are entirely removed so that there will be none to crack at the edge after hammering. Take a piece of 1/16-inch iron twice the length of the file and the same width. Weld this over the steel, and you will have a knife that will not break. Heat to a low red and harden in water until cool. Brighten the knife, hold over a hot iron until brown, and then let it cool. JOHN BLAKE.

Power Hammers for the Smith—I recently read the article "Power for the Blacksmith" in the August AMERICAN BLACKSMITH, and that article bears out what I believe to be the best and cheapest power for small blacksmith shops. May I now be permitted to ask a question? In a blacksmith shop that employs four men all the year round, and having an oil engine, 2½ horse-power, would a trip hammer, "The Little Giant," or similar, be sufficient to work with this power, iron 2½ and 3 inches square, or would it be better to have a boiler and work hammer by steam? Are the "Little Giant" trip hammers or similar hammers equal in power of stroke to a steam hammer, say 1½ or two hundred weight size? EDWARD A. GRANT.

Little Giant Trip Hammers—A 2½ horse-power is more than sufficient power to run our hammer to its full capacity. The hammer will handle 2½ to 3 inches square or round iron to very good advantage. As to comparing our hammer with a certain size steam hammer, will say that this is rather a difficult matter. All trip hammers, whether steam or belt driven, are gauged by the weight of falling parts. Therefore our fifty-pound trip hammer would be equal to a fifty-pound steam hammer, but they do not manufacture steam hammers smaller than one hundred pounds, and while our belt driven power hammer strikes 325 blows per minute, one cannot strike over 100 blows per minute with a steam hammer. MAYER BROS.

Contraction—Noticing in the September number a communication from A. H. as to the contraction of horses' feet, I will give my plan of shoeing what we call a narrow heel, as I learned it from a veterinary surgeon. I take a shoe and bevel it on the top side from both ends for about two inches, making it slope from the inside of the shoe to a feather edge at the outside. I make the shoe just as wide as the foot will bear and in six or eight days you will find the foot spread out over the shoe. Take this shoe off and spread it, replacing the shoe as before. Do this every six or eight days until the foot is spread to its proper width. I find this much better than spreading the shoe after it has been nailed on the foot, as it is a gradual spreading and does not hurt the horse. I have been shoeing for twenty-seven years and think the above the best method that has ever been brought to my notice. J. L. FIELDS.

Interfering and Forging—I should like some brother smith to write his method of shoeing interfering horses which interfere in front. I shod a horse which interfered in

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front, striking his knee; for a starter I shod him with a Perkins side weight shoe, weighting the feet on the outside, but he interfered worse than ever.

I find the best results in shoeing a horse for forging are gained as follows: Take a Perkins snow shoe for front and Perkins side weight behind of the same number or size, so as to about equalize the weight on all four feet. After paring the feet level, I shoe the front feet as short as they will stand, rolling the toe as much as possible. Behind I allow the shoe to protrude as far forward as possible, *i. e.*, the hind feet are generally dubbed off. I allow the shoe to protrude far enough in front so that it would fit the hoof if it were not dubbed a particle. I also weld toe on shoe of ½ by ½ calk steel. I have stopped the worst cases in this manner. S. SMITH.

Answer to Chain Puzzle—I will give the following in answer to the chain puzzle by S. W. Short. Let the five pieces of chain be represented by A, B, C, D and E. Cut one link from E and join A and B with the link cut from E. Cut another link from E and join C and D with it. Then take the remaining link of E and join the pieces you have, and you will have made a straight pulling chain with three cuts and three welds.

There is considerable logging in my territory and consequently a great many log wagons to repair. One wagon with 3-inch tire was brought to our shop to have the tire reset. Before the wagon was brought to the shop the tires were very loose and the spokes would creak when loaded. We cut the tires, welded them and replaced them, and they were tight enough to ring when struck with a hammer. The wheels showed plenty of opening when the tire was off, so I don't think the wheels were rim-bound. But in a few days they were loose again. I believe the spokes sunk in the hub, but if I am wrong, will some brother blacksmith correct me? A. J. ROOKS.

Interfering—I see in your October issue that D. W. Cryce asks for some one to give him a pointer on shoeing interfering horses. While I am not a perfect horseshoer yet I think I have an easy plan for such.

I take the size shoe the horse needs (long heel preferred) cut the inside heel off, so that after it is turned up for heels it will barely reach to the frog. The outside I turn up pretty stiff at the heel, and leave it from ½ inch to ¾ inches longer than the inside heel and almost ⁵⁄₁₆ inch or ½ inch higher than the toe. I let it extend over the outside a trifle. By doing this it will throw the ankles together and naturally the horse will pick his front foot up and throw it out away from the other ankle. Fit the shoe flush with the foot on the inside. I have used this method for about ten or twelve years and it has always proved to remedy the fault, if not the first time, the second. I have been at blacksmithing going on twenty-one years and have had quite an experience with good smiths. ANON.

The Blacksmithing Craft—I fully realize how much organization is needed at the present time. I find it very difficult to get good help. I notice, too, that very few are learning the trade, and I do not wonder at it as present prices for shoeing in this county are not encouraging for young men to learn the business. About all the blacksmiths and horseshoers that understand their business and are steady and trusty are doing business for themselves, or have good positions, and I often wonder what will happen in the near future, if something is not done in the way of organization and better prices so as to encourage the young fellows to learn the trade. I am trusting that the craft will wake up to the fact that something must be done soon. I fully realize that the art of horseshoeing is one which should be "looked up to," as it requires some natural ingenuity, lots of study and common sense, and where is there a profession on the face of the earth to-day so misused and looked down on as that of horseshoeing? A. S. DARROW.

About the Prize Contest—I wish to thank you for the prompt way in which you answered my question on blackboards. I also intend writing an article for the prize contest, now on, and I wish to know if I may send more than one article and what length it would be. Also if new work and repair work may be mixed in the one article. Kindly let me know soon. GEO. E. BRIERLY.

In Reply—In answer to the question of Mr. Geo. E. Brierly, more than one article may be sent in competition, in fact, as many as desired in order to increase the chance of winning a prize. As to length, there is no particular limit, except that the subject should be treated clearly and thoroughly, yet without any unnecessary words. From five hundred to one thousand words would be a very good length. Of course, where necessary to make the points clear, pencil sketches or drawings would make the matter more acceptable.

As to mixing new and repair work in the same article, this of course could be done if desired and the subject seems to call for it. The articles will be judged by their practical use, value and information to the man in the shop in his every-day work. ED.

Link Warping—I have noted Mr. A. W. McCaslin's common mention on the matter of case hardening in reply to my recent request. While I appreciate his efforts to aid me in this matter, I conclude from his remarks that he does not understand the real nature of the trouble as I endeavored to explain it. The trouble is not with the link springing, which he speaks of, but with what might be called swelling, as the block face of the link rises up toward the center.

I shall try to explain more fully what I mean. Supposing the link face is three inches in width. I find when the link is hardened that upon laying a straight edge across the face it is perfectly straight at the end, but from this point begins to rise, gradually increasing as it approaches the middle of the link and diminishes, of course, from this point to straight again at the opposite end, or in other words the link face is convexed in the center.

The four essentials of which Mr. McCaslin speaks are worthy of attention, for I find that a forging which has been thoroughly annealed keeps its shape much truer when hardened than one which has not been submitted to a second heating after forging. The above is my difficulty. GEORGE FROST.

Preparing and Working Scrap*—To produce good material for the important members of train service, referred to this committee, is an important subject, as the producing of good material has to pass through many operations before the finished product is completed; and each operation should be carefully guarded, particularly the initial point, that of piling the scrap material. We cannot produce good material from a poor quality of scrap, for the important members of locomotives referred to in this report.

In putting up the 160 or 200-pound piles to produce the forging required, the best quality of scrap iron only should be selected. If any foreign substance that has no affinity to iron adheres to the surface of the scrap, it should be removed before being placed in the pile. Another important factor is placing the scraps so that each piece shall lap, and, if practical, also placing the fibre of the pieces in the same direction that the forging is to be elongated, as good fibrous iron is what is desired. There is so much low carbon steel at the present time that gets mixed with iron in our scrap piles that it requires an expert to determine, in its rusty state, the steel from iron. In no case should steel of any kind be permitted to be placed in the pile, for the reason that steel will not stand such a high heat as is required to weld the iron into a solid mass. In other words, the steel will disintegrate when brought to the heat that is required to thoroughly weld the iron.

The next operation is to place the pile in the furnace, bring the same to the proper heat for manipulating under the steam hammer. The fuel used to bring the metal to the proper heat for manipulating is an important factor. Oftentimes the coal used contains a large per cent. of sulphur. Such coal should not be used for any purpose where welding heats are required, particularly scrap piles in a furnace, as the heated pile will absorb the sulphur or other elements that have no affinity to iron, which is so detrimental to iron. In the Southern Pacific shops crude oil has been recently introduced for the purpose of producing finished products from scrap material, and, from the writer's point of view, is far superior to coal, as well as more economical. The heats come out of the furnace much cleaner than with coal. The furnace should be so constructed that perfect combustion takes place before the heated gases come in contact with the metal. The white flame alone should come in contact with the metal.

The time required to bring the piles to the proper heat must be governed by the dimensions of the piles, which should be heated no faster than they will absorb the heat. Oftentimes the zeal of the heater will cause him to bring his heats out of the furnace quickly, or before the metal is properly heated through. If this work is done too quickly, the outside of the metal becomes hot before the center of the pile, consequently when the metal is worked under the hammer the center of the pile is not thoroughly welded. The heater should take great care in manipulating the piles in the furnace. Should any foreign substance, such as silica from the furnace bottom, adhere to the piles in their heated state, it should be removed before the hammer comes in contact with the heated metal.

The proper manipulation under the hammer is also an important factor. The pile should first be squared up with light blows, then drawn carefully to the dimensions required. If the pile is of sufficient weight to produce any special forging required and is intended for the purpose, it should first be squared and upended at the same heat, then returned to the furnace and heated through its entire bulk, again placed under the hammer and worked into the shape required. For large forgings that one pile cannot be conveniently manipulated, the piles should be drawn into slabs and the slabs piled in sufficient quantities to produce the forging required.

Hammered iron for V-shaped pieces for welding frames should be of the best quality and stand a high heat, and the fibre of the "V" should run in the direction of the lengthwise of the bar or frame it is intended to weld. The method adopted in the S. P. shops to produce the V-shaped pieces is to first produce slabs about 8 inches wide and 3 inches thick, then cut the bar into sections of 3 or 4 inches. This gives a piece of iron 8 inches long and 3 inches square, with the fibre running at right angles to its length.

S. UREN, Chairman of Committee.

*Read before the Convention of the N. R. M. B. A. at Buffalo.

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A Toast to the Holidays.

May the coming Christmastide bring to all friends and readers of THE AMERICAN BLACKSMITH a season of abundance, of gladness, of wholesome large heartedness, together with a sense of peace and contentment, all of these the fruits of an old year of honest toil and a new year of brightest prospects!

Last Days of the Prize Contest.

Have you sent in your article on wagon building or repairing yet? December 12th is the last day of the contest, so that if you care to have a chance for one of the ten prizes, your article should be mailed at once to the Editor. Address P. O. Drawer 974, Buffalo, N.Y.

Take any interesting topic connected with wagon work, and write about it in a straightforward way. The articles will be judged for the value of the practical hints and information contained.

Don't forget to mail your article by Saturday, December 12th.

Choosing Text Books.

Perhaps no single year has produced so many good craft text-books as the year 1903.

Their name is legion and they deal with every art and craft known to modern civilization. Looking over our library and noting all those new-comers, leads to many thoughts. In the first place, the tendency towards education of the tradesman is in evidence. A few generations ago, and the blacksmith's work was a mere matter of drudgery and experience, now it is thought worthy the attention of scientific men, and its principles are laid down according to scientific system. And who writes these blacksmithing books? The practical and intelligent blacksmith who has become an expert, and acknowledged authority in his trade. Besides the excellent books placed before the public, unfortunately there are many of inferior quality. A book whose teaching is not absolutely accurate and trustworthy is more than useless; it is dangerous. Any man who undertakes to write a book should consider the responsibility attaching to his work. And any craftsman, in choosing a text-book for instruction in his craft, should carefully select his book from the best on the subject. A book published by a thoroughly reliable firm, and written by a man of standing is the one to select.

The present system in vogue among some of our leading publishers of "If you like it keep it, if not send it back," is a godsend to the mechanic of literary bent. By this practice he is able to unerringly choose just what he needs. His library becomes a collection of well-tried friends, always ready with advice and always up-to-date with the current thought of his trade.

Unity and Discord.

Seven brothers once lived in a certain place, making shoes for all those in the land 'round about. They were the only people in the land who were skilled in the trade, so that their shoes brought a good price, giving all of them plenty to do and a good living from their industry. These brothers were wise. They worked together and rejoiced each in the other's prosperity. They knew what their skill and labor were worth, and they made the farmers and others pay it. Here was unity, and unity was prosperity.

In another land lived seven other brothers, also shoe makers. These seven likewise had all the trade in their land, but each was foolish, and exceeding jealous of every penny earned by another. So they strove to best one another, not by their skill and industry, but by selling their goods each a little cheaper than the other. They thought to get the best of each other, but the farmers and the butchers and the bakers 'round about got the best of them all, laughing up their sleeves continually at the brothers. Things went from bad to worse with these, until finally some sold out to take up trades where their shoeing skill went for naught, and the others sold their services to the farmers, or struggled on, living from hand to mouth and fighting those who took their brothers' places. Surely, a house divided against itself cannot stand. Here was discord and ruin.

Random Thoughts on Blacksmithing.

Blacksmithing may be called one of the foundation crafts. Not only because of its dating back to Biblical times when the machinists or moulders were undreamed of, but because the blacksmith's work precedes, underlies or plays such a fundamental, indespensable part of so many crafts. The time-worn legend of Solomon and the smith aptly illustrates this.

The blacksmith must use head as well as hands. In his craft, strength, skill and "know how" work together. The smith of to-day is coming more and more to lay out and plan his work. The blue-print is a familiar acquaintance. Foremen are chosen, not from the size of their biceps, but from their ability to lay out work intelligently, to handle men successfully, and to get up tools or methods of doing work rapidly and cheaply. It is another evidence of the ascendency of mind over matter. Are blacksmiths of to-day striving to improve mind as well as muscle?

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Where is the blacksmith's machine which, after it has been adjusted and started to work, will allow him to sit down and read the paper? The smith must be constantly at it, heating one iron while he is working another. His forging machines supply brute strength principally—they are not automatic in the sense of machinists' tools, and require continuous watching over.

Blacksmithing requires the use of the head and of the hand. Those who pursue it are subjected to hard work in trying situations, hot work, dirty work, extremes of temperature.

Blacksmithing, therefore, should be paid on a scale of wages equal to those of any other mechanic. Every good blacksmith rightfully earns and richly deserves a good living from his labors.

Price Schedule from Mississippi.

D. C. HOBSON.

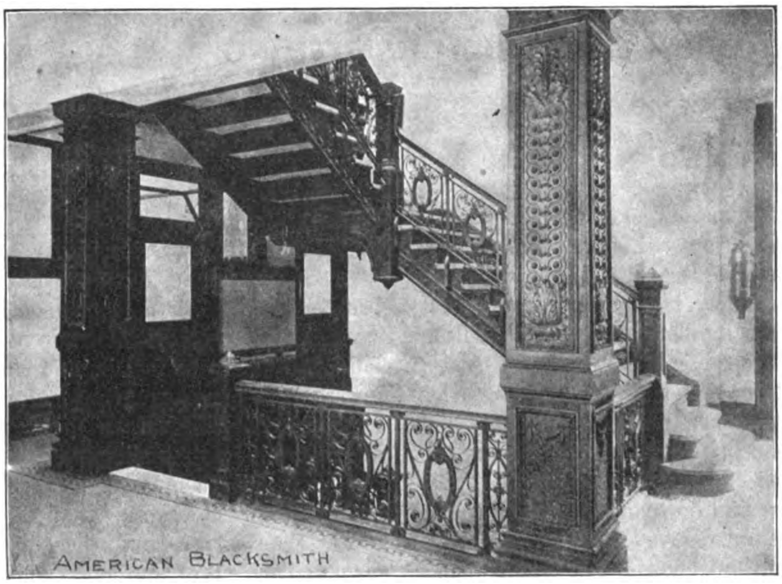
Four new shoes	$ 1.00
Four old shoes	.60
Four new wheels	12.00
Spoking one wheel	2.50
Four buggy stubs, 1"	6.00
Shaping rock drills	.50
Buggy reach, each	1.00
Setting wagon tires	2.00
Setting buggy tires	3.00

Three Masterpieces in Ornamental Iron Work.

From Long Island City comes another group of handsome pieces of ornamental iron.

Of the three reproduced herewith, the lower is a particularly fine grille in the Astoria Hotel, Astor Court, of which H. J. Hordenberg is the architect.

The upper one is a staircase of cast iron of which the balustrade is of highly artistic design and workmanship. This staircase is to be seen in the Townsend Building, situated in New York City.



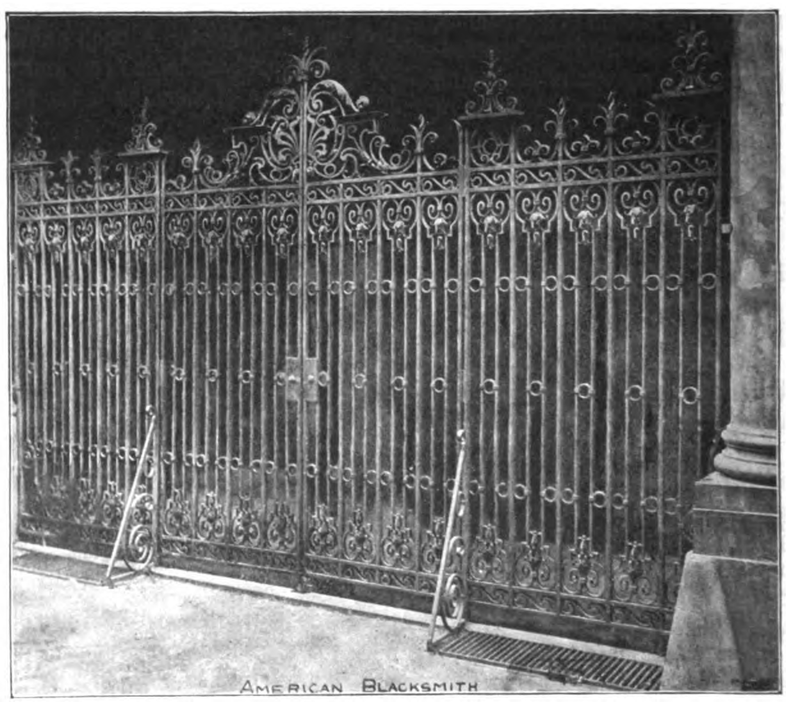
AN ORNAMENTAL STAIRCASE IN CAST IRON.

A second stair rail of very striking design is also illustrated on page 43. All three pieces are from the forge of Richey, Browne and Donald.

Punching Holes in Iron.

BY H. S.

As we had a piece of iron ⅜ by 2½ inches, in which to punch a 1-inch hole in one end close to the edge, and two smaller holes farther back, we cut the iron and took a good heat and then tried to punch the large hole, but the iron split on both ends. We did not know what to do, but after studying a little time, I came to the conclusion to punch the large holes first and then cut it off. By doing this, in a good many cases, a smith saves a lot of iron and time.



A WROUGHT IRON GRILLE OF HANDSOME DESIGN.

Talks to the Jobbing Shop Painter.—9.

The Varnish Room.—Its Location Light. Ventilation. Cleanliness Heat and General Arrangement.

M. C. HILLICK.

In the September issue of THE AMERICAN BLACKSMITH, Mr. C. D. Briddell asks some brother smith to tell how to build a varnish room, advising size, how planned and equipped, and how much light it should have. Mr. Briddell states that his shop is 25 x 40 feet, two stories high, and wishes the varnish room large enough to accommodate from five to eight buggies at a time.

The writer is not a blacksmith, but as a painter with nineteen years' familiarity with paint shops and varnish rooms, he may perhaps be able to advance some points relative to the varnish room and its requirements which may prove of general interest.

In arranging for the varnish room, at least four important considerations are involved, namely, size, location, light and ventilation.

In size, the varnish room should be made as large as the proportions of the paint shop will allow. The average

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varnish room is too small rather than too large. In the paint room the parts of a carriage may be put away in much closer compass than in the varnish room. Paint dries out of the way of dust quicker than varnish, thus permitting an earlier handling of the parts coated. In the varnish room there must be room given for free handling of the work without menacing the cleanliness of freshly varnished surfaces. In the varnish room where new work is handled exclusively more work can be taken care of, in proportion to size of shop than where old work is handled. New carriages, when passing through the paint shop, are taken apart much more completely than old ones, and the storage can therefore be made much more compact without injury to the quality of the work.

Most paint shops of fair size are provided with a varnish room for bodies, and one for running parts, which include gears, wheels and shafts. This, of course, is the most satisfactory arrangement, but in case of the small jobbing shop, this plan, however excellent it may be, cannot always be adhered to. Especially is this true in its application to the shop that carries only from five to eight buggies at a time to be painted. But even in this case the writer would advise making one varnish room for running parts, and one for bodies, as eventually it will prove the wiser plan.

A fair sized varnish room for bodies in a good city shop would be 25 x 35 feet. Mr. Briddell in stating his wants fails to say whether he desires to divide a portion of the 25 x 40-foot space for a varnish room, or whether an addition to this space is to be provided as a varnish room. It is assumed, however, that a portion of the 25 x 40-foot space is to be set apart, and that a room in which to varnish bodies, and one in which to varnish running parts, is preferred to a single room for both branches of varnishing. Accepting this as the situation, we would say make the varnish room for bodies 10 x 15 feet, and the varnish room for running parts 15 x 15 feet. This leaves paint shop proper 25 x 25 feet.

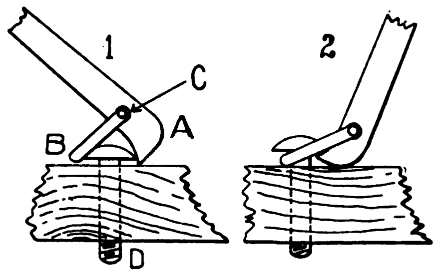
The varnish room should not be located over the smith shop. In fact, it should be as far removed from the smith shop as possible. Blacksmith shop smoke and gases are fatally destructive to high-class varnish room results. At the same time, the fact must be recognized that in the country shop undesirable conditions are not infrequently unavoidable, and one of these conditions sometimes brings the varnish room, or the paint shop in which the varnishing is done, directly over the smith shop, in which case it only remains to reduce the element of danger to the minimum. The varnish room located over the smith shop should have a double matched floor with heavy building paper between the two floors. It should be an unusually tight room in respect of walls, window casings, etc., so that the exclusion of smoke, gases and bad air may be made quite complete. Then from the roof of the building should come a generous supply of ventilation. But conservatively speaking, the varnish room located in close proximity to the smith shop is indeed in a critical situation.

The light for the varnish room should preferably come from the north and east, hence the varnish room located in the north-east corner of the shop may be considered the most advantageously located. The North light is the best light. It is the easiest light for the eyes, being free from the glare of the south and west light. From the north the light comes more uniform, and is of a softer quality, and dries varnish—in so far as the light promotes the drying of varnish—faster than light coming from other points of the compass. Light from the east windows has the advantage of bringing a bit of sunshine into the room in the early morning, passing out after a brief interval, with an effect upon the work and the workman always beneficial.

The varnish room cannot have too much light. It is therefore desirable that a good measure of window space be given. For the east windows furnish light-yellow shades; for the north windows dark-blue shades. The light-yellow shades serve to break and mellow the bright glare of the sun, and the blue shade softens and graduates the north light, and when necessary—during the heroic reign of the fly, for example—they may be used to darken the room, while the varnish is setting, free from dust.

Ventilation is an all-important as a matter of fact, we may say, indispensable factor to be accounted for in the varnish room. Ventilation should come through the ceiling of the varnish room, and so out through the roof of the shop. The old-fashioned top or revolving ventilator, while perhaps quite a little less effective than some of the re-recently patented ones, will do good work. Bring the pipe from the ventilator through the ceiling and into the varnish room, enclosing the end in a wire sieve

DIAGONAL SCHEME FOR ORNAMENTAL IRON STAIR RAILING cap which can be removed at the will of the workman. While varnishing is going on have the sieve extremity of the pipe filled with trimmer's curled hair washed clean. This affords adequate ventilation attended by no risk of the work's catching a smear of dirt. This



AN INGENIOUS TOOL FOR PULLING WAGON BOLTS.

method of ventilation removes all foul or poisonous air from the room without draughts, without an inflow of cold air through the windows, and furnishes absolute cleanliness. And cleanliness the varnish room must have. As aids to maintaining the clean varnish room make the floor of hard wood, matched stuff, so that, when necessary, it may be mopped and washed. Give the floor an oil finish. The ceiling and side walls should be of matched lumber of good quality, and as a means of reflecting light, paint the ceiling white or straw color. Finish side walls in oil. Plaster or painted side walls are objectionable on the ground that they bruise and disfigure readily, making a bad effect, and, in case of the plastered wall, making dirt as well. Furnish the varnish room and especially the body varnish room, with as many windows as possible, both north and east. Hang the sashes with weights. Make the varnish room door, or doors, to swing outward so that no dirt will be stirred into the room. Locate the stove, if heat must be had from that source, near the door, that the air thus entering the room may be warmed ere it comes in contact with the work. The stove should be a hard coal, self-feeder, a clean, and good heater. Of course, the varnish room will need a cupboard in which to keep a can or two of varnish, a brush-keeper containing the varnish brushes, dusters, cups, chamois skin, etc. This should be a plain, compact affair, tight and cleanly, and located near the door. Provide this cupboard with lock and key, that contents may not be at the mercy of the inquisitive. In case two varnish rooms are provided—and this is always advisable—locate the body varnish room in the northeast corner of the shop. At any rate, give it the most desirable location. When work is freshly varnished it is thought to be the best plan by many celebrated finishers to darken the room until the varnish sets free from dust. Then make the room as light as possible.

Varnish hardens more rapidly in the strong light and takes on a deeper brilliancy and a sharper lustre. Revolving trestles, etc., for the varnish room have been illustrated in previous issues of THE AMERICAN BLACKSMITH.

(To be continued.)

A Simple Tool for Taking Out Bolts from a Wagon.

WM. DEGEN.

The following is a description of a simple tool to remove old bolts from any part of a wagon—that is, if you can raise the head enough to put the point under and the clevis over the head. Take an old 1¼-inch axle, make a point in it the shape of a crow-bar, then make a clevis of ½-inch square iron or mild steel. Drill a ⅜-inch hole about 2 inches from the point of the bar and a trifle above the center. Fit your clevis so that it will pass the point about 5/16 inch. Put a ⅜-inch hole through the clevis and bar and it is ready for use. The whole length of the bar is 2½ to 3 feet as may be desired. I have shown this puller to many blacksmiths here in the city and they all have adopted the use of it. Referring to the sketch:

A, is a bar.
B, is a clevis.
C, a bolt through bar and clevis.
D, a bolt in a piece of wood.

Pull the clevis back, put the point of the bar under the bolt head, drop clevis over bolt head and the bar is ready for action. In the first figure is seen the tool in this position. In the second is the tool in the act of pulling the bolt. Bear down till the bolt comes out. If it should happen to be a long bolt, raise the bar up, take a new bite, and so on till the bolt is out.

I have seen many good tools and items in THE AMERICAN BLACKSMITH that were of benefit to me, and I hope this may prove the same to others.

Method of Welding Steel Buggy Springs.

J. GOOGERTY.

In welding steel buggy springs, say 1¼ or 1½ inches wide, the first thing after getting the spring out is to build up a good clean fire, build it up with wet coal, round it up nice and high, and then make an opening in front and leave the coal well rounded at back and on the top as much as convenient, also have some well burned coke handy. Now take the broken ends, lay them in the fire, and get as good a heat as you think it will stand, without burning, take one out and upset it by driving it back with hand hammer as much as the heat will stand, then lay it back and repeat the same way with the other.

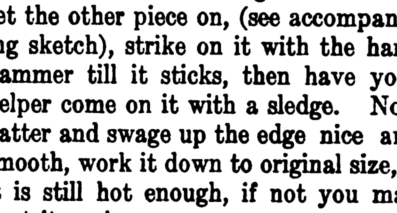
Now take another heat, bring them out and scarf with face of hammer by driving them back with a short bevel from one side, lay them back in the fire with scarfs up, throw a few nice pieces of coke on them and blow up slowly till you get a good red heat, then shut the wind off, take the forge scraper and scrape the coke off. Put on some borax and let it burn down well, turn them over and put some on the other side. Let it lie a little while, and sprinkle on a pinch or two of iron drillings. Now blow up slow and feel the laps with the point of a poker till it begins to stick a little, then turn them over and blow up till you think you have the right heat. Have your helper take one out, and be careful not to drag it on edge of the fire, set it near the inside edge of anvil and set the other piece on, (see accompanying sketch), strike on it with the hand hammer till it sticks, then have your helper come on it with a sledge. Now flatter and swage up the edge nice and smooth, work it down to original size, if it is still hot enough, if not you may heat it again.

A weld of this kind ought to be made in one heat and can be with a little practice, barring accident. At least that should be the aim of every blacksmith; if he fails, then it is time to take the second heat.

Success at the Forge from a Mechanical Standpoint.

J. M. FIX.

In the first place you must have a good fire. Your tuyere iron should be from five to eight inches under the surface, depending upon the character of the work to be performed. Whether bellows or blower, the wind must be forced through, and a steady blast is best in most cases.



WELDING STEEL BUGGY SPRINGS.

Good coal is essential and also good iron and steel. To make the greatest success attainable by any one, a good soft welding heat is best in most cases for

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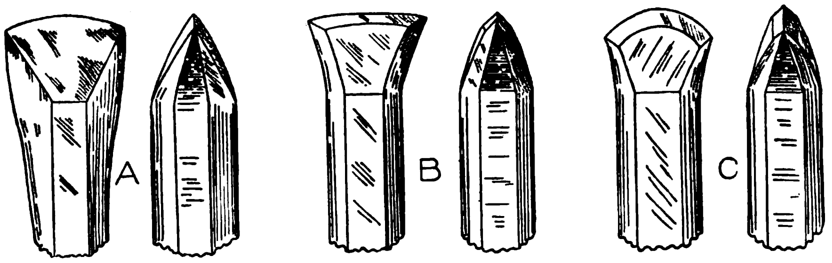
iron. Of course it must be hammered rapidly, and, as a rule, turn it every blow. A rather long hammer is much easier to forge with than a short, thick one. In bending right angles, do not use the vise, nor the sharp corner of your anvil. Heat to a good white welding heat, as a rule, and bend over a round corner, cool one end close down to the heat and drive down with your hammer, having the bend on the anvil. In this manner you can make a good bend at one heat in any ordinary size iron. You can rest assured that when you see a smith rush to the vise to bend his iron, he either does not know or he does not care as to the quality of his work. On account of the surface of your iron coming more in contact with the hammer and rollers, it is tougher on the surface than inside. If you bend in a vise you cut the surface and the least cut in the outer edge destroys the quality of the job from 10 to 75%. It ought to be stronger in the corner than anywhere. To illustrate, suppose you take a piece of iron 1 by ½ inch, and bend at right angles for a brace, and you cut it in the corner; that iron would not be much stronger than a ⅛ not cut at the corner. I feel from the observations I have made in life that I have not explained this important point thoroughly enough. Working eighteen years at the forge, I have observed, that only about two in ten smiths are up to date in bending iron. Now then, if my observations be correct (and I think they are from a mechanical and scientific standpoint) I have not said enough yet, for not only the user of the products of the shop, but eight out of ten smiths do not know how or else they do not care to make a scientific and mechanical job of bending.

If a corner iron should break, a number of the consumers or users, and quite a percentage of mechanics would attribute the break to bad material in place of poor workmanship.

The Making, Hardening and Tempering of Rock Drills.

W. P. WOODSIDE.

As an experienced rock drill dresser knows, there is more in making a drill bit the proper shape than most smiths think, and to explain to the readers of this paper, they will notice the cuts of drill bits shown herewith. First, you will notice that the bit at A is slightly rounding on the cutting edge with lots of backing behind the corners, and you will notice, side view, the gradual slope from drill body to cutting edge. These three points are very essential in making a good drill. The first point is this, if a drill is made straight across on the cutting edge, often that drill is dull. The next bit, being square or straight on the cutting edge, has to do it all, cutting at first on the very corners, which makes it very hard on a sharp drill. The next point, if you do not have backing behind the corners, as soon as the corners begin to wear, the bit begins to get narrower, therefore, losing its gauge and causing the next sharp drill put into the hole to stick. It is this which causes so many broken bits, or bits with the corners off. This gradual slope makes the bit very easy to sharpen and keep in shape, which means a great deal when the smith is rushed. At B is a very badly-shaped bit. It will show all the bad points which I have just mentioned. The bit at C is also a very poor shape, the cutting edge being too round, making it very hard to sharpen. You will also notice the quick bevel towards cutting edge at A and B which makes them very hard to sharpen and keep in shape.



SHAPING A ROCK DRILL BIT.—A, THE RIGHT FORM. B, C, VERY FAULTY FORMS.

(To be continued.)

Steel—Pointed Paragraphs.

OHIO STATE UNIVERSITY.

"The mastery of iron and steel working implies the ability to master the working of all metallurgical products" —(*Woodward*).

"The treatment of steel is the study of a lifetime."

There is no known process of ascertaining definitely in workshops the quality of steel, except by use. A skillful man can so manipulate a poor piece of steel or iron as to make it appear better than the best grade of either metal.

Tools made of steel depend more upon the temper than the quality of the metal, for testing; but their durability is determined by the quality and manipulation which they undergo.

A piece that will not properly harden by being heated red, and quenched in water, is iron. When it will so harden properly and sensibly, it is steel. (This rule has been sufficient for the toolsmith from time immemorial). Common usage of steel makers includes the product of open hearth and Bessemer furnaces; compounds of iron and its ordinary ingredients which have been cast from a fluid state, which resembles wrought iron, should be called steel; that which is aggregated from pasty masses or from piles not in fluid state, is wrought iron.

Steel is liable to be injured in a very hot fire; a quick heat may rupture it. It becomes decarbonized if left too long in the fire, and should not be over annealed.

The structure may be ruptured more readily at an uneven heat than at any other time.

High carbon steel is more liable to injury than low carbon steel.

Hardening.

Hardening is produced by high heat and sudden cooling. By proper hardening the steel is refined.

Water is not essential for hardening. It improves with use if kept clean.

The hotter the steel and the more sudden the quenching, the more coarsely crystalline will be the fracture.

Oil and fat do not cool the metal as rapidly as water.

Mercury, brine and other substances cool the metal more rapidly than water.

To prevent loss of carbon, tools may be heated in melted glass, or salt and cyanide of potassium or melted lead.

A quick heat and a cold bath may cause the steel to crack.

A rapid cooling gives the status quo, the state into which the steel was brought by heating; the sudden quenching fixes the hot condition, making the metal in a cold state to show itself as it was when hot. (This has from time immemorial been accepted by toolsmiths as the cause of hardening).

The right hardening heat for any steel is fixed by its chemical constituents.

Tempering.

Tempering is a reduction of hardness produced by heating to not more than 700 degrees Fahrenheit.

The ductility and elasticity of steel are restored or increased by temper.

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The more slowly the tempering heat is applied the better the article will be.

The higher the tempering heat the softer the piece becomes. If heated by induction the rapid rise in temperature can do no harm.

When steel is properly hardened and polished, the color is a certain test of temper.

Tempering with oil prevents oxidation and increases the elasticity of the piece.

Chemical tempering pickles have nothing to do with the effect.

Defects arise from adhering to any special process of tempering because steel is not uniform.

Case Hardening.

Wrought iron may be exteriorly converted into steel and afterward hardened.

Yellow prussiate of potash or cyanide of potassium, sprinkled on red hot iron before quenching in water gives a hard surface, but it will not stand much wear. More uniform and greater effect is produced by enclosing the article in an iron box containing charcoal, heating to redness which should be maintained for at least one half hour, and quenching the article at a full red heat after it is taken out of the box. Animal charcoal, made of leather, bone or hoofs, packed in the box with salt and steel chips, from drill or lathe cuttings, is best for case hardening purposes.

The Progressive Smith as a Business Man.—3.

BILLY BUNTZ.

The Blacksmith's Day Book.

A carefully itemized record of accounts will save the smith much annoyance and obviate any display of temper. By it he will be enabled to tell who owes him, the amounts, and the dates debts will become due, as well as draw a comparison at any time of the progress he is making, one month or year over another. It will also enable him to readily quote a price on a special job by the account of some customer who was charged for similar work.

Some smiths have the idea that because their hands are usually besmeared they could not keep a record without plastering a book with iron rust, forge smut or axle grease, while others seem to think that to keep accounts requires pretty writing or a regular book-keeper.

The principal thing a debtor wants to know is the amount of his account and what items it includes, regardless of any finger marks, although it may be said here that the smith can avoid smearing a page by using a blotter, piece of paper, or anything of this kind, under his hand, allowing only the pencil to touch the page; or he can wipe his hands on a bit of waste or cloth.

Probably the simplest and most convenient method of keeping accounts in the smith shop is by the pencil system, as pen and ink are unhandy for the average mechanic to use when at work.

While working on a job a slate and pencil are useful for jotting down weights of different kinds of material, number of hours worked, or for making any memorandum, as of course slate pencil figures may easily be erased should a mistake be made. In fact, all accounts may first

(DEBITS) (CREDITS)

Customers who owe	Cash Received	DAY BOOK AND DIARY OF JOHN JONES, 1818 MAIN ST.	Cash paid out	Persons I owe
		Commenced smithing business on June 5, 1901 by buying shop of above number, including machinery and tools. Deed and bill of sale on file.		
		JUNE, 6th. JAMES BARTON, DR.		
1 50		4 shoes for "Nellie." will pay next time comes to town. PAID 6-15		
	50	Straightening sucker rod of pump.		
	75	Making cleats for a boat.		
	85	Tightening shoes.		
1 50	1 60			
		JUNE, 7th. W. E. WILSON, Dr. Porter Road,		
1 50		4 shoes Will pay by 15th. PAID 6-15		
	50	Sharpening scythe.		
		Bo't a hammer.	1 00	
	1 50	4 shoes.		
		Started to build a wagon to have something to do during spare time. Keeping account of time and material in a Memo. book, to afterwards transfer here.		
1 50	2 00		1 00	
		JUNE 8th. Rainy, worked on wagon nearly all day.		
	75	Repairing a buggy.		
	25	Filing a saw.		
	10	Making staple.		
	1 10			

be put on a slate, although this is not really necessary, albeit the memorandum, "Johnson—fifty cents," is a good reminder, as where memory is depended upon altogether something is likely to be overlooked.

In addition to the slate, a Day Book should be kept as a permanent record. This book may be large or small, according to the distribution the smith desires to make of his accounts, although it is best that it have enough pages to contain a year's business, and be sufficiently wide to accommodate large handwriting. The cover may be plain, the paper a little coarse or rough. An indelible pencil should be used, as the record made by a common lead pencil might become obliterated by constant rubbing in handling the pages.

Into the Day Book all accounts should go. In fact, it should include a record of every transaction in the shop, and may also be used as a memorandum book or diary. Its principal use in the smith shop is to show the amount of cash taken in, and the amounts which customers owe. Two columns on right hand side of page are sufficient for showing this information. When a customer pays his account it should be marked "Paid," and the date of payment shown, as well as the amount checked off. It then stands as a complete record. Where all debts have been paid by the end of a month or year, this debtor column is really a record of cash received as well as debts paid, while the regular cash column shows the amounts received when completing jobs, in fact, these two columns show the amount of business the smith is doing, with the exception of the memoranda which show improvements made to shop.

Where the smith desires to show the amount of cash he pays out from time to time, as well as the persons he owes, it is necessary to have two more columns, preferably two columns on either side of the page, those on the left showing Debits, and those on the right Credits. Or there may be any number of columns on either side by using a large book. However, where the smith keeps strict record of the active part of his business, i. e. cash received and paid out, and persons who owe and those he owes, there is little necessity for further distribution or sub-divisions of accounts, as these would show little more than what the smith himself knows all about, as, for instance, how many machines he has in the shop, where they were bought, price paid, etc., or how much he paid for his shop. Transactions of this kind are fully recorded on invoices, bills of sale, deeds, and kept on file at home, the Day Book simply containing reference to their whereabouts without any amounts being shown. Two or three box files with indexes will show nicely for holding papers of this kind.

A date calendar having 365 leaves, like the "Columbia" calendar or that of the Lunkenheimer Co., of Cincinnati, is very handy for keeping memoranda in date order. When a customer says, "I'll pay you on the 10th," his name may be written on the leaf of that number, as well as recorded in the Day Book. A calendar of this kind will accommodate hundreds of memoranda by allowing the leaves to

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remain intact instead of tearing them off.

Where the smith has a bank account he can keep record of money expended by adding up the stubs of his check book.

GLIMPSE OF INTERIOR OF SHOP OWNED BY MR. HARRY RUSH.

Private accounts, such as the grocery bill, should be kept at home, preferably by having the grocer render a monthly statement, which may be receipted and put on file.

The accompanying sample page of Day Book illustrates how a smith may commence keeping record of his business transactions at any time without going back into the Dark Ages for any data, as this record dates only from the time it is started, unless the smith especially desires a preface giving general information about his business in former years.

A system of this kind takes up little time, is not at all inconvenient or technical, and is at the same time a complete record of the smith's business and progress, as he can tell at any time how much cash he has received or paid out, as well as who owes him and how much he himself owes.

This system is the same as used by Jones when he first started in the smithing business. Read "Jones as an Advertiser" in the August number of THE AMERICAN BLACKSMITH.

(To be continued.)

A Busy Shop in North Dakota.

HARRY RUSH.

Oberon is situated in the Northern part of the State in a rich farming country. The work is principally plow work, although a blacksmith here must be able to make anything from a spring colter to a threshing machine.

I settled here in the spring of 1884 and have sharpened the plows that have broken up the country hereabouts for miles around. My shop is now 24 by 48 feet with a wood shop 16 by 24 feet, in addition. I have a 6-horse power "White" gasoline engine, made by the Globe Iron Works, Minneapolis, Minn., with which I run a blower for three forges, a "Little Giant" hammer, made by Mayer Bros., Mankato, Minn., a "Silver" lever feed drill from the Silver Manufacturing Co., Salem, Ohio, emery and polishing wheels, shears, upset, and a screw-cutting Barnes lathe. We have also a complete set of bicycle repair tools, including brazer, oven, vulcanizer, etc. A full line of wood-working tools also forms a part of our equipment, with a Silver hub-borer. We run a useful machine for heating tires by kerosene, which is very handy in windy weather. When a job comes to this shop we never say no. We *have to* do it. If I could not have power in my shop I should be ready to quit blacksmithing, and the gasoline engine is the right power. (I mean "White").

With two men and the Mayer hammer I can sharpen two hundred plow shares in a day. In a future article I shall give my method of making a plow share.

A Short Talk About the Moulder's Tools.

Of all the tools that the moulder uses, the most useful are his own hands. These, trained to their task, are capable of performing the most delicate bits of work that other tools would damage. In making an uneven bed or for bedding down a pattern the workman's hands must be used. The whole surface must be gone over in detail to judge of equal consistence or otherwise. By pressure applied with the hands and the addition of more sand, soft places are made firm, and surfaces are roughened by rubbing the palms to and fro over them. In tucking the sand under flanges and ribs and into angles, these tools are used, also in rounding up pouring basins. Broken parts are more safely mended by the fingers, and small patterns are more easily lifted out by hand than with spikes. Besides the hands, several tools are necessary. A hammer, vent wires, various cleaners, head and flange and similar tools are used for shaping.

Molten metal tends to fly off from a hard surface, because the gas present being unable to escape, forms a cushion between the metal and the mould. In a hard-rammed, open mould not vented, the gases bubble through the metal, causing jets or fountains of metal. This bubbling, in a closed mould, will break away the sand in patches, causing scabbing. In a chilled mould not properly dried and rammed the metal will blow out. Hence, a green sand mould should be rammed only sufficiently to sustain the metal. Of course, the pressure is always greatest on the bottom. With green sand a hard bed is necessary. Ram a hard bottom and cover with softer and more open sand. Thus bubbling is prevented, the gas going into the hard bed which is well vented. In thin, shallow castings, soft-ramming at the surface is of more importance than in a deeper one because in the former, there is little counter pressure exerted by the metal to force the gas downward. Harder ramming is necessary in the top than in the bottom, because the pressure there is relieved by the riser while that at the bottom is constant. Ramming may be harder at the sides than at the top or bottom, but care must be taken not to punch the bars, lifter or rods but only the sand. If the pattern is struck by the rammer, it makes undue hardness at that point, causing a scab.

The vent wire is a very important tool. A small vent wire is $\frac{1}{8}$ inch or $\frac{3}{16}$ inch in diameter. A large one is $\frac{1}{4}$ inch to $\frac{3}{8}$ inch. The latter, being long and large, requires the use of both hands to drive it through

ANOTHER VIEW OF MR. RUSH'S SHOP AT OBERON, N. DAKOTA

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the sand, hence, it is furnished with a cross-handle.

A rammer is like a small mallet, having differently shaped heads for different

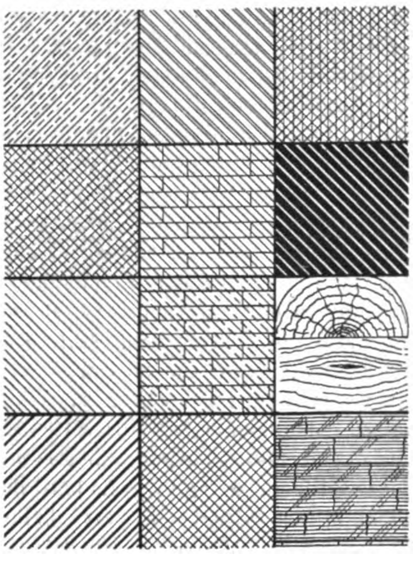

Fig. 1. CONVENTIONAL MODES OF INDICATING MATERIALS.

BRASS.	STEEL.	WIRE.
COPPER.	BRICK.	RUBBER.
CAST IRON.	FIRE BRICK.	WOOD.
WROUGHT IRON.	LEAD OR BABBIT.	STONE.

purposes. The part by which the sand is actually punched is from 1 inch by $\frac{3}{8}$ inch to 3 inches by 1 inch. Certain kinds of mould dispense with venting, such as loam and open sand. With green sand and dry sand moulds venting is absolutely indispensable. A great deal of gas is always generated by the decomposition of moisture in sand. The amount of this gas is astonishing to anybody but a moulder or chemist. When the mould is poured, from every vent issues hydrogen gas—a sufficient quantity to blow up the whole mould many times over, but for the venting. The necessity for many vents is forced by the fact that the retention of gas sometimes causes minute blow holes which render the whole casting useless. For large masses of sand, it is a good plan to ram up a central portion of sand not too near the surface, producing what is termed "lumpy casting." Ashes make a particularly good vent in dry sand cores, allowing the core to yield to the shrinkage of the metal.

It is not necessary to touch the pattern in venting; $\frac{1}{4}$ inch or $\frac{1}{2}$ inch from it (as nearly as practicable to gauge) will be sufficient. The porosity of the sand allows the gas to escape. The closer the sand the more vents will be needed. In bedded-in castings, vents are driven from the bottom, face downward and the surface rubbed over with sand to close the vents. If this is not done, the metal gets into the vents, spoiling the whole casting. The heavier the work the greater may the distance be between the termination of the vents and the surface of the pattern, because the weight of the metal tends to force the gas out. In very thin, light work it is well to bring the vents to the surface.

Lastly, a trowel of ordinary form is necessary for mending, shaping and finishing moulds.

The Elementary Principles of Mechanical Drawing—7.

Conventional Marks.

In order to save time and work on the part of the draftsman, several mechanical conventions have been agreed upon that greatly simplify the work of making and reading mechanical drawings.

To indicate the material of which an object is to be made, the surface is lined in a special way. This device is most commonly employed in sectional views. When an ordinary elevation is

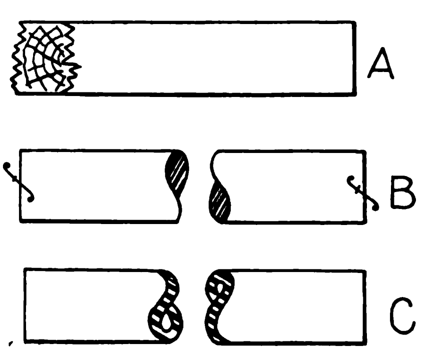

Fig. 2. CONVENTIONAL BREAKS IN DIFFERENT MATERIALS.

presented, the name of the material may be lettered on the surface. Fig. 1 shows the different devices used to represent the more common materials. Still further differences are made for indicating special kinds of wood, but these are not in common use, nor are they necessary except in special drawings.

When any part of an object is not necessary to the drawing, it is shown as if that part were broken away. Breaks of this kind are represented in various ways according to the materials broken. Fig. 2 shows breaks in different materials. At A is a break in wood. At B is a break in a wrought iron solid cylinder. At C is a break in a hollow steel cylinder.

The more lines upon a drawing, the more complicated will it be, hence it is always desirable to reduce the number to a minimum. This may often be done. For instance in drawing gear wheels, only a portion of the circumference need be toothed (Fig. 3). Likewise a carriage wheel need be only partly finished off. In sectioning pulleys or wheels, only the rims and hubs are sectioned, and when a pulley-arm, the spoke of a wheel or other part is drawn, instead of presenting two views, a section of the part may be placed right upon the surface as shown in Fig. 3, where the spoke of the wheel is sectioned. In a machine drawing, an assembled view is generally given, supplemented by drawings of parts. In the case of a part that occurs more than once, as nuts of the same size and shape, only one need be drawn. The draftsman writes—"four of these—machine steel" or whatever the case may be. All these conventions help to make a drawing cleaner and less complicated for the mechanic who is to construct the tool or machine.

Of screw-threads there are two principal kinds: Triangular and square. The ordinary right-hand screw is drawn with the lines that indicate the thread running from left up to right. When the lines slant down towards the right a left-handed screw is the result. Fig. 4 shows the different conventional ways of representing screw-threads. At A is a double V-thread. At B is a single V-thread. The drawing at C shows a double square thread. D shows a single square left-handed thread, and at E is a thread drawn in the conventional way. This way saves much time and trouble, and is neater and clearer on a drawing than when the thread is defined. The end of the short, heavy line marks the depth of the thread. At F is a conventional thread in use when the screw is very small. The dotted line here shows the bottom of the thread.

Colored ink often adds to the clearness of a drawing, for the colored lines stand apart from the black, thus aiding the eye. The color also adds to the appearance of the drawing. But one special point should be borne in mind—that colored lines must *never* be broken.

Finally the "finish" mark is added.

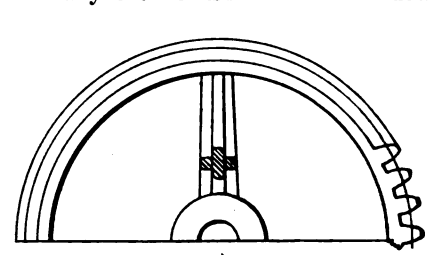

Fig. 3. CONVENTIONAL METHOD OF DRAWING GEAR WHEELS.

This consists of a neat *script* letter *f* placed upon the projection of the surface that is to be machined on lathe or planer, say. An example of this is seen in Fig. 2. The finish marks there, indicate that the bar B is to have the ends

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machined off smooth, and the blacksmith when cutting the bar should make allowance for the stock that would be turned off in the lathe.

(To be continued.)

Oil as Fuel in Axle Manufacture.*

T. C. McNEAL, FOREMAN BLACKSMITH.

As Chairman of the Committee on Oil as Fuel and its Merits Relative to Coal, Gas or Coke, will say that I have never been in a locality where the gas fuel could be employed as a fuel economically over coal or oil as fuel for furnace work. As to the practicability of oil as fuel in furnace work, such as heating scrap for shingling and forging axles, frames and all kinds of engine axles, and forgings for motion work, I am satisfied from the experience I have had with oil fuel that the iron produced is a much cleaner fibre and more pliable after forging than the iron is that is produced from coal burning furnaces, as the sulphur and injurious elements that are in coal are absolutely foreign in the oil, and that, with the increase of material heated in the oil furnace as against the coal furnace, should, in my opinion, recommend it to any progressive foreman in charge of a forging plant.

I wish to call the attention of the members of our Association to one particular defect in the iron axles forged from coal fuel; that is, the seams that are found. In every axle you pick up to forge any work from, you will find more or less seams. This is not to be found in our axles that are forged here with oil fuel. I am now forging all our supply of 30-ton and 40-ton axles from scrap iron, and also heating for all our bolts and forging machines, as well as the bulldozer, with oil fuel.

*Report read at the Buffalo Convention of the N. R. M. B. A.

As our plant here is a new one, I am not prepared to furnish any data as to the cost per pound of forgings as to fuel, but I am of the opinion that it will average a little better than that of my last year's report, made at San Bernardino, California, with the Santa Fe Railway Company.

To make a perfect locomotive and car axle, free from slag and seams, the spring furnaces, as you will note, are constructed with a double retort, and are very nice, pleasant furnaces to work. The bolt heating furnace, you will readily notice, is a very convenient little furnace for light bolt and forging machine work.

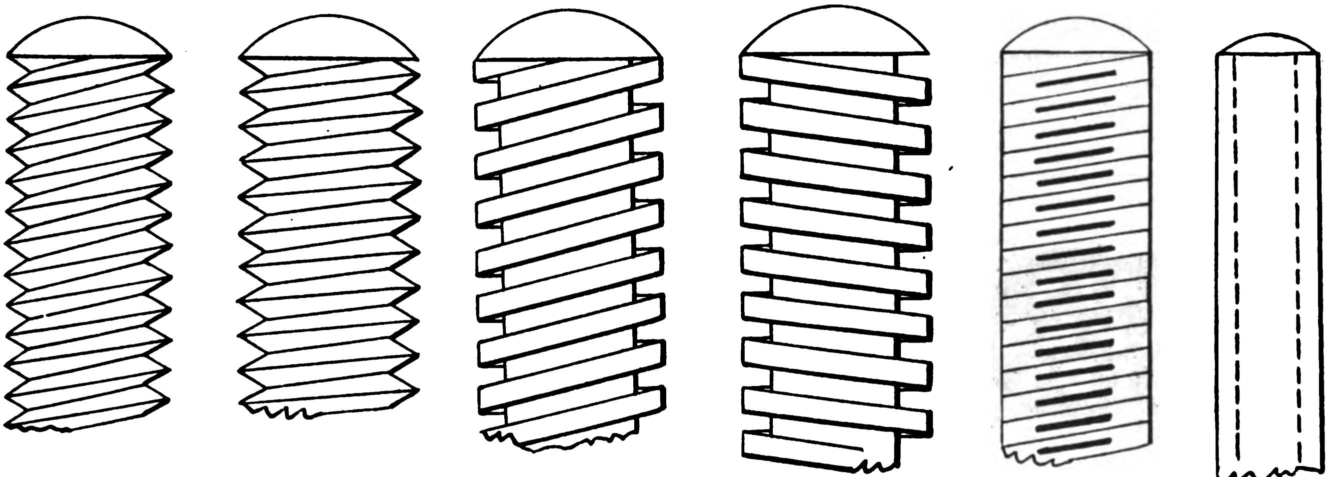
I also furnish print of dies for forging hexagon and square head bolts. These are the pattern of dies employed here in our shops on all our Ajax bolt forging machines, and by which we are able to turn a perfect hexagon or square head in three blows. By the use of these dies we have been able to increase our output over one-third, which means a great saving on cost.

I will be glad to send to any of the members of our Association who are contemplating going into oil burning, a blue print of either of our furnace and burners, on application.

I also send you a print showing the design of our burners for our large furnaces. You will note that the oil flow is central, and the atomizer passes through the outer opening. This is, in my opinion, the best oil-burner I have ever applied on heavy work. I employ steam atomizer on scrap piles, and compressed air on axle piles, as I find that the air will cut the lose scrap where the steam will not. I employ no fan blast whatever, preferring the stack draft altogether.

I wish further to call your attention to the fact that a forging produced from oil fuel will show a slight degree more oxidation than that forged from a coal or gas furnace, and that it is the objective point of many who condemn the oil as fuel and advance the argument that the metal is burned and overheated, etc. I claim that metal that is overheated will not oxidize, as there is no oxygen or hydrogen in the metal after it has been subjected to such treatment, and without those two elements there will not be any oxidation of the material. And I can, as the chairman of this committee, recommend that oil fuel be recommended for all locomotive forgings, as well as for heating small scrap iron, either for rolling or shingling at a hammer.

From an economical point of view, I am inclined to consider oil as having the advantage over coal, when axle welding is to be done. It is very satisfactory in every way. These statememts have come from my own practical observations.



A B C D E F

Fig. 4. DIFFERENT FORMS OF CONVENTIONAL SCREWS.

Prices in the Oil and Gas Belt of Southeastern Kansas.

ED. LANDER.

Horseshoeing, per horse (up to No. 5)	$1.50
Resetting " "	.80
Retoeing, extra " "	.20
Plow sharpening	.25
" pointing	.50
New shares: 12" $3.25, 14" $3.50, 16"	$4.00
Setting buggy tires, per set of 4	2.00
" wagon " "	1.50
" " " bolted, per set of 4	2.00
New buggy tires furnished and put on,	$4.50 to $5.00
Welding shaft iron	.35
" brace on tongue	.40
" spring leaf	1.00
Setting axles	$1.00 to 1.25
New Stubbs, 1" with boxes set	6.50
" " 1⅛" " " "	7.00
" " 1¼" " " "	8.00
Setting boxes by machine, 1, 35c., 4,	1.00
Felloes	.20
Spokes	.15
½-in rim. up to and including 1¼-in.	.50
Cutting down 4 buggy wheels and tires, set	6.00

An Excerpt.

LONGFELLOW.

Oh! if thy fate with anguish fraught,
Should be to wet the dusty soil
With the hot tears and sweat of toil,—
To struggle with imperious thought
Until the overburdened brain,
Weary with labor, faint with pain,
Like a jarred pendulum retain
Only its motion, not its power,—
Remember in that perilous hour,
When most afflicted and oppressed,
From labor there shall come forth rest.

And if a more auspicious fate
On thy advancing steps await,
Still ever let it be thy pride
To linger by the laborer's side;
With words of sympathy or song
To cheer the dreary march along
Of the great army of the poor,
O'er desert sand, o'er dangerous moor.
Nor to thyself the task shall be
Without reward, for thou shalt learn
The wisdom early to discern
True beauty in utility,

As great Pythagoras of yore,
Standing beside the blacksmith's door
And hearing the hammers as they smote
The anvils with a different note,
Stole from the varying tones, that hung
Vibrant on every iron tongue,
The secret of the sounding wire,
And formed the seven-chorded lyre.

HEATS SPARKS WELDS

A Merry Christmas once more!

The last month of the old year! Ready to make an energetic start with the new?

Daylight wanes, and keeps waning. Does the amount of work increase in spite of this fact?

Thirteen days before Christmas, December 12th, the prize article contest closes. Ten prizes go to the ten best articles on wagon work.

Tricks in all trades there certainly are, and blacksmithing is no exception. Have you worked out any new ones in the course of your daily routine? Pass them on.

Engines, tire setters, power hammers,—new tools and improved equipments,—these are evidences of progressiveness on the part of the smith installing them. Such are the mechanics who get ahead.

Back numbers of The American Blacksmith are very different from an American blacksmith who is a back number in his craft. The smith who is not a back number should save all his back numbers.

Harness to match is often wanted by the buyer of a wagon or buggy. The man who deals in wagons can often take up this as a side line, always having on hand or within easy reach a little stock in the harness line. A new source of profit.

The old pump is very aptly taken by a contemporary to illustrate the "keep it going" principle as applied to advertising. As long as you keep it going you are in line for results, but leave off and you must begin all over again. Keep at it.

Don't growl over things you cannot help but bear in mind that there's very little a good man cannot help. Put the shop in order, push your business and keep a cheerful heart. It's a good old world to be in after all, and growling wastes time.

Next month, will be announced the result of our prize contest, and the best articles submitted to us will be printed for the benefit of our readers. Are you among the possible winners? Every sender of an article has a chance. It's not too late up to December 12th. Send it in.

Another big issue of The American Blacksmith will be sent out in January—we are preparing one of 50,000 copies that is to be the best we have ever given our readers. Know any friends in the craft who would like a sample copy?—Send us their names and addresses in full.

Appreciation and encouragement go hand in hand. The American Blacksmith does not like to take up the space of readers telling what others think about it, but the many appreciative letters received are "mighty" encouraging, and we sometimes cannot forbear printing one or two.

Afraid of tools—That's what some smiths are. Study your tools and get all the use you can out of them. By an ingenious manipulation of his apparatus a plumber mended a typewriting machine. The ingenious blacksmith can do almost anything if he thoroughly understands his tools and is not afraid to try.

Even at this date of advancement the unfortunate horse is not entirely emancipated from the slavery of the horsecar system. In the State of New York, says a contemporary, 115.17 miles of track for this purpose are still in use. California and Kansas also contain a considerable mileage. This seems almost like a relic of barbarism.

Hickory, that most valuable of woods to the wagon builder is said to be in great danger of extinction. The large demand for this wood in making buggies, and the increasing number of these made, have raised the price 100 per cent., and it is expected that there will be still further advance. Steps are being taken to protect this tree.

The thinking man can often add considerably to his income by making over old vehicles. It often happens that a vehicle in its present shape is useless, but it may be converted into a form that will make it, to all intents and purposes, "as good as new." This offers a good opportunity to the energetic smith who is on the lookout for profitable side-lines.

Tell your neighbors. Most of our readers are always ready to tell others about the value of The American Blacksmith. That is why such clubs of subscribers as the following are daily coming in: John Maguire, Philadelphia, Geo. A. Hartline, Glenville, Ohio, Ed. Boyle, Aurora, Ill., Sam Lewis, Winnipeg, Manitoba, good sized clubs, every one of them.

A new metal called selium, lighter and stronger than aluminum, has been discovered in Germany by Edward Mollard. It costs only one-twelfth as much as aluminum and will be found very suitable for pipes, ship building and railway building. It polishes like nickel and has greater resistance than iron, but not quite so great as steel. One more new thing.

A telephone that writes the message has been invented by E. Earl Gruhn, Dresden, Germany. The instrument is called a telecrirograph. What an advantage it would be not to have to run to the telephone or to have an operator constantly answering its ring! A business man could simply look at his telecrirograph at leisure, and dispose of all messages at once.

Don't go away with the idea that you can get as good results with cheap paints and varnishes as with the best. At the same time it is well to remember that there is a whole lot of art in laying on either paint or varnish to obtain the best results. The condition of the shop, in respect of air, light and cleanliness will tell on the work as will also the skill of the painter. Buy the best materials, have a suitable shop and study methods and results, and success will follow.

Carborundum is one of the very interesting manufactures of the present day. The carborundum in use has a very different appearance from the unprepared substance that comes from the electric furnace. It consists of a porous mass of hexagonal crystals that give off a rainbow of colors in sunlight. Carborundum is made at Niagara Falls, by an application of the electric power of the Falls. It is a compound of silicon and carbon, of extreme hardness, and is widely used as an abrasive or material for grinding wheels and the like.

Bats and owls like the dark, but human beings do not naturally thrive in gloom. There is something peculiarly depressing about ill-lighted quarters, yet the majority of small smith shops are dark and gloomy and entirely unfitted for human occupation. Besides the direct effect of darkness in straining the eyesight there is another important point to be remembered, which is, that sunlight is necessary to health, and no shop that is not thoroughly filled with sunlight (or sunshine, if possible) can be healthful nor conducive to the best work.

A sorry sight is Tom Tardy's shop since its accident. "Ben havin' quite a time here," Tom called out as we passed a few days ago. Then he pointed to a hole in the roof and a charred portion of wall and floor, and continued:

"It made a bad blaze. I was workin' a bit of iron on the anvil, an' the hot splinters was a-flyin', when I see an old customer o' mine what has gone to neighbor Jenkins with his work, an' still owes me money. So I runs out an' we begins to talk.

"I never thought o' the heap o' wood shavin's near to the fire,—you know my work is pretty close together in there, an' the floor around the anvil is jest plain plank. So first thing I knows, up she comes a-smokin' through the roof.

"O, yes," he concluded, "it'll have to be fixed up before the real cold weather sets in."

We suggested his laying a bit of cement floor around the anvil and forge, or making one of coal-dust mixed with sand and gravel and sprinkled every day with water. Thereupon he remarked, "I've heard tell o' them floors, but—well, it's kinda like lockin' the barn-doors after the horse is stolen."

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American Association of Blacksmiths and Horseshoers.

If you desire to help along the movement now under way to secure Lien Laws in the various States for blacksmiths, horseshoers and wagon builders, drop a postal to The American Association, Postoffice Drawer 974, Buffalo, N. Y. The support which will be asked of you is slight, involving no expense, and the benefits at stake are great. Certainly if the blacksmiths of any State desire a Lien Law or any beneficial legislation, it must be they who ask for it from their legislature. The unfailing sympathy and support of the craft is essential to the success of any measures taken to secure the benefits mentioned. The time is fast ripening for action. Are you ready to lend your personal backing to the extent of a small effort? If so communicate with THE AMERICAN ASSOCIATION, under whose guidance the present movement is being put forth.

For the benefit of many late readers, the following brief outline of the nature and purposes of a blacksmith's Lien Law is given: The idea is to secure the passage of a bill through the legislature of each State, or as many as possible, putting a new law on the Statute books, or else amending existing laws relating to liens, so that a blacksmith, horseshoer, or wheelwright can secure the payment of his bills by means of a lien filed upon the horse or vehicle upon which he has worked. We will suppose, for instance, that a smith has shod a horse for a period of six months without receiving any pay. The account may drag along three or five months after that, no attention being paid to frequent statements of the account or requests for settlement. The smith may then file a notice of lien upon the horse, covering his charges for shoeing it, for a year or more back, according to the terms of the law.

If the moral effect of this does not suffice to bring the delinquent to time, he can, by an action under the lien, have any just claim settled, even going so far as to force the sale of the animal to satisfy his claim. Other craftsmen have their lien laws—why not the smith? Laws permitting the horse or vehicle to be held in the shop until payment is made are of little practical value compared to the one outlined above. Your support is desired. Will you give it?

We wish to present to the craft this month one little word for their individual consideration. It is "unity." Are not the interests of neighbor blacksmiths alike, and is not jealousy the greatest stumbling block in his progress towards better things? Unity is a great force. With unity, a band of neighbor blacksmiths can accomplish wonders—without it, little or nothing. Unity is the secret of successful co-operation and organization for the advancement of prices and the betterment of craft conditions. Is there unity in your neighborhood?

We should like to hear from different sections upon this topic. Our plans for the formation of local county associations may be had upon request, and many craftsmen in various States are availing themselves of these plans to secure a better living for themselves.

Now is the time to concentrate your efforts towards organization—now when the new year is opening out before you. Talk the matter over with your neighbors, and see what you can do towards effecting an organization in your locality. Explain to your neighbors the advantages to be derived from unity. A thorough understanding of his own position is all that most smiths need to be convinced of the benefits at stake.

Steel and How to Treat It.—7.

JOSEPH V. WOODWORTH.

The Hardening Heat.

While all mechanics who have worked and tempered steel through any length of time have usually secured good results, the majority experience difficulty in deciding exactly the proper heats for hardening different kinds of steel to be used for different purposes.

First, let it be understood that the effect of heat on steel is to expand it—even or uneven expansion depending upon the care and thoroughness of the heating operation. Thus, if one part of a piece is heated quicker or higher than another the expansion is uneven, and the shape of the part changes to accommodate the local expansion. The consequence is that distortion takes place and remains permanent. In machine parts which have been finished and fitted, or in any part which it is not practicable to grind afterward, the distortion often prevents the use of the piece; especially is this so in intricately-formed tools.

The matter of deciding upon the proper hardening heat for different tempers of steel is a most important one. The ability to do this correctly is one to be prized, and comes through knowledge, observation and experience and, although each temper of steel necessitates a different degree of heat to harden it perfectly, an expert operator strikes it nine times out of ten. However, what of those who are not expert operators? They are the ones I wish to reach.

In the first place there are too many steel workers who consider any steel that will harden as good steel. Some may think that when the steel operated upon is of a uniform grade, the same degree of heat will always bring forth uniform results. But this is a mistake, because steel decarbonizes according to how it is heated and where; a small piece deteriorating by being heated in the open fire, a large piece from "soaking" too long, and a piece often heated for repairing or sharpening suffers in proportion. Hence the hardening and tempering processes of steel must necessarily differ according to the "carbon percentage," of the steel, the nature of it, the amount of uniformity required, and the results which the tools or parts are to accomplish.

The capacity of all steel to cut, punch, withstand pressure and concussion lies principally in its temper, while its durability depends entirely on its quality, and its adaptability to the kind of work for which it is to be used. Thus, to secure the best results from hardened tools steel of the proper grade must be used. In the heating of steel for hardening, the proper heat is generally determined by the eye of the operator. The only other way to ascertain it is by means of a pyrometer. However, even in the use of the pyrometer, skill plays prominent parts, as the size of the article and its carbon percentage have considerable to do in determining the heat that must be given it to harden it properly. The proper hardening of steel is a matter of good judgment combined with experience, not of hard, hide-bound rules! It is not possible to tell in a few words how to determine the correct heat for any given temper, size or grade of steel.

We have now got back to the question, "How shall the steel worker know positively and accurately when his steel has reached the proper heat?" The answer is, "By means of a properly constructed furnace, and a pyrometer with which to measure the temperature." Of course, in all open fire heating the eye of the operator is relied upon to determine the proper heat. But the open fire method is becoming obsolete, and is gradually giving place to the furnace, while the use of the pyrometer is becoming extended, so much so, in fact, that over 800 of the most famous type are in use to-day in the United States alone. This fact alone indicates that

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hardening and tempering have become a science, and that the time is not far distant when experienced operators will be capable of eliminating all risks and losses.

The work of hardening and tempering of tools should be given to one man. The effect of previous annealing on steel that is to be hardened must be understood. The successful hardening of an intricate tool depends upon how the previous annealing was done, and it is that process which removes all strains sustained in rolling, hammering and forging. The manner in which the steel enters the quenching bath will determine whether the tool will come through the process hard, and free from cracks and deformities. Large pieces with deep recesses will have to go into the water with the recessed part first, or vise versa, according to the shape and location of the same; large pieces which are worked out in the center will require a stream of water striking against them. With some grades of steel the best results will be attained by removing them from the bath as soon as they cease verberating, lastly, experience, skill and good, sound, practical judgment are absolutely necessary. I recommend three grades of steel for different purposes: For planer, lathe, slotter, screw cutting tools, and hobs and dies, etc., use the high-grade of "Crucible, or carbon steel," for hammers, chipping chisels, etc., and all tools required to stand shock or concussion use the second grade; while for sets, hot punches, fullers, etc., use the third grade.

Now how are we to get the best results from these different grades of steel, with the different treatments? First—after having selected a good steel for the purpose for which the tool is intended, a good furnace is necessary, and if one is not at hand, a good, clean fire with a deep, well packed fuel body, which will prevent the air blast from striking the steel. We now heat slowly and thoroughly, turning the steel frequently. When the steel is heated no higher than is necessary to get the desired degree of hardness, we remove and quench in the cooling bath. For planer and lathe tools, etc., do not draw the temper after hardening, as a little practice with heating and quenching will teach one how to quench at the proper heat. It would not instruct the novice for me to say "heat to a red, a full red, a cherry red, or a dull red," it would be too indefinite. The man before the furnace or the one behind the anvil *knows what* these heats are; he also knows that the successful toolsmith is an artist, and that any tool from his hands represents a triumph in science and mechanical art. The steel worker whose eye is not trained must harden by science. I will discuss both methods.

Let us say that we have a large die, or punch, to harden, and we are going to do it by sight. After heating the tool until the eye tells us that the proper heat is reached, we carefully remove it and lower it into the quenching bath. We have taken lots of time in the heating of the large tool, probably a couple of hours so as to allow the grain or particles of steel to prepare for the wondrous change that is about to take place. As the tool is gradually lowered into the bath, the water boils with the intense heat. When the water becomes calm, we remove the tool and find it just right. We have done a good job, but can we feel certain that the same method can be relied upon the next time? No! We have been hardening by sight.

Now we will harden scientifically. First we secure a good grade of steel, and gain a knowledge of its contents by experience and testing. Then we secure a good steel heating furnace, that will heat slowly and maintain an even degree of heat; a furnace equipped with a pyrometer to register the degree of heat. We raise and hold the heat at the proper degree until the steel is heated through. Then we immerse the tool in the bath and the job is done. With this last method there is no guess work and no necessity for artistic ability. With the first method the eye may be deceived as to the right heat, but with the latter, natural laws that are absolute, govern the results, and uniform results are guaranteed. With this method of hardening, there is no drawing of temper—none is necessary. This twentieth-century method of steel treatment eliminates all possibilities of error and loss, and guarantees the efficiency of the product.

In my next chapter I will discuss the all too prevalent habit of overheating and uneven heating for hardening, and the effects of the same.

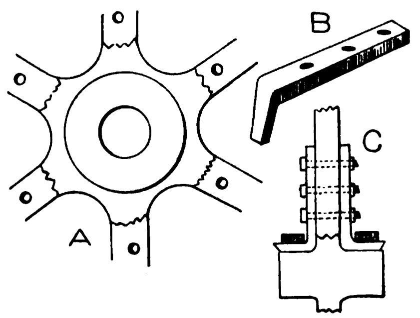
(To be continued.)

Mending a Driving Pulley

F. L. MORGAN.

The accompanying sketch is of a driving pulley from a 40-horsepower engine broken last winter, and the following is the way I patched it.

All the spokes broke at the hub, as shown at A. I made two pieces, as shown at B, and bolted them on the foot, ran out over the hub and ⅛ off, as shown at C. When I got them all on, I made two rings, 1½ inches square, (seen in section at C,) drove on hot, and let them shrink on the feet and drew the spokes down tight. This engine has run away twice since and never broke, so the job was a good, strong one.



INGENIOUS PROCESS OF MENDING A BROKEN ENGINE PULLEY.

A Few Good Shoeing Shop Suggestions.

A. M. MEISNER.

A few rules for shoeing that have been drawn from daily experience and observation in my shop may be of interest to the craft.

First: Save the heel as much as possible.

Second: Save all the frog.

Third: Cut nothing except what is loose on the sole of the foot.

Fourth: Do not cut out the braces.

Fifth: Beware of opening the heels.

Sixth: Fit the shoe level all round the foot, and be sure that the bearing is on the heels and not on the quarters.

I do not believe in cutting out extremely for toe clips—not more than the thickness of a thin clip on a healthy foot. In some cases I cut nothing at all. Often I have been compelled to let the shoe project a quarter of an inch over the toe. The shoes must be fitted full to the foot for the purpose of saving the wall, as that is the strongest part of the foot and should not be chopped or rasped off.

I also find that most of the ordinary shoes are not properly punched. The nail holes are too near the outer edge. When such a shoe is put on the foot and the outside of the hoof rasped off even with the shoe there is but little left, and will break out sooner or later. By punching the holes properly, the nails do not have to be driven so high, and the foot outside will remain solid.

We all know that the colt was born with level feet without calks and heels, and in my estimation they should be kept that way as nearly as possible.

A horse with level bearing shoes will

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not be subject to corns or difficulties, and his feet will remain in good condition for service. Contracted feet, I believe, are caused by high heels and calks with poor fitting. Sometimes the shoes are extremely concave, clear out to the end of the heel. At other times the bearing

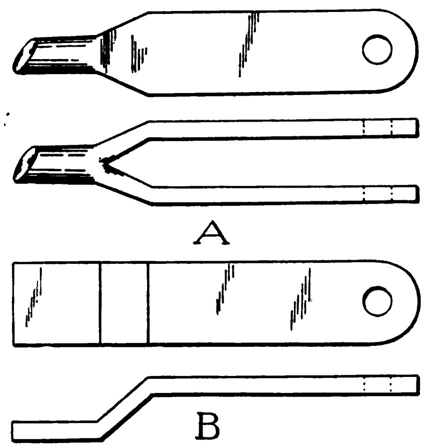

Fig. 54. MAKING A BRAKE-ROD JAW FOR LIGHT LOCOMOTIVES.

is on the quarters instead of on the heels which will naturally help to contract the feet. This can be overcome by properly made and fitted bar-shoes. It can also be done with plain, open shoes without heels and calks by having the heel ends about 1½ inch in length, concaved towards the outside. Fit the shoe so that the heel ends come close up to the frog, but the feet must be kept soft to reach these results.

It can also be done by applying three-quarter light slippers on the toes; and allowing the horse to walk on the frog is also a good remedy.

If any of my rules or suggestions should be found of benefit to any of THE AMERICAN BLACKSMITH readers, I shall be glad to feel that I have done something for man's best friend—the horse.

The Country Smith.

BY EXPERIENCE.

Times are constantly changing and with them the country blacksmith is whirled along, or if he refuses to move, is left behind. The old way of having a small shop located at some cross road for the convenience of a few farmers is a thing of the past, and the shops are now clustered in the confines of a thriving village, where the farmers go to mill, to the stores, or to market, and where there is good hotel accommodation for themselves as well as their horses. While they are getting their wants attended to, they take their horses to the blacksmith to be shod, as well as some other things that need repairing, and in this way several blacksmith shops are kept busy in the same neighborhood.

Now it is a question between the disciples of Vulcan which is getting the most patronage. One may have the lead in horseshoeing, another in building and repairing vehicles, while the third will excel in the repairing of machinery, etc. At the present time the farmer is very particular to have whatever work he entrusts to any one of the above mechanics done in a neat and workmanlike manner and for that reason, more care should be exercised by the craft in finishing their work. No matter how well a horse is shod, if the foot is not neatly dressed and polished, the farmer will not be pleased with the shoer. The same is true of the repairer of vehicles. If his work is not neatly done, no matter how good it may otherwise be, it will not satisfy, and he will soon be known as a rough mechanic. Also a man who has taken the repairing of machinery as his chief calling—whatever he undertakes to do must look well when finished.

This being the case, it devolves upon the craft to cater to that taste of the customer, and when one has once acquired the habit of making his work look neat, it won't take him any longer to do it than it would to do it in a rough manner, and he, himself, will take more pride in his work and gain a reputation that will enable him to get better prices for the work. Say for instance, a part of the castings of a farming implement has broken. It can be mended and made to stand the strain as good as new, but it must be done without looking clumsy, or disfiguring the implement if the customer is to be pleased enough to stand the price asked without grumbling. It is therefore necessary that first he learn what is wanted by the customer, and next, the way in which the work can be done to be a success. In that, the suggestions of the customer may often prove of much value. It is also necessary to have the tools and materials at hand to carry out whatever plan is adopted, and, lastly, to do it in a neat, as well as substantial manner.

A free use of rasps, files, sandpaper and a little paint will go a long way to make work look pleasing not only to the customer, but also to the mechanic himself. Therefore, no matter what kind of work you are doing, finish it neatly and it will soon establish for you a reputation that defies competition, and you will always be fully engaged.

The blacksmith who intends to make a success of his trade will do well to pay attention to these seemingly unimportant points. To the business-like man, pleasing a customer becomes a matter of policy. A neat job is sure to bring more trade, while a careless one drives people elsewhere.

The Railroad Blacksmith Shop.—14.

W. B. REID.

Tools in the Blacksmith Shop.

The accompanying illustrations show some of the tools that may be made to simplify work in the forge shop. Fig. 54, A, shows an ordinary brake-rod jaw used on light locomotives, freight cars, etc. Making these in quantities, the tool in Fig. 55, A and B, will prove a great help and time-saver. It is made of mild steel with planed, hardened cutting surfaces. The drawing will make its construction clear.

The cutting and forming plates Fig. 55, A and B, are rivetted in place. This simplifies construction and answers the purpose as well as if made in the solid. This tool shears the ends round, puts in offset and, if desired, punches holes in pieces used in making the jaws, in one heat. The iron used is 2½" x ½, ⅝" or ¾". Cut in lengths of 11 inches, the pieces are laid along the recess in the tool, extending slightly beyond the round end. The plate shown at A, Fig. 55, is then adjusted upon the top of the die at B, Fig. 55. A light blow of the hammer shears the ends.

Removing the cutting, a second blow of the hammer drives the piece down

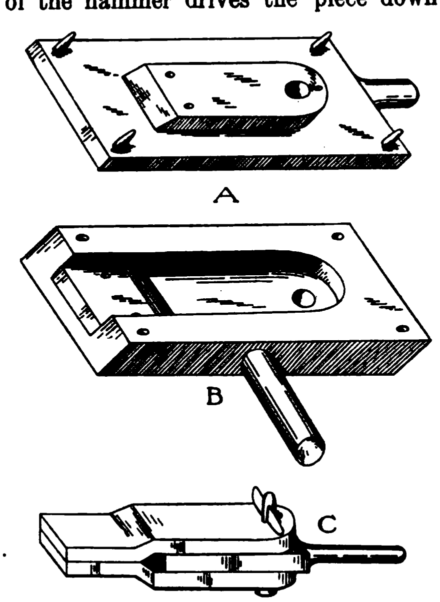

Fig. 55. TOOLS FOR SIMPLIFYING CONSTRUCTION OF BRAKE-ROD JAWS.

into the recess of the tool, forming the offset. The punch is then inserted and driven through, completing the pieces with uniform accuracy for welding as shown in Fig. 54, at B. In welding the jaws, light flat mandrels, used as shown at C, Fig. 55, keep the holes true and make easy handling of the piece.

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The dowell pins in this and the other tools here described are somewhat longer than usual, to overcome the thickness of rivetted cutting plates. Kept well oiled,

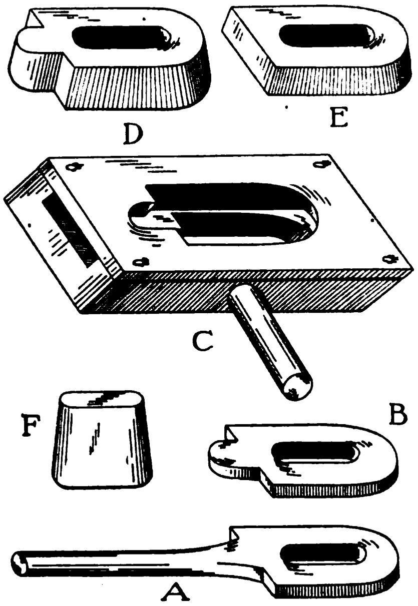

Fig. 56. PUNCHING PLATES USED IN MAKING CAR DOOR STOPS. A. B.—FINISHING UP THE PIECE.

however, and handled properly, the tools work smoothly and will last indefinitely.

An occasional order of several hundred car door stops, (Fig, 56, A), is easily and cheaply overcome by means of the punching tool shown in Fig. 56, C. The drawing will give a clear idea of its construction. The cutting parts are made of old steel axles. The guide plate, it will be noticed, is rivetted permanently to cutting die. The iron $2\frac{1}{2}''$ x $\frac{1}{2}''$ is slipped in from the end, beneath the guide plate. The punch (see D, Fig. 56), is then driven through, driving the stamped piece down upon the washer at E. This washer fits into the bottom of the tool to form the shear for the thin, oblong punch at F, for which the hole in the punch at D forms the guide. The pieces then drop out from the bottom having been thus stamped out, as shown at B, clean cut and uniform. The welding of 7 inches of $\frac{1}{2}$-inch rod upon the end completes the job. The forging might be stamped out with sufficient stock on the end to draw out the stem full length. It is better and quicker to weld. This can be done at the anvil, removing the pressure at the hammer, a point of some importance in shops where hammers are limited in number and capacity.

Fig. 57, at A, B, and C, shows tools for making knuckle joint pin nuts as at D. Method: A piece of mild steel is drawn out to hexagon shape to fit in the hole of the die C. This is cut into short lengths with sufficient stock projecting above the surface of the die to form the collar. A few blows of the hammer will suffice for this. The piece is then reheated and placed in the tool at A, Fig. 57, the hexagonal hole of which catches the point of the nut and keeps the collar central with the cutting radius of the tool. The cutting plate at B, is then adjusted upon the top, shearing the collar neatly and accurately with a few blows of the hammer. The holes in the center of the nut are more properly machined, but, if desired, they can be punched in the tool by having a hole through the centre of the cutting plate (B, Fig. 57,) and a small washer, with similiar hole, to fit in the bottom of the tool A, and a round punch to suit.

Having to shear mild steel, this and the next tool described could with advantage have cast steel cutting surfaces. But when well hardened with potash and kept cool when in use, mild steel will be found to give good service.

Fig. 58, A, B, and D, shows the parts of the tool for cutting out cross-head pin nuts and crank pin nuts. These nuts are made of mild steel. In tools of this kind the guide plates are generally rivetted to die as in Figs. 56 and 59. When so made they can only be used for stamping out the nuts. As arranged in Fig. 58, B, the guide plate is removable, allowing the tool to be used for punching a hole in a closed hexagonal wrench, occasionally required (Fig. 58, C).

The dowell pins, as shown in Fig. 58, B, are turned with small collars upon them, which keep the guide plate at suitable distance apart from the die, and hold the wrench C in proper position while being punched. If necessary, the holes in the centre of these nuts can be punched by the same means described in Fig. 57.

Fig. 59, A and B, is a tool of similar design to that shown in Fig. 55, for shearing the ends and punching the key holes in spring hangers. Fig. 59, C, shows a tool for the same purpose of a more complicated kind which we have seen used. The first answers the purpose equally well and is more easily made.

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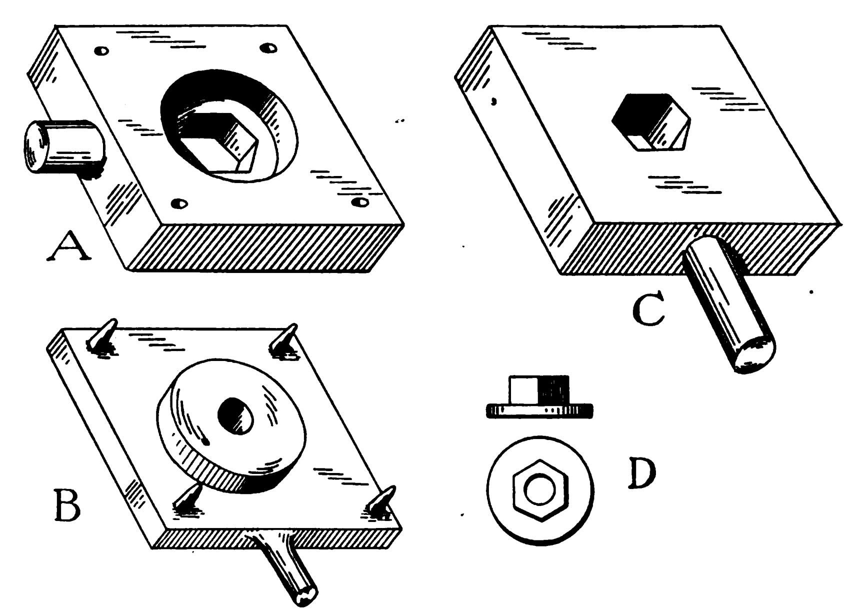

Fig. 57. TOOLS FOR MAKING KNUCKLE JOINT PIN NUTS. D.—THE FINISHED NUT.

A Property of Radium.

Much is being said just now about the wonderful new material, radium. A surprising fact in connection with this material is that its property of giving off heat is augmented by subjecting it to low temperatures. At the temperature necessary to liquify hydrogen gas (and this is the lowest yet attained by scientists) the heat given off from radium, instead of being diminished is increased. This is directly opposed to the effect produced by low temperature upon ordinary chemical action.

Neatness vs. Roughness.

BY PLAIN TALK.

There is a very great difference which I have often observed in blacksmiths, which is merely a habit, but which is of much importance to the repairman, and that is, the rough or smooth appearance of a completed job. Now it is natural and pleasing that in anything we buy we like it neat, and manufactures of all kinds will be slow in selling if not neatly finished or at least neatly and attractively done up in some casing. Why is that so? Because if not done up or finished, it fails to please the eye and an inferior article often finds more customers than one of better merit, simply because it looks well. Now with that fact in mind, I would say a few words to those who, like myself, have various jobs to do, and for which we would like to have a fair remuneration for doing, but are afraid that the customer will think the price too high. Now that customer will cheerfully pay for the job if he is pleased, not alone because it is a good strong job, but more so because it is neatly done and he will not hesitate to say so. Now, what I am particularly referring to is forging. There are some smiths who will turn out a forged piece of work that resembles the cinders on his forge very much, and although it looks strong, it is extremely rough and looks anything but pleasing to the eye, a fact that the customer will notice at once and go away with it in full belief that it is burned. Now that man would be delighted if the smith had only exerted a few extra blows in smoothing and finishing that job and he himself as well as the customer would be better satisfied. The smith who does not smooth his work either with hammer, file, or otherwise will soon establish for himself the name of a rough workman, and very few men will care to entrust any work to his charge that is of any value. Now why cannot the work be done so that it is more pleasing? Is it because it takes up more time? I say no, for it's as I said before, only a habit, and where that habit is of long standing it is difficult to change. But it can be done by a little perseverance and it will then take no longer to do work neatly than rough and will be more satisfactory to both the smith and the customer, and the latter will be much less likely to grumble at the price. A little care in forging, a little filing, and a little paint, will go a long way to please. Therefore let me advise the young beginner to finish all his work so that it pleases himself and when he has once got into that habit, he cannot quit a piece of work until it also looks well in his eyes and make this his maxim, that whatever is worth doing is worth doing well, and I might add, doing neatly.

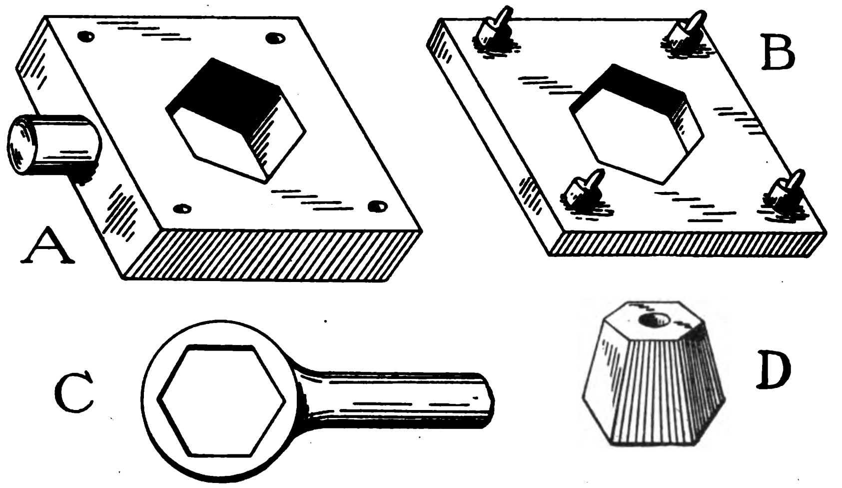

Fig. 58. PARTS OF TOOL USED IN CUTTING OUT CROSSHEAD PIN NUTS AND CRANK PIN NUTS. C.—PUNCHING A HOLE IN A CLOSED HEXAGONAL WRENCH.

A Very Interesting Bit of Shop Talk.

J. W. LARSEN.

I am glad to see that there is more interest taken in the blacksmith's art every year. When I started to learn the trade I never heard of such a thing as a journal devoted to the trade, and very seldom could I get an article of experience from any paper.

I learned my trade in Chicago, and when I had served my time, I thought I "knew it all," as the saying goes. There had been rules laid down for me for everything, and I was told that was the only way to do it. When I started out to earn my living I kept true to the old methods, but that was where I was wrong. That is why the blacksmith's art—the oldest art in existence—has almost been pushed to the wall by the other arts that have sprung from it.

The art of horseshoeing was known among the Arabs as early as the time of Mohammed, so history tells us. By tracing it carefully you can follow it from generation to generation, but we have been letting parts of it slip away from us from time to time.

In ancient times, whenever you wanted a sword, a scythe, or an ax, you went to the blacksmith for it, but to-day we are left to repair the work of the arts that have sprung from us. Now-a-days, most of our material comes ready-made from the mills—shaftings and bars instead of being hammered out and finished in swedges are rolled and then turned over to the machinist to turn on a lathe or square on a planer.

The machinist to-day is a very good mechanic. He can turn out a fine piece of work, but, if in turning the shafting should he find a flaw, can he repair it? No. What does he do but send it to the blacksmith and have it welded. He does not think it much of a trick, but if every blacksmith should take a lay-off for a year, where would all our great industries be? What would our railroads, manufacturing plants or mines do? If they could not get their picks sharpened and rods welded, they could not run a day.

It is true, a blacksmith does not have the chance to learn easily as other classes of mechanics, for where is the man that can lay down a rule for welding? The principal part of the work, the color or heat of iron or steel depends upon the kind or quality, if it is high in carbon or no carbon, and it also depends upon your fire and the kind of coal you use. But let a blacksmith learn by actual experience what heat iron and steel will stand. If he is a mechanic and has a good brain, he can learn the construction of any kind of a machine or vehicle by rules and explanation of others, and the trade journals of to-day can teach such men more than they could ever learn in any one shop in the United States.

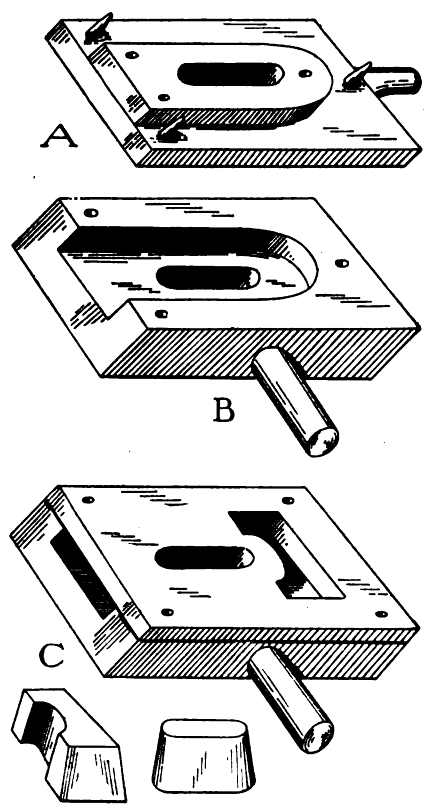

Fig. 59. TOOLS FOR SHEARING THE ENDS AND PUNCHING KEYHOLES IN SPRING HANGERS.

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What we want now is to educate ourselves up to what we have lost by giving our brother smiths the advantage of our experience and for him to do the same, for there is never a shop I have gone into but that I have found some handier if not a better way of doing things than my own.

It is evident that we must have power in our shop or we will soon lose tire-setting. The machine shop can put in a cold tire-setting machine and set tires cheaper and better than we can by the old way of cutting and welding or even by heating and upsetting. They can give the exact amount of dish, while it is almost impossible for us to get it to a sixteenth of an inch, and if we want to compete with them we must wake up.

As the making of tools has been taken away from us by the process of casting steel, it remains for us to improve our methods to keep up with the times or else we will soon be looked upon as tinkerers, and finally be lost sight of.

I like to see the laws they are passing in some States requiring a man to stand an examination before he can shoe horses. They should go a little further

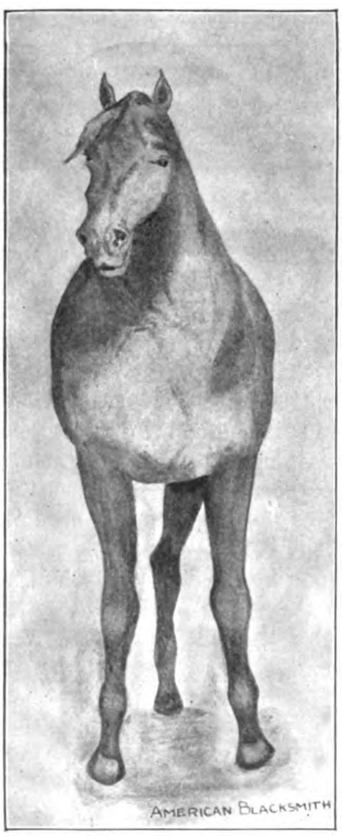

Fig. 1. BROAD CHESTED ANIMAL, SHOWING THE BASE-WIDE POSITION.

and require a man to stand an examination for his ability in welding. Many accidents can be traced to a poor weld which is the cause of death or crippling of human beings or animals.

I have been in shops in the Northwest, where men were doing a big business, probably three fires and four or five helpers, and they did not have a labor-saving tool in the shop. They were in such a hurry to get a thing done that they did not have time to take a good look at it when it was finished, to see if it was perfectly welded.

Much poor work was turned out there, but the people seemed to expect to have to come back to the shop with a plow that would not work or a shaft iron that did not stick, and when it broke, it probably upset the buggy or caused a runaway.

There must be more care taken in our work and we must learn better methods and the only way for us to do it is through the columns of the trade journal.

The Practical Scientific Treatment of Interfering Horses.—1.

S. W. PERRIN.

General Principles.

There has been so much written about interfering, that to the casual observer it would seem like threshing old straw to write more on this much-hackneyed phase of the subject. However, this is one branch that is never exhausted. It is a topic always new, because it presents itself to the horseshoer in his every day practice in a thousand different forms. It is a subject never absolutely mastered because new cases present individual peculiarities which often have the shoer at his wits end. Hence, we often meet men who have spent their lives at the anvil, and who have stopped numerous horses from interfering in their day, yet they occasionally meet with cases which baffle all attempts to rectify the trouble, and the truth of this is amply proven by the numerous inquiries to this Journal as to the proper way to shoe interfering horses. Hence another series of articles on the subject of interfering will doubtless be of interest to the numerous readers of THE AMERICAN BLACKSMITH. Interfering embraces any and all irregularities of gait or action which result in the striking of one limb with the opposite foot, or the striking of the front legs or feet with the hind feet, or vice versa. But as the different forms of interfering require different treatment, the subject will be dealt with in a series of nine articles as follows:—knee knocking; shin hitting; ankle or fetlock striking, front; fetlock striking hind; cross firing; forging; over-reaching; speedy cutting and scalping.

Knee Knocking.

Knee knocking, as its name implies, consists in the animal's striking one knee or both with the opposite foot. Usually only the foot is affected and often the pain caused by the blow is so acute as to cause the animal to fall.

Fig. 2. A NARROW-CHESTED HORSE IN THE BASE-NARROW POSITION.

Cause:—The cause of knee knocking is invariably defective conformation of the limbs, unbalanced feet, or both. The knee knocker is usually a high actor, (high stepper), he may be broad chested and "toe wide" with legs wide apart (Fig. No. 1), or narrow chested with legs close together (Fig. No. 2). With this class of horses if the feet are large and the action high, the feet must pass dangerously close to the opposite leg, in which case indifferent shoeing, or even careless driving would make such an animal into a knee knocker. Your patient may have one leg twisted from the elbow down, or from the knee (a twisted cannon). Sometimes one pastern only is twisted in or out, occasionally one leg is calf kneed, while its fellow is toe wide; these defects in conformation of the limbs cause irregularities in their gait and action—sometimes a mechanical impediment to the true and clear movements of the limbs. To balance action, then how to shoe for knee knocking will depend upon the cause, and this is wherein the difficulty lies, for remember it does not take a limb that is a foot out of plumb to make a horse interfere. These defects in conformation of which I speak may be very slight and yet sufficient to cause interfering.

To the causual observer all horses' legs look alike; it takes a keen, accurate observer with a true eye to detect defective conformation, but if the horse interferes, the defect, be it ever so small, is there, for the horse of perfect conformation does not interfere unless he is out of condition, carelessly driven or ridden, or badly shod. Hence the first thing to do is to endeavor to ascertain

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the cause. With this object in view, get all the information you can as to the history of the case from the owner or driver, and a reply to the following questions will materially assist the shoer in ascertaining the cause: One. How long have you known the horse? Two. Is he in the habit of interfering or is this the first time you have known him to interfere? Three. Is he a green colt or a matured horse? Four. Is he accustomed to the work for which he is now being used? Five. Did he go clear before he was last shod? Six. Is he thin and poor or in good working condition? The object of these questions is: Question No. 1,—If a man has only just purchased a horse that interferes he may not be able to give you any information of any value. Question No. 2,—If the horse is in the habit of interfering, you may look for defective conformation of the limbs. Question No. 3,—If he is a green colt and apparently properly shod, then don't experiment with his feet, unless you are certain of the cause, for many a green colt will interfere anyway, until he settles down to his work and learns how to handle himself; in this case protect the part struck with a properly fitting boot until the animal is thoroughly broken in—trained to his job,—then if he still strikes the boot it is time enough to look to the shoeing. Question No. 4,—If a horse travels close—is prone to interfere—it takes but little to make him strike; some horses that go clear single, will interfere when hitched double, especially if not properly mated; some horses not used to saddle work will interfere when ridden, and vice versa. Question No. 5,—If the horse travelled clear before the last shoeing, it is very probable that the shoeing is the cause—that the work was not properly done at that shoeing. However, this is not always the case. Question No. 6—If a horse that is prone to interfere, be thin and poor—in which condition he is not fit for work—there is but little hope of preventing the trouble until the animal is in proper working condition. Again some people try to make one horse do the work of two. In such cases many a horse interferes as a result of leg weariness; all horse shoers have observed that many horses interfere in the hot weather that go clear in winter.

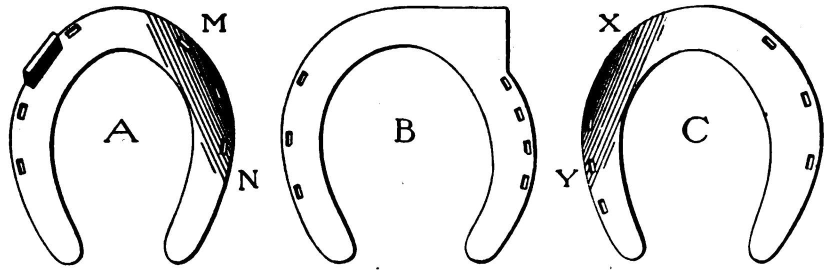

Fig. 4. GOOD FORMS OF SHOES FOR DIFFERENT CASES OF INTERFERING.

So let it be understood that all these points must be taken into consideration in order that you may arrive at correct conclusions, for the main point is to discover the cause, the application of the remedy is merely a question of mechanical skill. And these inquiries will hold good in the discovery of causes in all the subsequent articles of this series. Then having made up your mind as to the cause of the trouble, and assuming the cause to be defective conformation of the limbs, one leg or both, then that defect must be carefully studied, and here a careful study of nature's plan is a sure guide, for although nature makes a crooked limb, a twisted bone, or joint, she makes the foot in conformity with the limb. But some unscientific horse shoers try to make a straight foot work in unison with a crooked limb.

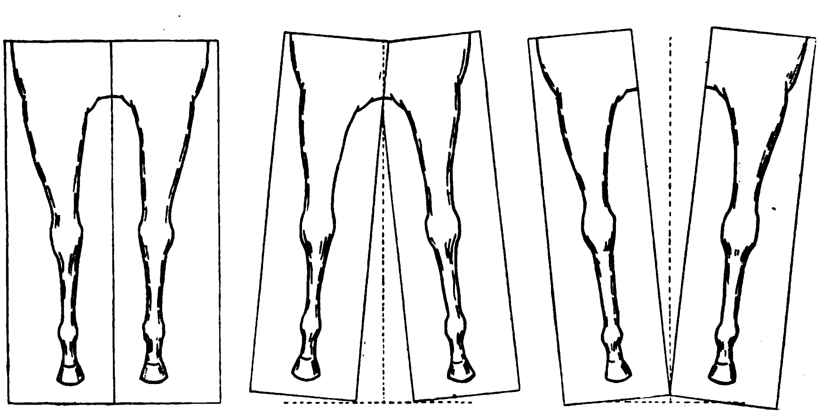
Fig. 3. PRACTICAL ILLUSTRATION OF DIFFERENT POSITIONS OF THE FORE FEET OF A HORSE.
NORMAL POSITION. BASE-WIDE POSITION. BASE-NARROW POSITION.

To illustrate what I mean, I will introduce to your notice the following diagram:—Take two 9-inch envelopes and draw on them a rough outline of two forelegs, then stand them on end, (Fig. 3), thus illustrating the normal position of the fore-legs, now tilt the envelopes towards each other at the top, showing the base-wide position (Fig. 3), and you'll see at once that to level these feet, you must lower the inside or raise the outside of the foot; now tilt the envelope outwards at the top, showing the base-narrow position (Fig. 3), and you see at once that in order to level these feet, the inside must be raised or the outsides lowered. In other words the hoofs are level only when pared in conformity with the limb to which they belong. Then the matter of first importance is to level the feet; if the animal strikes the knee, the leg with which he strikes will probably toe out, while its fellow may be normal, in which case only one foot will need treatment; all knee knockers should be shod as light as is compatible with the work for which they are used. On the foot with which he strikes, use the shoe shown in Fig. 4, at A, with the outside quarter rolled. If the foot with which he strikes is base-wide or calf kneed, then leave the inside of the foot low and use the shoe shown at B, Fig. 4. If your horse has both legs toe wide and strikes both knees, then use an inside weight with the outside toe rolled as at C, Fig. 4. The Charlier system of shoeing is excellent for some knee knockers whose feet are strong enough to stand close contact with the ground. All such cases should be protected with a properly fitting boot until you are sure that the trouble is remedied.

The individual horse to be shod must always be studied, for what answers as a good remedy in one case, may only make matters worse in another. Where the fault has become chronic, great perseverance will be necessary to render even the best shoeing-principles effective. Thus it is better that the same farrier should shoe a horse rather than that different horseshoers should work on him. The owner of the horse should be made to appreciate this fact.

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QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

Corns and Their Treatment.—I should like to hear from some one as to what he consider the best treatment for corns on the horse's foot. J. S. JENNINGS.

A Good Word.–Locality Enquiry.—I like THE AMERICAN BLACKSMITH very much and should like to see it prosper.

Does anybody know of any good shop location in Illinois, Missouri or Iowa, back from the river bottoms? I should like to make a change from present location on that account. F. L. MORGAN.

A Few Questions on Steel.—I should like to have some one answer the following questions: What steel is most suitable for rivet snaps or cups as used with pneumatic hammers or boiler work, say ¾-inch rivets? Is there any special method of tempering these tools? JAS. BATTLEY.

Rubber Stamps.—Names and addresses written hurriedly on letters are in most cases not nearly so legible as they should be, so that a rubber stamp is a great aid towards a clear, readable signature at all times. The man who runs a shop finds much use for something of this kind.

Why Is It?—I have a question I should like answered. I use a lead pot to harden in, a piece of 4-inch gas pipe plugged at one end, and lay it on the fire at an angle of 45 degrees. When work is dipped in the bath it seems to have a thin skin on the outside and will not harden. It is not the fault of the steel, because the same piece will harden all right in the open fire. Why is it? J. F.

Hack Saws.—I will give a pointer on how to use a hack saw. A great many smiths take a saw and saw until the same heats, and thus ruin it in a few minutes. If they would but dip their fingers in the water and rub on the saw blade every little while, they would find that it will last three times as long, and will cut three times faster. Try it. H. STADE.

Is This Correct?—One of the largest industrial shops of Harrisburg, Pa., writes regarding blacksmithing papers, "We agree with you that it is a good thing for the men to read mechanical papers. In our machine shop and foundry they appreciate such things very much, but it is hard to get the blacksmiths interested." Is this a correct statement, and are blacksmiths less interested in literature pertaining to their craft than machinists, molders, and other mechanics? We do not believe this to be so, and should like to hear from any of our readers on this topic. [EDITOR.]

An Interesting Letter from Canada. I should like to see in your valuable paper a series of articles on the management and running of gasoline engines, or could you refer to any publication on the subject?

I think your paper a very estimable friend, coming every month with new ideas, points and latest methods in vogue, which should be of great interest to all good working smiths. And certainly it gives the vim and relish to our work, by bringing us in touch with what others are doing, thus to bring our work to the best standard possible. Wishing your paper success in every particular, I am, E. J. COVINGTON.

Case Hardening Links.—In answer to the question of Mr. Frost relative to case-hardened motion links convexing, I will say I have had no experience with links convexing across the face. We have in the machine shop five sets of new links with faces three inches in width, just case-hardened for five new engines we are building. I have tried straight edge across the face of all of them, and they are as true as when machined. I am at a loss to know the cause or remedy for such trouble. Am pleased, however, to know Mr. Frost is looking the matter up. We often hear of "cause and effect" and when the effect alone is in evidence we should try to determine the cause A. W. McCASLIN.

A Hardening Query From England.—Will some one tell me the proper way to harden punches and shear blades? I have a punching and shearing machine combined and I have trouble in getting the small punches to stand. They start bending where they are turned down, just above the point and sometimes they break off. The shear blades chip on the cutting edge, and as I use it a great deal on wrought iron, I should like to remedy this. Also, should the punches be kept square on the end? I cannot imagine a smith being without your paper, which is both instructive and interesting. I find it a great help to me in my work. W. J. HOLDEN.

From Texas.—I enclose money to pay for my renewal subscription, together with a new subscription for a neighbor. I shall try to get others in the business to subscribe. I have come across several mechanics who pride themselves on having mastered their trade, and who will not therefore give books and papers on their trade notice sufficient to appreciate their advantages.

The American Blacksmith has been of great help to me, by increasing my skill as well as by its advertisements of material and new tools. I got a car load of the New Etna blacksmith coal that you recommended me and will say that it is the best of blacksmithing coal I have ever tried and cannot be beaten. A. E. HEISTER,

A Chatty Letter.—I am very much pleased with my paper. It can't be beaten. It is the only paper that I have seen that is worth anything to me. I wouldn't be without it for any money. I am doing all I can to induce my neighbor smiths to take it.

I saw in your October number a way to remove old spokes. I have a way which I think is better than that I take a ring about three inches in diameter, put it on the spoke and make a wedge, driving it through the ring on top of the spoke with a hammer. It never fails to pull and does'nt injure it at all. If a new spoke is driven and doesn't suit you, it can be pulled out by this method O. K. C. E. MARKES.

An Interesting Letter.—Enclosed find money order to pay our subscription up to February, '05, We are very grateful to you for sending us your valuable paper which we feel that we cannot do well without.

On July 15th last we bought of the Witte Iron Works Company of Kansas City, Mo., one of their three-horsepower gasoline engines, and with it we operate a 10 by 40-inch screw-cutting engine lathe, a 26-inch Silver band saw, 14 by 1½ emery wheel and buffer, rip saw, cut-off saw, 14-inch drill, and intend to place in our shop a trip hammer, as we find we have power to spare. The consumption of gasoline is but a trifle. We wish to say that no shop is complete without an engine and would cheerfully recommend the Witte to any contemplative purchaser. OBERG BROTHERS.

A Few Questions.—I am very anxious to secure a book giving designs for scrolls and bent ornamental iron works, and if any brother can tell me of such a book, I should like to hear from him through THE AMERICAN BLACKSMITH.

I should also like to ask the question of how coal is washed.

I also desire to have Mr. Swartz explain how he makes the drilling jars as mentioned in the October issue. H. W. POPE.

In Reply.—There is a book published by W. T. Comstock, of 23 Warren street, New York City, that has a large number of fine plates of different designs, both in ancient and modern wrought iron work—title "Architectural Wrought Iron," price $2.00. It is very hard to get books of this kind, but this one is good. J. GOOGERTY.

In Reply.—For Modern Iron Work. "Schmiedearbeiten aus den besten Werkstætten der Gegenwart" published by Ernst Wasmuth, Berlin, 1893.

For Renaissance. "Wiener Schmiedewerk des XVII. und XVIII. Jahrhunderts" by Dr. Albert Ilg and Dr. Heinrich Kabdebo, Dresden, 1883.

For History. "Monographien des Kunstgewerbes—Adolf Bruning—Die Schmiedekunst," published by Herman Seeman, Leipzig.

These books can be procured from Mr. Bruno Hessling, 64 East 12th Street, New York City. RICHEY, BROWNE & DONALD.

In Answer.—I give below in the order of my preference the names of three good collections of plates of German work.

Die Kunstschlosserei des XVI, XVII und XVIII Jahrhunderts by Konradin Walther. Published by Konrad Wittwer, Stuttgart.

Die Kunstschlosser by Ferdinand Moser, Berlin.

Moderne Kunstschmiedearbeiten—Erste Serie by Franz Brechenmacher.

Published by Ch. Clacsen & Co., Berlin.

A good little handbook of moderate price is "A Handbook of Art Smithing" by Franz S. Meyer, English Edition. All of these books and many more can be obtained from Bruno Hessling, No. 64 East 12th Street, New York City. I hope that this may prove of service. WM. C. STIMPSON.

In Reply.—The method of making drilling jars will be described and illustrated in the January issue of THE AMERICAN BLACKSMITH. [EDITOR.]

A Good Hoof Parer.—In answer to the question of O. W. Dilts, in regard to buying the best tool for paring the hoofs of horses, I would say, this is a very important question. I think I am very ably prepared to answer this question, as I have used almost everything in the way of tools for dressing hoofs. There is one tool which I think far in the lead today of all others, and that is the Giant Hoof Parer, No. 52, manufactured by the Champion Tool Co., Ltd., Conneaut Lake, Pa. It is a new invention, but I recommend it to my brother smiths, R. S. Mercur, Centralia, Pa., division superintendent of the Lehigh Valley Coal Co., has supplied a dozen tools or more in his collieries and also recommends the "Giant."

I find THE AMERICAN BLACKSMITH a very interesting and valuable paper for blacksmiths. MATTHEW DAPP.

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An Old Texas Shop.—Please find enclosed $1.00 for my subscription to your monthly paper. I have had my shop "struck," and will send it to you just as soon as it is finished. The shop that I am working in was built in the year 1852. It is three sides brick and one side plank It was built by James Ramsey, the oldest settler in Gonzales, and also a first-class blacksmith. He lived to be 98 years old, was raised in a shop and raised to work, and learned his trade perfectly before he died. He died five years ago, leaving about $10,000 worth of property to his wife. I think I have got the worst looking shop in the state of Texas and the oldest, from what I can learn. My business is mostly horseshoeing J. J. SCHAUMLEFFEL.

Five Years in Advance.—If there is one thing gratifying above all others to the publishers of THE AMERICAN BLACKSMITH, it is the esteem in which this journal is held. It is constantly being manifested, not only in words, but in other ways as well. Many subscribers pay not only two and three years in advance, but for five years. Mr. J. B. Baker, blacksmith and wagon builder, Sanitaria Springs, N. Y., has paid up his subscription for the next five years, as the most substantial form of expression of his value of THE AMERICAN BLACKSMITH. We hope to have every one of "our folks," whose lives are spared, as regular subscribers to THE AMERICAN BLACKSMITH for the next five years, together with thousands of others, and we have concluded to make a special price whereby they will save money by remitting in advance for five years' subscription. The prices for advance long-term subscriptions are as follows:

Two years	$1.60
Three years	2.00
Four years	2.50
Five years	3.00

Encouragement.—Readers of THE AMERICAN BLACKSMITH are at perfect liberty to make any suggestions whatever for the purpose of making these reading columns more suited to their needs. In fact the publishers will be glad to have them do so. If, on the other hand, there are any features about the paper which please subscribers, their appreciation and encouragement will be welcomed. Encouragement may be manifested in many different ways. Say that you like the paper the next time you write. Tell your friends about THE AMERICAN BLACKSMITH and advise them to subscribe. Renew your own subscription promptly when it expires Mention THE AMERICAN BLACKSMITH to our advertisers when you write them. Send us some new subscriptions—have a try at the $25 subscription prize. These are some of the ways in which you can show your appreciation of THE AMERICAN BLACKSMITH [EDITOR.]

The Ills of Poor Shoeing.—It seems to me that the most educated man can learn something new every day, especially in the line of blacksmithing and horseshoeing. These trades, I am convinced, are away behind others. This is certainly true as regards improvements in horseshoes and what a horse ought to have on his feet for comfort, durability and safety on hard pavements in large cities. Whenever I am out on the streets, I cannot help keeping my eyes on horses' feet, watching them slipping and sliding over the stone pavements. I contend that a draft horse can pull a heavy load without having enormous shoes with big toe and heel calks. It is a shame that these heavy work horses are not shod with more judgment and care. Horses are brought to me only too often with bad corns, or the heels cut clear down to the hair, or else chopped away at the toe. I suppose every horseshoer with any amount of trade has the same experience, horses brought to him with feet disfigured or injured by poor shoeing. I do not mean to criticise, but there should be some way of protecting the dumb brutes from unskilled workmen such as these M. A. M.

Spoke Removing.—Please find one dollar for my renewal subscription. I would not miss a number for the price of two years subscription. I expect to take THE AMERICAN BLACKSMITH as long as I live and am able to read or hear it read. The reason why I do not wish to miss a copy is for fear that it will contain some new device or something valuable which I do not know. I have passed my 66th mile-post, and am vigorous, healthy and able to do a good day's work in the shop, and I love it too I often smile at some suggestions as to doing work on wagon wheels when they are preparing the old hub to put in new spokes; one in particular whose modus operandi is to cut the old spokes off flush with the hub, and then bore a hole in it and screw a lag bolt into it to withdraw it out of the hub. I can take them all out of the hub before he can get one-third of his out. My way, where the spoke is broken off flush with the hub, is to take a brace bit just the size of the mortise and bore into the spoke and then take a small chisel and slit out the remainder by sections or take a small gimlet bit and bore into the broken spoke to the box and insert a small stock of dynamite and blow them out if I am in a hurry to get over the fence, etc., but where there is enough of the old spoke left I saw a notch in it and knock it out with a hammer. I remain as ever your eager and constant reader. D. J. LESSEL.

A Newsy Letter.—Enclosed find order for one dollar for which send me your paper for one year. I find it to be all you claim for it and to be a great helper in my business.

I will give you an idea of business in Mississippi. I began at the place I am now at about two years ago, and it was a very poor stand. Pontotoc is a town of about 600 population and only one shop—I mean good shop, but I have a great deal to contend with in the county in small shops who do work for almost nothing. I came here as I said before about two years ago, and when I took the shop there was only one forge in it and a very sorry set of tools. Now I have two big forges and work three men. I have raised the business from about $500.00 a year to about $2,000.00. I have also raised the prices of everything, shoeing from 80 cents to $1.00, axles from $1.25 to $2.25 and everything else in proportion. I am only 27 years old and I need all the help I can get. I find more good things in your paper than any other paper, so I want it as long as I am a blacksmith.

I will give my brother smiths a good recipe for tempering a spring. Take three pounds beef tallow and one pound of beeswax, mix together, heat your steel to a working heat, dip in this solution, let cool, and hold over your clean fire till the oil is burnt off. Put it somewhere that the air cannot get to it (say in your cinders) till cool, and you will always have a good spring. To temper a tool, axe or cold chisel add about 1 pound English Resin to the above and temper the same, only cool in the open air. I hope this will be of some good to somebody. D. C. HOBSON.

Stocks for Horseshoeing.—I notice in November issue of your journal an inquiry by Mr. Bailey, asking for information as to the best "Shoeing Rack"

Horse stocks or shoeing racks are appliances designed to hold the horse in a convenient position for operating upon him by the veterinarian or the blacksmith. The old method of setting shoes is attended with more or less physical danger, depending upon the gentleness of the animal, and the extent of his breaking. At best it is a most arduous task, one requiring great physical endurance, and is always attended with many elements of hazard.

For many years inventors have been designing and building stocks for this purpose. In the patent office at Washington are to be found a very large number of different designs, but strange to relate, but very few of these machines have ever proven practical.

Most of them are clumsy, cumbrous affairs possessing but little if any merit, awkward to handle and lacking in the very essentials of practical stocks. The elements to be considered in a good horse stocks are: Safety, both to man and horse. Comfort, both to horse and man. A good stocks is one that will enable the horseshoer, or the veterinarian, as the case may be, to securely hold and effectually control the animal while he is in the stocks. A vicious horse is usually one that possesses a sensitive, nervous temperament, and it is of the utmost importance that while he is confined in the stocks, that he should be held in the most natural position possible; that the operator have absolute control of his feet, and in holding them, to do so with the least possible friction. Many vicious horses struggle through fear and some horses struggle constantly while confined in the stocks. Hence it is essential that his feet be held in such a way that his struggles will not cause him to strain his muscles and tendons. Another essential of a good stocks is such an arrangement as admits of his being quickly secured, quickly shod and quickly released after the shoes are set.

If you are looking for a shoeing stocks, the first thing to ascertain is whether the stocks will hold the horse securely in a natural position. Second, can the feet be held in a convenient position for shoeing? Third, safety to the horse. Fourth, safety to man. Fifth, quickness of operation. It is highly important to have a stocks that will admit of two shoes being set at the same time. Last, but not least, is simplicity of construction, and an easy, quick and effective means of releasing the horse, without danger, after he is shod.

Many successful stocks embrace what is known in horse surgery as a "sling," and the best is one that enables the operator to control the sling with greatest ease and dispatch. The cuff and foot holding appliance is the next essential. The halter arrangement for confining the head and the breast, and shoulder stays to prevent rearing and plunging are also most useful accessories. C. E. MILLS.

The Independent Farmer.—I have noticed in a recent issue of The Sun of blacksmiths raising the price on horseshoeing from 25 cents to 35 cents for new shoes, also from 10 cents to 12½ cents for setting. Why not ask 50 cents and be done with it? They would be sure of getting it. For the benefit of those who may read this, I may say the writer is a farmer who shoes his own horses, buys his shoes the same as the blacksmith, and pays about 4 cents per pound, or from 3 cents to 5 cents per shoe, according to size. Think of it! Figure it out. What are you taxed for shoeing? A set of medium shoes will cost about 20 cents retail, and you are charged $1.40 to get them put on, or, in other words, the blacksmith receives $1.20 for his work and about 5 cents worth of coal and nails. How long is he putting four shoes on? Figure it out. Talk about independence! How did your last load of hogs or grain hold out with your own weight? Don't begin to complain. If you do you can just take your stuff home again or take

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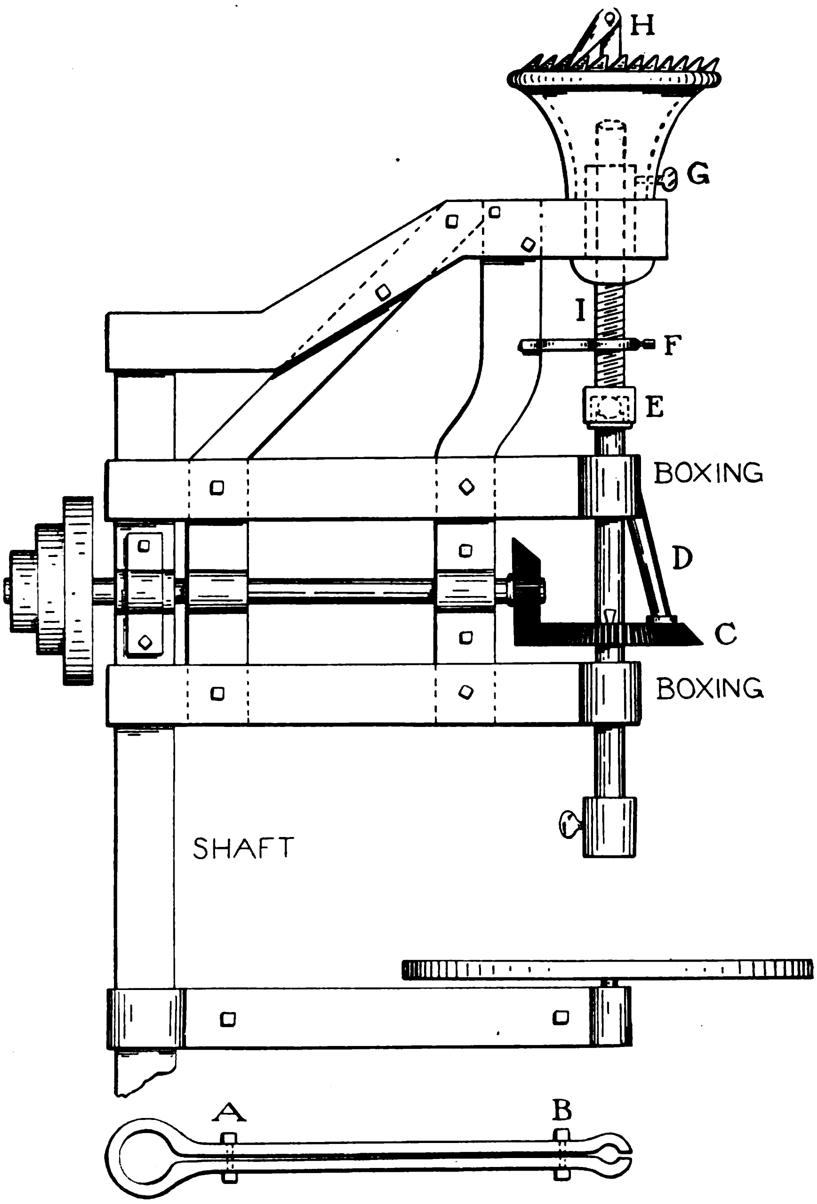
the buyer's weight. That's independence.
FARMER.

The foregoing clipping is from a recent issue of the Farmers' Sun, a publication in the interest of farmers issued in Toronto. The article is of value to the horseshoers, showing that steps have been taken to get a little better pay for the hard work of horseshoeing in Canada. Your correspondent assisted by two brother smiths have taken the initiative steps in this locality with the result that instead of 10 cents for resetting a shoe one now gets 12½ and for new shoes we get 30 cents instead of 25 cents as under the old conditions.

The task was a comparatively easy one and I was agreeably surprised to see all the brother smiths fall in line. In these prosperous times the smith has a full right to enjoy a few of the bounties of nature, and if he don't, it is his own fault. As prices of nearly everything have advanced that is needed to enable the mechanic to live and decently support himself and family, no right-thinking man will or can find any fault in his taking some steps to protect himself against pauper wages, or remunerations, and if anyone kicks as a farmer does, why let him kick. Now men of his stamp are to be found in all farming communities, but happily they are the exception, for if otherwise yours truly would soon quit and join the ranks of the downtrodden, independent farmer, and others would follow. Now that individual, whoever he is, belongs to the class whose sole aim and object is to make money and everybody should contribute to that end. He owns up that he shoes his own horses and would do so no matter how cheaply he could have it done by some experienced mechanic, and why? Because he begrudges the little hardearned money that he would have to pay to have it done properly. He claims that there is an enormous profit in new shoes. Now he tries to lead the farmers to believe that it takes only a few minutes to put on two new shoes. He gives no credit or makes no allowance for the experience the expert smith has undergone before he was enabled to shoe a horse properly, but reasons on the line of the person who had a tooth extracted by a novice who worked over two hours before he got the operation completed, pulling the patient from the chair to the floor before he could yank the tooth out, and then only charged the man 25 cents. Later on he had one extracted by a dentist who did the work in a minute but charged 50 cents. The man kicked a'bout the price and to show the dentist that he was an extortioner, said: "The other time a man worked for over two hours getting the tooth out and only charged me 25 cents and you want 50 cents for a minute's work. I shall patronize the other man in the future." Now as I said before such men are fortunately the exceptions, otherwise mechanics would give the country smithy a wide berth. My reasons for writing this are that it shows that a movement in the right direction is on the way in Canada among the smiths and the sooner it is adopted by all, the better. The old saying that the Lord helps those that help themselves, may well be adopted by our craft, and if this is the means of helping to better conditions of things I feel amply repaid for my trouble.
CANUCK.



A HOME MADE DRILL PRESS.

A Home-Made Drill.—In response to requests to know how I made my self-feed drill, I give herewith a sketch and description of how it is constructed. Referring to the illustration, the main frame of the drill is made of a piece of 3-inch shaft. The drill table is held by an arm, a top view of which is substantially as shown in the lower smaller drawing. By loosening the nut A, this arm may be moved up or down on the frame shaft, thus raising or lowering the table. The latter is made from the end of a beater of a thrashing machine, with a 1½-inch trunnion fitting into the arm B, holding the table. Five braces or arms carry the main drill spindle, the drive shaft and the feed mechanism. The three horizontal arms are made out of steel, 3 x ½-inch, bent very much as indicated by the table arm, with the exception that the smaller outer end has a piece of sheet iron put around it and bolted to the arm. Room must be left for babbitt around the spindle, at the points marked "boxing" on the figure. The upper one of the three arms has to be bent up four inches as indicated, but otherwise is shaped the same as the rest. The two vertical braces are bent as shown; these go in between the two plates or leaves of the horizontal arms and are securely bolted, as shown.

In the end of the top arm is placed the thread boxing of the feed screw, I. This boxing is indicated by dotted lines, and is 4½ inches long. I made it with a 1½-inch hole in it, then placed the feed screw in place in it, and after oiling the screw, poured babbitt metal in, thus forming my screw box. The connection between the drill spindle and the feed screw, as shown at E, is a ball in a recessed head on the end of the feed shaft. This allows the drill spindle to turn constantly, and the feed screw to push it down at any time. As the feed screw must move only up or down, brake or guide F is useful to keep the screw from turning around. The feed screw itself is ⅞-inch in diameter, 8 inches long, with nine threads to the inch. The feed wheel at the top is arranged to tighten up by means of the set screw G, so as to turn the screw boxing and feed the drill when desired.

The self-feeding arrangement is very simple. An eccentric cam on the hub of the gear G moves the rod D in and out, by the aid of a spring (not shown). The rod D has a roller on its lower end which the cam touches. This rod runs up and rocks the ratchet dog H back and forth when the self-feed is in operation, thus moving the feed wheel and the feed screw down. The rod (shown only at D) is pivoted at the upper arm, and is made light enough so that when the feed pressure comes on the drill bit too hard it will spring and not let the dog push the wheel until the drill bit has cut some metal out of the piece being bored. A thumb screw on the rod D is used to limit its swing, and thus regulates the rapidity of the feed.

The horizontal drive shaft has a 4-step cone pulley on one end and a small bevel gear on the other. It is supported as shown. The one pulley is driven by belting to a jack shaft on the floor; this has a cone, together with tight and loose pulleys.

I have found this drill most serviceable, and hope the description of it will be of some benefit to some of my brother craftsmen.
WM. EXLINE

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THE AMERICAN BLACKSMITH

A PRACTICAL JOURNAL OF BLACKSMITHING.

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Special Issues.

A few words regarding this issue of THE AMERICAN BLACKSMITH may not be inappropriate here, owing to the fact that it will be read by a great many blacksmiths and wagon builders who have not before had an opportunity of examining the paper. To them we would especially say that January is a special issue only in the fact that double the usual number of copies is published and mailed. It is a common practice of many publishers to put forth special issues once or twice a year, resplendent in color and containing a large amount of valuable reading and information, but lo, when succeeding issues of the paper reach him who has unsuspectingly forwarded his subscription to the publisher, they are found to be as lean and emaciated as the proverbial church mouse, such reading as they do contain being clipped from other papers and affording but scant news to the subscriber.

With the thought only of those whom THE AMERICAN BLACKSMITH now makes its first bow, allow us to direct attention to the fact that the publishers of this paper guarantee readers twenty pages of solid, unpadded blacksimiths' reading matter each month, from the pens of the foremost craft authorities, with no trade puffs or stale clippings, and to the fact also that this January issue contains no more and no less of reading than is to be found in the eleven other issues of the year, the same standard of reading pages, both as to quantity and quality being maintained throughout the twelve months.

A Movement to Secure State Lien Laws.

Just a line here to say that as a result of efforts on the part of The American Association of Blacksmiths and Horseshoers definite assurances have been given that the lien law bills, which have been carefully drawn up by the Association, will be introduced in a number of States at the next session of their legislatures. But, needful and just as such laws are, their introduction does not necessarily mean their passage. They must be passed through the efforts, not of this association nor of the State legislators, but of the blacksmiths and wagon builders for whose good the bills are intended and who by liens on horses or vehicles will be able to collect money that is owing them. The AMERICAN BLACKSMITH is the official organ of this Lien Law movement, and is directing the work. We want every craftsman whose eye meets these words to write to us to learn how he personally can greatly help on the good work and at no expense to himself whatever.

An Authoritative Treatise of Horseshoeing.

One of the best series of horseshoeing articles we have ever published commences with the present issue of THE AMERICAN BLACKSMITH. This series constitutes "A Treatise on Horseshoeing," from the pen of John W. Adams, A. B., V. M. D. The subjects of the various articles, in order, are as follows: Anatomy of the Foot; The Growth, Care and Characteristics of the Hoof; Types of Feet; Preliminary Examination for Shoeing; Preparation of the Hoof; Characteristics of the Shoe, Special Peculiarities of the Chief Classes of Shoes; Hot Fitting; The Bar Shoe; The Rubber Pad.

Mr. Adams is a Professor of Surgery and Lecturer on Shoeing in the Veterinary Department of the University of Pennsylvania, and is an authority on horseshoeing matters, so much so that the Department of Agriculture of the United States has seen fit to issue this treatise in bulletin form.

Each topic is concisely and clearly discussed, and illustrations are introduced in explanation wherever necessary. To the horseshoer this series will be exceedingly valuable. Not one number should be missed.

A Remarkable Racing Season.

Never before in the history of American horse racing, it is safe to say, has there been a season so remarkable for record smashing as the one just ending. To briefly review some of the many achievements, Dan Patch placed the world's record for pacers on a half-mile track at 2.03¼, earlier in the season having taken records for the fastest mile by a pacer and by a pacing stallion, 1.56¼. This famous horse likewise holds world's records for the fastest half mile, 56 seconds, and the fastest wagon record by a pacer, 1.57¼. Lou Dillon cut the world's trotting record to 1.58½, placed the record for a second heat at 2.04¾, and trotted the fastest two-heat race, each heat in 2.04¾. Among her other records is a figure of two minutes to wagon against time.

Cresceus reduced the trotting stallion record to 1.59¾. Major Delmar brought the world's record for trotting geldings down to 1.59¾. The four-heat race record was taken by Dan T. who won the last two heats of such a race, the four heats being trotted in 2.06¾, 2.07¼, 2.08¾ and 2.07¼. A slice of four and one-quarter seconds was taken from the world's record for team trotters when Monk and Equity went a mile in 2.08¼. Prince Alert reduced the pacing

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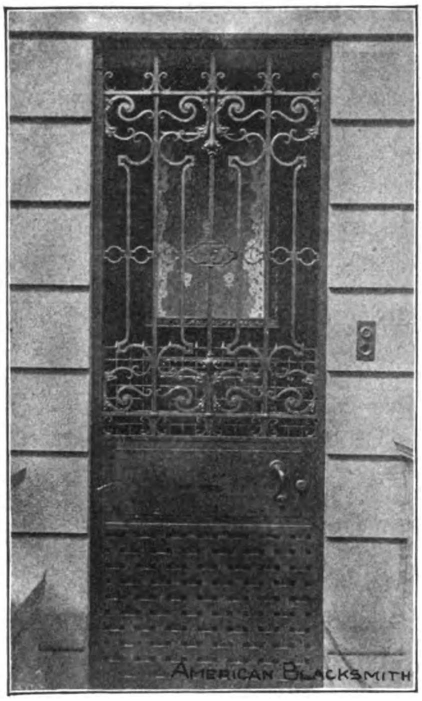
record for geldings to 1.57, and Dariel cut down the pacing figure for mares to 2.00¼. The record for a mile and a quarter pacing was reduced to 2.38 by



WROUGHT IRON ENTRANCE DOOR.

Nervolo, and Locanda placed the record for a mile and a half, pacing, at 3.15¼. It seemed as if almost every day brought the news of a new world's record, and the prospects are that another such season will not come for many a long day. The long-dreamed of two-minute trotter was realized in Lou Dillon, whose picture appears on another page of this issue.

The Education of a Tradesman.

The full value of a good education is not felt all at once. Two men set out in the same trade. One has a sound schooling, the other has spent his school-days in the shop, learning practically what the other has acquired in theory.

At first the shop-trained man goes right ahead. He knows just what to do and how to do it, while the other flounders about all at sea amid the practical problems that he knows only on paper. Time goes on, and the shop-trained man's experience ripens slowly. The other in the meantime is cultivating just the practical ability that he lacked. His mind has been trained and sharpened up so that he easily recognizes his own needs, and is able to fit a means to an end. A little experience goes a long way with him. One problem solved solves many others, because he is a reasoner.

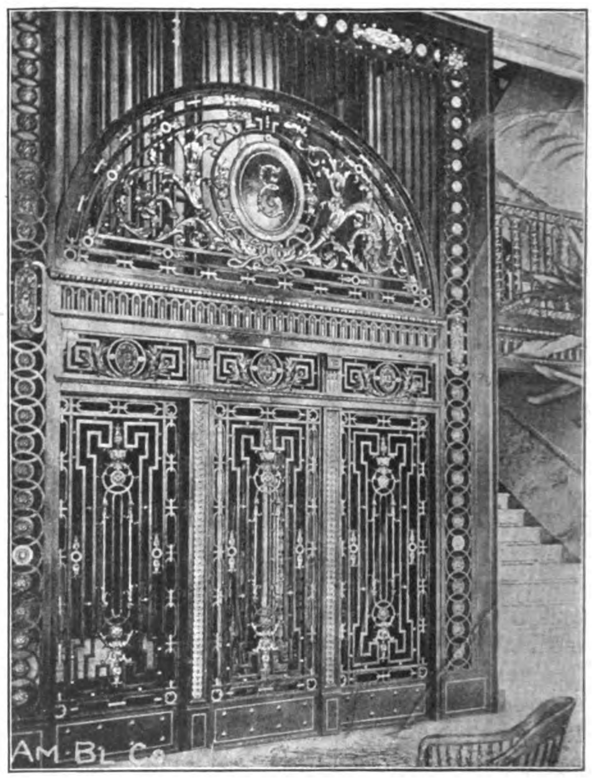
So, at the end of ten years, the two are compared again. The shop trained man has advanced slightly. The other has won a wide experience, has become an expert craftsman, and is, over and above this, a well-educated, intelligent citizen, probably earning many times as much as his rival.

It is a somewhat hard matter for the practical man, in the rush of a business life, to gain an education for himself, but it can be done. Night schools and correspondence schools afford the opportunity and they are boons indeed to him who must devote his daylight hours to manual labor. In these days of close competition it is a matter of necessity.

Ornamental Iron and Copper in Architecture.

The neat wrought iron door here illustrated is the entrance to a residence in New York city. A basket-work effect is introduced in the lower portion, which is both pleasing and unique. The upper portion presents a graceful arrangement of lines and curves.

The stair and elevator enclosure also illustrated are to be found in the Essex Hotel, New York city. The design here is more complicated, but is particularly well worked out. The border around the elevator doors consists of a series of circles interlaced and strengthened by small circular plates of ornamental design. This forms a striking outline on frame to the central portion.



A HANDSOME ELEVATOR ENCLOSURE.

One of the finest bits of art metal work that has come to our notice is seen in the remaining half-tone. This piece is seen in Riggs' National Bank. This lamp standard here depicted is of bronze. Winged lions at the base give the impression of strength and majesty. These support a handsome column of the Corinthian order. This is topped by a globe, and upon this globe, again, is a small column and globe similar to the lower one. Surmounting the whole is perched an eagle. Thus is strength evident at the base and airy lightness at the top. The idea is so good and the whole piece so harmonious and graceful that the designer deserves great credit. It is one of the handsomest pieces of ornamental work which has come to our notice. All three pieces are the work of Richey, Browne and Donald, architectural iron workers, Long Island City.

Talks to the Jobbing Shop Painter.—10.

M. C. HILLICK.

Painting the Medium Grade Buggy.—Priming.—Putty.—Surfacing, Striping and Finishing.—Painting the Body. Rubbing Roughstuff.—Applying Color and Finishing.—Etc.

Preparations for the coming season's work are now practically due in all carriage paint shops. Not a few jobbing shop painters have ventured into the business of buying carriages in the white, and painting and selling them, handling this line of trade in connection with their regular painting business. In this way the shop is kept active during seasons when the finding of new business is in many respects as difficult as the discovery of the north pole.

It is with the painting of this class of work, and particularly the class ordinarily accepted as cheap, that this article has to deal.

The word cheap, as here used, does not necessarily mean that the article to which it applies is of an inferior quality, but rather that the buying and selling price is cheap, taken in connection with the substantial quality of the article handled.

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The first step in the process of painting is the priming. Of primers there are divers kinds and, of course, of varying degrees of excellence. Not a few carriage painters elect to use ready prepared primers, or new system surfacers, as they are called, while others hold fast to that which is good—the traditional lead and oil system. Under conditions which allow for the proper drying of the material, white lead, as a surfacer, has no equal, but the limits of time often forbid the use of oil and lead. In such cases, and other cases unnecessary to enumerate at this time, the new surfacer systems may be used to advantage. The writer of this article has for the past ten years been connected with a painting business in which a patent system of surface, from which lead is supposed to be practically eliminated, has been almost exclusively used, and the countless surfaces brought to a finish upon this patent surfacing system have, with but few exceptions, proved of high class durability. It is not so much, therefore, the kind of primer, but the way it is applied, the preparation of the surface, and the allowance of time made for the adequate drying of the primer, that deeply concerns the painter.

In the first place, sand paper the job clean and smooth throughout—body and running parts. The smoother the job is worked down at this point the less work of sanding upon the priming or other coats. Then dust off, and lay on the primer with a good oval bristle brush. Brush the coat out smooth and uniform, and set aside in a dry, warm air to harden. In sandpapering on the priming coat, once it has sufficiently dried, avoid cutting through and striping sharp corners and angles of needed protective material. If the primer be made of lead and oil, take white lead ground in oil, three parts; lamp black, one-half part; finely ground yellow ochre, one and one-half parts. Mix in three parts raw linseed oil, one part rubbing varnish and one part turpentine, adding a tablespoonful of coach japan to each quart of the mixture. For second coating of the running parts with the lead system use the lead shaded to a normal gray with lamp black, and mix with raw linseed oil, one part, turpentine, three parts, and lay on with an oval bristle brush. When this coat is dry proceed to putty—glaze all open, eaty portions of the surface, using ordinary carriage putty thinned to a consistency that allows the pigment to work fully from the knife blade. All open cavities, etc., putty smooth and level.

A good reliable carriage putty, a standard putty perhaps we should say, is made of dry white lead mixed in equal parts of coach japan and rubbing varnish.

Formula No. 2—Keg lead ground in oil, two parts; dry white lead, one part; best bolted whiting, one part. Liquids: rubbing varnish and coach japan equal parts.

LAMP STAND ORNAMENTING THE RIGGS NATIONAL BANK, WASHINGTON, D. C.

Formula No. 3—Keg lead ground in oil, four parts; dry white lead, one part. Liquids: Rubbing varnish and gold size japan, equal parts.

But of putty formulas there are no end, hence these must suffice, and they are sufficiently reliable to insure first-class work under proper methods of use, both for bodies and running parts.

The second coat of lead, or of patent system surfaces, and the putty glaze, and the putty, having been surfaced down smooth and fine mix a third coat of lead, using a normal gray pigment, mixed to a consistency suited to be applied to the surface with a camel's hair brush. Use turpentine alone in the mixing, adding as a binder, a tablespoonful of raw linseed oil to each pint of the mixture. This coat should go on smooth and clean, and flatten out as nicely as a coat of color. When dry, sand off lightly with No. 00 sandpaper, polish with a tuft of curled hair, and the running parts are now ready for the color. Apply one coat of color, then one coat of color and varnish. When this color and varnish is dry sufficiently, dip a moist sponge into No. 00 pulverized stone and rub over the surface just enough to knock off the glass, together with removing dirt, motes, etc., then wash up and stripe. Use tube colors for striping purposes, and aim to make the striping to harmonize with the general color scheme, the two line stripe being best suited, on the whole, to this class of work. In handling work among country buyers, neat and effective striping is a potent factor in selling the work. It assists to conceal the defects in surfacing and finish, and carries with it a certain element of value to the user not obtained in any other way. In case the job is to go in the ordinary class, finish directly upon the striping with a single heavily flowed on coat of heavy gear finishing varnish.

If a "special" job, apply a coat of clear rubbing varnish, and in due time rub this coat with No. 00 pulverized pumice stone and water, wash up thoroughly, and finish with a fine, high class gear finishing varnish.

The body having been primed at the time the running parts were, and with the same material, and set aside for proper drying, may in due season be taken in hand and puttied with the formula No. 1 putty. This putty being dry, the first coat of surfacer is in order. Make this first coat of roughstuff, to answer both in the capacity of a lead coat and a roughstuff coat. It should consist of three parts of any good American roughstuff filler and one part keg white lead, proportions being by weight, reduced to a thick paste with elastic rubbing varnish and coach japan equal parts and then thinned to brushing consistency with turpentine.

The day after this coat is applied, look the surface over carefully and putty any places which may have been overlooked at the first puttying. The following day this coat may be re-coated

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with a roughstuff mixed thus:— Equal parts, by weight, of American filler and keg white lead mixed to a heavy paste with equal parts of quick rubbing varnish and coach japan, the mass then cut to the proper consistency with turpentine. Two coats of this roughstuff may be applied per day, and four coats of this, and the coat made by the first formula, should suffice to give the proper surface. In the last coat of roughstuff mix sufficient yellow ochre to distinctly alter the color. This will serve as a guide coat in rubbing the surface and will save the expense of the guide coat usually applied.

Stand the surface aside for a week to dry out, after applying the last coat of roughstuff. In rubbing the roughstuff use the German rubbing Fabrik. This rubbing stone yields a clean, smooth surface if properly handled. Rub with long straight strokes of the stone and use plenty of water to keep the surface from gumming up. Aim to keep the surface free from scratches or bruises. Keep the inside of the body and seat as dry as possible, and when the surface is perfectly rubbed set aside for twelve or fourteen hours for the moisture to dry out. Then run over it with No. 00 sandpaper to remove gritty substances, and to polish it. Sand the inside of body and seat thoroughly, also.

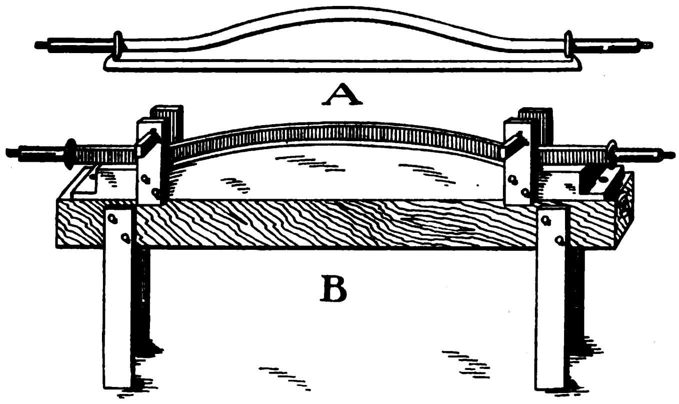
Paint both sides of bottom boards of body and seat. Then apply color to inside of body; lastly, outside. Then color and varnish inside and out of body and seat. When dry, rub this coat lightly with No. 00 pulverized pumice stone and water, and apply a coat of rubbing varnish with enough black or body color in it to keep it from greening or discoloring. When dry, rub this coat carefully with pumice stone, as above, and water, wash up, and, for ordinary work, finish with a heavy, rich flowing body varnish. For a "special" job use an additional coat of rubbing varnish. All these coats of varnish should be flowed on, rather than brushed on, as such coats give a richer, deeper brilliancy of finish. Use only clean colors and varnishes. Also a very essential feature in work of this kind, is the use of clean tools. Work in warm quarters, free from dirt, otherwise dust is very apt to rise, which will surely spoil the brilliant finish of your job. Another important point, be clean personally, when at this work. The finish obtained will amply repay all the care and skill lavished upon it.

(To be continued.)

The Wagon Work Prize Contest Award of Prizes.

The prize contest on wagon work, though opened only a short time ago by this journal, was one of the best and most vigorous ever held. We wish to thank all those who participated. The standard of articles submitted was unusually high, many of them so equally good that considerable time and consideration on the part of the judges was necessary before any decision could be arrived at. The following was the award:

First prize, $20.00, Nels Peterson, Des Moines, Iowa; two second prizes, $5.00 each, J. Vestal, Nacogdoches, Texas, and C. Youngstrom, Meckling, S. D.; three third prizes, blacksmith's aprons, George E. Brierly, Arva, Ont., Canada; Charles W. Briddell, Marion, Md., and G. O. Bishoff, Gainsville, Texas; fourth prize, yearly subscriptions to The American Blacksmith, R. O'Hearn, Monterey, Ky., M. A. Foster, Fort Wingate, N. Mexico, J. W. Breckenridge, Lawry, Md., and F. W. Price, Harviell, Mo.



A—GAGE FOR MEASURING AXLE LENGTHS.
B—TRESTLE FOR SHAPING AXLES.

We congratulate the winners on having sent articles which were judged the best of the great numbers submitted. We wish to call attention also to the fact that these prize winning articles have come from a great many portions of the country, an indication of the widespread interest taken. The prize articles and the best of the others will be published in these columns in this and following issues as space permits.

Wagon Building in the Factory.

Prize Article.

NELS PETERSON.

During the twenty-seven years that I have worked at the blacksmith trade, my experience has been varied and interesting. Starting at the age of fifteen in my father's shop back in Sweden, I was afforded every opportunity for learning, that I could never have received from anyone having nothing but his pecuniary interest at stake. The line of work done at this shop covered every thing, from building a threshing machine to making a padlock and presented chances for acquiring practical experience not enjoyed in many shops. Having served the required time of three years as an apprentice in that country, I was promptly advanced to the fire, to do less difficult forgings at first, but at the tender age of nineteen had charge of the shop.

Besides doing general repair work, we built machinery of every description, for dairies, wind-mills, distilleries, etc. The shop was first class for its time and locality. There was no such thing as buying a carriage or wagon ready made at that time or place; farmers or business men had them made to order, depending entirely on the village smithy for every thing in that line. All forging done at this shop was by hand. The motive power for turning lathes, drill presses, etc., in the machine shop was horse power. To iron a fancy carriage in those days was quite different from today, and required considerable skill and practice. Every piece from springs, axles, bolts, clips, rivets, and nuts, was forged by hand. To forge an axle, we would take a piece of square iron the required size, swage the center round the proper distance, upset the square parts, where the collars and lips for bolting to the spring were welded on, then draw the ends to taper, and swage the spindle to fit the box, leaving it sufficiently large to allow for turning down in the lathe to a snug fit. In making the springs the stock was cut to length, the smaller leaf was drawn to taper and finished off, the main leaves upset to sufficient thickness, and with peen of hammer and sledge drawn out wide enough to turn the head. The main leaves were then bent to proper curve, and the smaller leaves fitted in their order. For the better class of vehicles platform gears were used entirely.

At the age of 21 I immigrated to the United States. In Chicago, Ill., I found employment in a tool factory but being of a restless spirit and desirous of seeing the country I visited many large cities and worked at various branches of the

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trade. In the last 15 years I have followed the carriage business exclusively, for the last 11 years in Des Moines, Iowa. The firm I am with build about 5,000 jobs a year of varying styles, such as light family carriages, phætons, stanhopes, surries, buggies and some spring wagons.

I will now attempt to give you an idea of the way we do it here. The plant is quite large, being 265 feet long by 132 feet wide, two stories and basement with two railroad tracks and equipped with a 50-horse-power steam engine, which furnishes power for elevators and machinery. The first floor, south half, is occupied by the blacksmith and woodworking department running parallel; also a large stock room is located in this part. The north half of the same floor is occupied by the office, display room, and shipping department. The upper floor is used for paint shop, trimming and assembling room, and the basement for storage, some painting also being done here. All material is shipped here by the carload and unloaded at different parts of the building, for the blacksmith shop, the paint shop, the wood working and the trimming shop. A large stock room is provided with numerous shelfs and bins, all labeled, indicating their contents. From this room leads an elevator to the second floor. A receiving clerk directs his men where to place the different goods as they are unloaded, so he may know where to find them when called for. Goods that have to be transported any considerable distance through the factory are carted on trucks built for that purpose and so constructed as to admit of carrying a considerable load. All bodies and seats for the different vehicles are delivered at the elevator landing on the second floor, where they are primed as soon as possible to prevent them from absorbing dampness. When dry they are looked over and all small holes and other rough places are puttied, then from five to eight coats of filler or rough stuff, according to the grade of work, is applied, when they are passed on to the rubbing deck, where another gang of men do the rubbing, sand-papering and slushing. A coat of color is next put on, then color varnish. They are next ironed off and a coat of rubbing varnish put on, rubbed, striped, and again passed on to another room where they are finished, and finally stored in a dark air-tight room while the finishing dries.

The several coats are applied by men who are specialists, so that better work and more of it is the result. During these operations the job has passed through the entire length of the building, and is now located at the north end, where it is handy to the trimming shop and assembling room.

We will now return to the blacksmith shop and attempt to describe, in detail, the methods employed in this department. All stock intended for the blacksmith shop is unloaded at the west door. Bar-iron, tires, etc., are placed in racks, each rack being marked with size of iron. Springs are stacked at a convenient place for the men putting up gears and the axles, where they are convenient to a large pair of shears. Here they are unboxed, sheared off cold to the proper length for welding and brought to the forge, where they are piled, the left arm on one side and the right on the other. In welding axles a large fire is built to permit of heating several at the same time. The ends are heated to a white heat, brought out and upset by thrusting them against a heavy piece of casting placed on the floor for that purpose, then scarfed under the trip-hammer, to a shape much the same as an ordinary piece of iron is scarfed for welding, replaced in the fire and heated to almost welding point. Next they are brought out and emersed in the flux, replaced in the fire with the scarfed sides upward until the compound is melted sufficiently to adhere, then turned over and allowed to remain till brought to a welding heat, when they are withdrawn, and with a gentle tap against some object all harmful matter is removed before placing them under the hammer for welding. A fairly long lap is best and by rapid beating they are welded down sound and finished to the exact length, for which a gage is placed handy for measuring as shown in Fig. 1, A. As soon as the welding is completed, the axle while still hot is placed over a form, shaped to conform to the axle cap, wedged down and all irregular kinks taken out. A cast iron form resting on a wooden trestle is used, as is shown at Fig. 1, B. An expert smith and helper can weld from 50 to 75 sets per day, without missing a heat.

In setting axles the spokes of the wheels are made to stand plumb from the floor to the hub, that is, measuring the spokes from out to out at the hub, the measure will correspond with the outer edges of the rim on the floor. This operation of measuring is, however, never gone through with, as we use an automatic axle gage, by means of which one can tell to the smallest fraction of an inch how much pitch the axle has. No gather is put in the axles here, as it is deemed useless and even injurious and has been demonstrated by practical test that an axle with gather will cause the box to bind at the collar, creating undue friction, and impeding the momentum of the wheel, and cause the vehicle to run heavy. The top surface of the axle is then ground to a bright finish, glue applied, the axle cap put on by means of thumb screws and left standing till glue cools, when the thumb screws are removed and wood projecting over the axle is ground off and polished over a revolving drum, on which a heavy sheet of sandpaper has been fastened. They are now ready for the gear setter.

(To be continued.)

Facts about the Fire.

Use good coal always—all impurities as slate, earth and especially sulphur, are harmful. Good coal should break easily, appear glossy black all the way through, and should coke easily. Coal should be thoroughly wet before being put on the fire. Start the fire with coke, place "green" coal on top and around the fire. When the coal on top has been coked, the fire is ready for heating the iron. Putting fresh coal on the fire is bad practice—draw from the coke around the sides. Add the fresh coal to the outside and let it coke in turn.

Facts and Hints on Wagon Work.

Prize Article

GEO. E. BRIERLY.

Suppose that a wheel with a 4-inch tire comes to the shop to have a couple of new spokes put in. The tire is tight on the rim, and you do not wish to injure the wheel. Just take an old coarse saw and saw a piece out of the joint, strike a few sharp blows on the sole of the tire, and you will find that your tire will come off easily.

A wheel 2 feet 6 inches high with a 4 inch tire is sometimes a troublesome thing to rim. By putting on rims 2 inches higher than the wheels, you will overcome a lot of that trouble, as a bent rim will pull down easier than it will pull open.

When the bands on a hub get loose, do not take them off, and cut and weld them, it is unnecessary. Make a lot of thin wooden wedges. Then take a thin iron chisel and drive into the hub pretty close to the band, pull out and drive one of the wedges in its place. Do this all around the hub and the band will be as tight as necessary.

Light delivery wagon wheels should be riveted each side of the spoke, in the rim, to prevent the tenon of the spoke

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from splitting it. Now, the hardware stores charge $1.25 for having this done. The rivets and burrs cost about 25c, which leaves $1.00 for two hours' work. Place the wheel on the wheel tub or horse, face up, mark where the rivets come and bore with a screw bit, which the rivets will follow tight, and drive your rivets in. Take the wheel off the horse and screw it face down on the iron tire platform, place the burrs on, cut the rivets the right length and rivet them. Proceed with the other wheels in the same manner.

Wagon bolsters are generally about the same size and shape. In spare moments make up several and paint them. The paint prevents the air checking them and also if a man is in a hurry you do not have to let the job go without paint.

In the country repair shop black is the color generally used for striping. To mix it so as to work free, take drop black and mix it as if it were going to be used as ordinary paint, then add enough heavy varnish to hold it together. It will then work freely and will not run. Yellow is also a handy striping color to have around the shop. It goes well with the gear in the red, wine color, black, green or brown.

If when setting the tire on a light wheel, you should pull it to dish, stretch the tire cold by pounding on the edge with a fuller.

When re-rimming a wheel do not drive the old rim off, because there is a danger that the spokes will move in the hub, and if they do they never are as tight again. Take some iron wedges and split the rim off from the back.

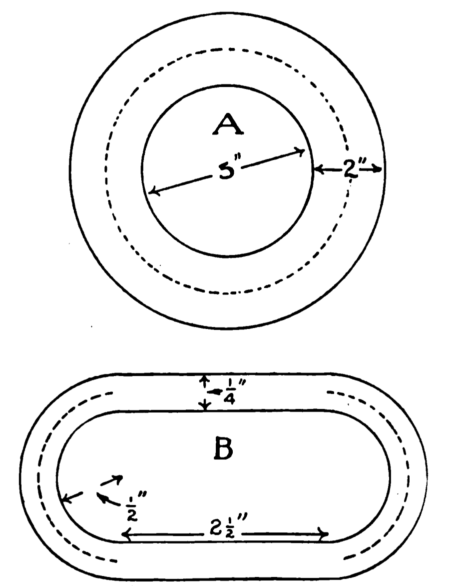

Fig. 1. CALCULATING AMOUNT OF STOCK FOR FORGING IRREGULAR SHAPED PIECES.

Suppose you wish to make a round stick. Take a square piece of wood which will make it the right size, trim it to eight faces and then round up as near as possible with the smoothing plane. Take a piece of maple, the end of an axle will do, and bore a hole in it the same size as you wish the stick. Now drive the stick through the hole, when it will be about as round as if turned in a lathe.

If when taking a weld on large iron the fire is dirty, take some salt and throw into it. It will clean your fire and make it burn brightly.

Sometimes a wheel comes to the shop with the tire spiked on. To drive the cold chisel between the rim and the tire is rather hard on the former. Find where the spike is, centre punch it, put the wheel under the drill and bore the spike out.

If the centre plates on whiffletrees are bolted on with 3-16-inch tire bolts they will not cause annoyance by becoming loose.

To tighten the box in a wheel do not wrap the box with canvas and drive in. It is sure to get loose again. Take a piece of pine board and split off a lot of very thin wedges. Place the box in the hub, get it centred, and fill up tightly between the box and the hub with the pine wedges. When you have driven in all the pine you can, get some hard wood wedges and wedge, as you would on a new job.

(To be continued.)

The Elementary Principles of Mechanical Drawing—8.

How to Calculate the Amount of Stock Required in Forgings.

When a mechanic has a drawing presented to him from which he is expected to make a tool, one of the first problems that confront him is: "How much stock will it need?"

This fact may be borne in mind: The finished forging, no matter what its form may be, will contain exactly the same number of cubic inches as the stock from which it was forged—with slight allowance for scaling.

In any case the dimensions will be given on the drawing, so if the piece to be forged should be a simple bar, for instance, the blacksmith may find the amount of stock by simply measuring from stock of the size and shape required.

When the forging is of irregular shape, the parts should be considered separately, and the results added together, to give the total number of cubic inches in the forging. Taking this amount of stock the blacksmith thus knows from the drawing just how much stock is required for each part.

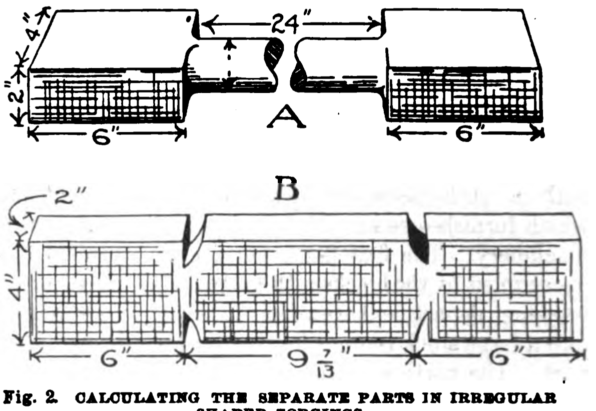

Fig. 2. CALCULATING THE SEPARATE PARTS IN IRREGULAR SHAPED FORGINGS.

The ring common occurs in tools, and the amount of stock required is easily found by the following simple rule: First, a few points should be noticed with regard to the nature of a solid ring. Referring to Fig. 1, a ring is to be forged from the drawing at A. Here the inner diameter is 5 inches, and the ring is to be of round two-inch stock. Then in the finished ring the iron on the inside of the ring, being formed from the same length piece as that on the outside, must have been upset, or crowded together, while that on the outside has been drawn out. In the center of the ring the iron will have kept its original length. Hence, by measuring the length of the center of the ring will be found the amount of stock required. From the drawing it will be seen that the diameter of this center portion (the dotted line) will be the same as the diameter of the inside, with half the thickness of the stock added to each end, which is just the same as adding the whole thickness of stock to the inner diameter. Now multiply this new diameter, which is 7 inches by 3 1-7 inches (or more correctly 3.1416), and the result is 22 inches. This is the length of the middle line of the ring, and gives the length of 2-inch stock required.

Where a link is to be made, the two ends may be considered as semi-circles (see Fig. 1, B.) and the side portions as straight bars. Suppose this link to be $2\frac{1}{2}$ inches long and 1 inch across. The diameter of the semi-circles will be 1 inch and this added to the thickness of the stock

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(say ¼ inch) will give 1¼ inches. Regarding these two semicircles as making one whole circle, proceed as before. Multiply by 3 1-7 which gives 1¼x3 1-7 = 3 13-14 inches. Now the remaining length of the link will be 1½ inches for each side. Hence the stock will be 1½x1½ inches x 3 13-14 inches = 6 13-14 inches, or approximately 7 inches of ¼ inch stock, allowing for the weld.

In measuring irregularly curved pieces, as scrolls, it is a good plan to step around the outside edge with dividers, and then step off an equal number of the same spaces on paper. The length of the line thus obtained will be the distance around the curved edge.

In making a forging of the form shown in Fig. 2, the method given below is convenient. This piece consists of two blocks, each 2 inches by 4 inches by 6 inches, connected by a round shaft 2 inches in diameter. This will conveniently take stock 2 inches thick by 4 inches wide. First make cuts, as shown at B, and draw down the center to 2 inches. It will be necessary to know how far apart to make these cuts. And to do this first find the amount of metal in the central cylinder. This volume will be 1x1x3 1-7 x24 = 75½ cubic inches. This will require, of stock 2x4 inches, 75½÷8 = 9 7-16 inches of stock between the cuts. Each end will require 6 inches of stock, making a total of 6x2x9 7-16 = 21 7-16 inches.

In this manner any irregular forging may be divided into separate parts for the sake of calculation.

(To be concluded.)

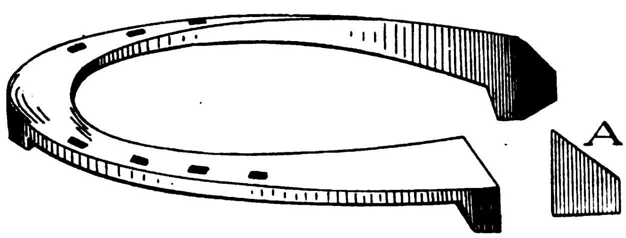
Spreading the Foot.

C. W. METCALF.

In the November AMERICAN BLACKSMITH I noticed that one blacksmith advocated spreading the foot with tongs. I do not like to see a horse's foot spread in that way. I have a shoe which, if once tried, would result in the use of no other, and it would also stop the practice of spreading the foot with tongs. I used to make a bar shoe that I thought was a dandy, but I would not use it now.

I have worked in a country shop since I was twelve years of age, and used to scold my father for spreading the shoe with tongs after it was nailed on.

The accompanying drawing shows the shoe in question, and I believe its shape will be plainly understood from the sketch. A, shows the bottom view of shoe. Its essential point lies in making the hoof surface of the heels high on the inside and beveling or sloping away to the outside. When using this shoe in a bad case of contraction, there should not be any heel calks and the back nails should be left out. A horse can not step on this shoe without spreading his hoof, I care not how hard it may be. I should like to hear from other shoers as to their opinion about this shoe.



A GOOD SHOE FOR SPREADING THE HOOF

Shoeing for Forging and Speedy-Cutting.

M. A. AMMERMAN.

Having promised some time ago to give an article on horseshoeing, I shall begin by telling how I shod young Signal.

He came into my hands with fifteen ounces forward and five ounces behind. He scalped so badly I could not road him, shod as he was. I reduced the weight of his front shoes to eight ounces, then to five ounces, and then to three ounces. I found that I could road him without boots, or without his injuring himself. I took him to the track and when at his top speed he would go into a pace. I called for the four ounce weights, tried those on him and he went into a rack, thus showing me that he was still out of balance. I called for the six-ounce weights and hung them on. Then he trotted like a spirit. I drove him a quarter in thirty-two seconds without a boot, and on examining him I found he had speedy-cut (this is an injury caused by the front foot striking the hind ankle). He was so tender I could not wear boots on him. Hence, I had to resort to shoeing him altogether to keep him from injuring himself. Having on five ounces behind, I began to increase the weight until I had nine and one-quarter ounces on him. I went again to the track. There was no end to his trot. He was perfectly balanced and could speed a two-minute gait without boots and never injure or touch himself in any way. I started him in a matinee race, and the fourth mile and last quarter in the mile, he trotted in thirty-two seconds. When we were twelve lengths from the wire we were even, and he finished six lengths in the lead. I never knew of a horse that had the wonderful bursts of speed that this fellow had, and now I hope that the reader in looking over this article will discover that a horse that forges and speedy-cuts can always be remedied by shoeing very light in front.

Tuyere Irons for Light and Heavy Work.*

ROBERT HENDERSON, CHAIRMAN.

The committee to whom was referred the consideration of the best kind of tuyere irons for light and heavy work beg leave to submit the following: We do not come before this convention with the idea that we have the best kind of a tuyere iron, but will endeavor to bring this important subject before you in a manner that we hope will secure your approval and obtain some good results. We are located in various sections of a large country, and all do not have control of a large shop and come in contact with something new every day. We do not have a chance to counsel with others who are better informed, but have to rely on our own resources; consequently the annual meeting of this Association is of great benefit to many of us.

The tuyere iron is a very important factor in successful blacksmithing. In the heating of iron, a good clean heat is necessary if you expect to obtain good results. Time and material are often wasted on account of a poor heat. If you should be obliged to use the old style tuyere iron, blowing into one side of the fire, the results would be very unsatisfactory, as the fire will heat quicker on the side nearest to the tuyere iron, and the result will be an uneven heat. With two pieces of iron in the fire at the same time, one will be hot before the other and there will be no certainty of a perfect weld; hence an increase in the trials and unnecessary labor of the smith. Therefore it is the judgment of the committee that the side blast tuyere iron should be a thing of the past.

We would recommend a bottom blast for either light or heavy work, as it produces a uniform heat, regardless of the length or width of the same, and an even heat is assured at all times. Our past experience would lead us to recommend a blast box 6x6 inches, and 9 inches deep, for heavy work, with drop grate on top in accordance with the accompanying drawing. The top of the box should be 12 inches below the top of the forge, as this depth gives you a good body of fire under the heat. It is to be understood, however that the size of

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the box and the depth of the fire may be increased according to the class of work to be performed. The blast pipe leading into the box should be from 3½ to 4 inches. The bottom of the box is provided with a slide for cleaning out the fire, which is accomplished with ease and without loss of time. For lighter work we would recommend a smaller box, 5x5 inches, and 8 inches deep, with top of the box ten inches below the top of the forge, and a 3-inch blast pipe. A box of this size will meet all the requirements of light or medium work. The drop bottom gives better results, in connection with some classes of work, than the one equipped with slide bottom. We would recommend that boxes and grates be made of cast iron in preference to wrought iron or steel, as the cast iron box can be made much cheaper and will not corrode as quickly.

In case the forge is built up from the shop floor, an ash box should be made of old boiler plate, 12 by 12 by 25 inches, with hole in the top and placed in the bottom of the forge low enough to allow the blast box to project through top of the same, and have sufficient room to operate the slide.

With regard to the economy of the bottom blast tuyere iron, as compared with one having the side blast, I will say that in getting a quicker, better and surer heat, you save a great deal of fuel, in addition to the amount saved in cleaning the fire, as the bank of the fire is not disturbed or broken up while clearing out the ashes. This method when compared with the old method of using a fire shovel, saves at least ten minutes every time it becomes necessary to clean the fire.

* Report read at the N. R. M. B. A. Convention at Buffalo.

The Progressive Smith as a Business Man.—4.

BILLY BUNTZ.

The Blacksmith's Invoice.

The shrewd smith studies his customers and handles them individually, taking into consideration who his customer is, what he does for a livelihood, his standing in the community, and so on.

Harrison H. Smith **Dr.**

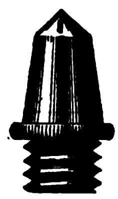
TO

WILLIAM JACKSON,

Expert Horse Shoer,

Established in 1880. **MUNCIE, IND.**

I have made shoeing a study as well as a business and guarantee an absolutely perfect fit.



I put on Never-slip Calks for my customers—guarantee them too. They never do slip

June 10, 1908.

4 No. 6 Shoes,	$ 1	50
Clipping "Fannie,"	1	00
	2	50

Customers are requested to pay their bills within thirty days. After that time unpaid bills are placed in attorney's hands.

While a Christian is a Christian, a rich man oftentimes generous, a gambler usually "a good fellow," a farmer well-meaning, a laborer generally honest—yet in a business way, when it comes to matters of credit or cash, a so-called Christian might "beat around the bush" as hard as anybody, as the application of Christianity depends considerably on whose head it's in. Many a rich man will squeeze the eagle on a dollar until it "screeches." A gambler may pay when he "makes a haul." A farmer may be burdened by owing for his farm. A laborer may mean all right, yet never be able to save the amount of the bill.

In extending credit to customers whom he knows to be worthy, the smith will find it business-like to give them an invoice itemizing the work which has been done for them, as a well-worded and neatly printed invoice is sure to impress them favorably by making them feel that they have been shown special attention, while if it be made attractive by his illustrated business card it will likely be preserved for future reference.

Sample invoices 1 and 2 have several meritorious business features, one being the special advertisement which renders them stylishly attractive. The more ways the smith has for appealing to his customers in matters of business, as well as in performing their work according to their whims, the greater will be his success.

From the samples it will be observed that the *writing* is mostly in *printing*, only the name, date and item of repair being written, hence very little time is required in filling out the invoice. These invoices need not be larger than 5 inches by 7 inches. By seeing these samples any printer can readily set up a neat one, inserting such wording as the smith's individual shop may require; at the same time the smith may run his illustrated business card in the newspaper. The advantages of using it on a letterhead will be dwelt upon in the next number of THE AMERICAN BLACKSMITH.

Sample No. 1 is a combined invoice, collection notice and advertisement. Even though the smith may never force the collection of small debts by action at law, on account of the expense attendant upon legal procedure, yet it is business for him to allow his customers to *think he would do so*, under the plan that a man is persuaded *through his head* much the same as a horse is guided by a bridle. The smith himself should specify the terms, rather than to allow his customers to dictate when they will pay. It is simply studying human nature to anticipate what a debtor might do under certain circumstances, and therefore he gives him proper treatment in advance. Even a reliable debtor might forget to pay, were he allowed to believe the smith "easy of credit" or dilatory in collecting a bill; hence the admonition that bills are placed in attorney's

John E. Gray **Dr.**

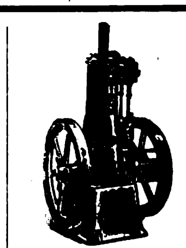
TO

W. E. DONALDSON,

BLACKSMITH,

PORTAGE CITY, WISCONSIN.

Shop driven by power, insuring prompt handling of jobs. All kinds of repairing neatly executed.



I am the agent for this engine. See how nicely the one in my shop runs. Can furnish any size and will set it up free.

December 5, 1908.

Resetting Axle,	$ 1	50
Fifth Wheel,	2	00
	3	50
Second-hand Buggy,	10	00
	13	50

PORTAGE CITY, WIS., Dec. 5, 1908.

Sixty days after date I promise to pay to the order of W. E. Donaldson, Thirteen Dollars and Fifty cents, with interest at ten per cent; value received as per above invoice.

I guarantee payment: JOHN E. GRAY.

S. W. DARMON.

hands is likely to forestall tardiness.

Sample No. 2 is used where the bill amounts to several dollars and the smith wishes to realize cash although his customer asks credit. A little "molasses" should be administered in getting the customer to sign, after which he should be induced to hunt up a surety to guarantee payment, which makes the paper gilt-edged and cashable at the bank.

"See that book!" the smith may exclaim to a would-be debtor, opening his day book at a "salted" page showing a large amount of money owing him. Having impressed his customer, the smith continues.

"You can see that just now I need money to live on. However, I can give you time on your guaranteed note."

Where the smith does work on the assumption that the cash will be forthcoming, but is surprised by the customer saying, "I'll pay you later," he should "corner" him.

"You know I don't doubt your credit," he may say, in a low, confidential tone, "but business has been dull and folks are pressing me for money, so I must have cash or paper I can discount at the bank."

The debtor may try to hedge, but the smith should point his finger at him and not allow him to get in a word edgewise.

"Now, I know you don't want to see me forced to make an assignment—you've always been a good friend."

Then the smith quickly hands him the pencil and the note. Should he refuse to sign he may "jump the debt," therefore the smith should keep at his heels until he gets something out of him. Where a debtor is dunned every day he soon tires. Sometimes a man's wages or an account owing him may be garnished by the smith, although it is best to take whatever he can get rather than to force a debtor by law to pay a small debt.

The smith may use other wording on his invoice, warning his debtors what will become of them should they be neglectful.

Altogether it is business-like to handle customers by giving them an invoice or bill.

(To be continued.)

Table of Tools and Parts Made from Crucible Steel.

Giving Percentage of Carbon They Should Contain, Temper Colors to Which They Should be Drawn and Degrees of Heat for Producing Different Temper Colors.

COMPILED AND ARRANGED BY JOSEPH V. WOODWORTH.

Tool.	Carbon, Per Cent.	Color.	Deg. of Heat. F.
Augers	0.70 to 0.80	Light purple	530
Axes	1.15	Dark purple	550
Arbors	1.05 to 1.10	Brown yellow.	500
Bone-cutting tools	0.80 to 1.00	Very pale yellow	430
Boring cutters	1.20 to 1.25	Straw yellow	460
Butt mills for brass	1.20 to 1.25	Very light yellow	420
Burnishers	1.22 to 1.25	Very light yellow	420
Bending and forming dies	0.90 to 1.00	Dark yellow.	490
Ball bearings	1.20	Very light yellow	420
Ball bearing plates	1.15	Very pale yellow	430
Barrels, gun	0.60 to 0.70	Blue	545
Bits, auger.	0.70 to 0.80	Light purple	530
Bits, axe.	1.10 to 1.15	Dark purple	550
Bits, channeling machine	1.15	Straw yellow	460
Bits, jointer	1.20	Straw yellow	460
Bits, mining.	0.80	Brown yellow	500
Bits, saw	0.80	Brown yellow	500
Bits, scarf	1.22	Straw yellow	460
Bits, tong	1.15	Brown yellow	500
Bits, for stone drilling	0.80 to 0.64	Brown yellow	500
Bits, well	0.80 to 0.84	Brown yellow	500
Bits, plier	1.00 to 1.10	Dark purple	550
Blade, knife	1.15	Straw yellow	460
Blade, pocket	0.90	Brown yellow	500
Blade, reamer	1.20 to 1.22	Straw yellow	460
Bushing, reamer	0.80	Dark yellow	490
Broaches	1.15 to 1.20	Straw yellow	460
Carver, blades	1.00 to 1.10	Dark yellow	490
Cams with sharp corners	1.15	Very dark blue	601
Centers, lathe	0.80 to 0.90	Dark yellow.	490
Chasers	1.15 to 1.22	Straw yellow	460
Chisels for wood	1.20 to 1.22	Spotted red-brown	510
Chisels for cutting files	1.20	Light yellow	440
Chisels, clay	0.80 to 0.90	Blue	545
Chisels, for hot work	0.60 to 0.70	Blue	545
Chisels, railroad track	0.85	Dark purple	550
Chisels, blacksmiths' cold	0.85	Dark yellow	490
Chisels, stone cutters'	0.80 to 0.85	Dark purple	550
Chisels, brick	0.60 to 0.70	Dark purple	550
Chuck jaws	1.20	Dark yellow	490
Circular saws for metal	1.60	Light purple	530
Claw bars	0.65 to 0.75	Light purple	530
Cold chisels for steel	1.20	Light purple	530
Cold chisels for cast iron	1.05	Dark purple	550
Cold chisels for wrought iron	1.10	Light purple	530
Collets	1.20	Dark yellow	490
Coppersmiths' tools	0.95 to 1.05	Light purple	530
Cutters, flue	1.20 to 1.25	Dark yellow	490
Cutters, glass	1.20 to 1.25	Light yellow	440
Cutters, milling	1.20 to 1.25	Straw yellow	460
Cutters, nail.	1.20 to 1.25	Dark yellow	490
Cutters, corn stalk.	0.80 to 1.00	Straw yellow	460
Cutters, pipe	1.18 to 1.20	Dark yellow	490
Cutters, tong	1.20 to 1.22	Dark yellow	490
Cutting tools for iron	1.05	Light yellow	440
Dental and Surgical instruments	1.22 to 1.25	Light purple	530
Dies, bolt	0.60 to 0.70	Brown yellow	500
Dies, blanking (bottom dies)	0.85 to 0.90	Straw yellow	460
Dies, cartridge shell	1.20 to 1.22	Very light yellow	420
Dies, cutlery	0.60 to 0.85	Brown yellow	500
Dies, drop forging	0.85 to 0.90	Brown yellow	500
Dies, drop forging, for knives	0.68 to 0.78	Dark yellow	490
Dies, envelope	1.15	Straw yellow	460
Dies, for pointing machine	1.15	Very pale yellow	430
Dies, glove	0.85 to 0.90	Dark purple.	550
Dies, hammer	0.67 to 0.78	Very pale yellow	430
Dies, horseshoe (cold punching)	1.20 to 1.22	Straw yellow	460
Dies, large cutting	1.15	Straw yellow	460
Dies, large press forging	1.10	Dark yellow	190
Dies, lever link	0.85 to 0.90	Brown yellow	500
Dies, nail	1.15	Straw yellow	460
Dies, paper cutting	1.15	Pale yellow	430
Dies, pipe	1.15 to 1.22	Straw yellow	460
Dies, rivet	0.60 to 0.70	Dark purple	550
Dies, silver spoon	0.85 to 0.90	Straw yellow	460
Dies, silversmiths'	1.15	Dark yellow	490
Dies, tong	1.10 to 1.18	Dark yellow	490
Dies, wire drawing	1.20 to 1.22	Straw yellow	460
Drawing mandrels	1.20	Very light yellow	420
Drifts	1.20 to 1.25	Brown yellow	500
Drills for tool steel	1.15 to 1.20	Straw yellow	460
Drills for boring shotgun barrels	1.10	Dark yellow	490
Drills for glass	1.22 to 1.25	Tinge of yellow	410
Drills, quarry	1.10 to 1.18	Light purple	530
Drills, twist	1.20 to 1.22	Straw yellow	460
Driver, screw	0.60 to 0.70	Dark purple	550
Drills for brass	1.22	Straw yellow	460
Edging cutters	1.15	Light purple	530
Embossing dies	1.22	Light yellow	440
Firmer chisels	0.90 to 0.95	Dark purple.	550
Flat drills for brass	1.20 to 1.25	Brown yellow	500
Flat drills for steel and iron	1.15	Straw yellow	460
Flatters	0.60 to 0.70	Brown yellow	500
Framing chisels	1.05	Dark purple.	500
Gauges	1.05 to 1.15	Brown yellow	500
Gimlets	0.85 to 0.95	Dark purple	550
Grips for tube work	0.85 to 0.90	Dark purple	550
Hack saws	1.05	Brown yellow	500
Hammer, bush	1.25 to 1.30	Brown yellow	500
Hammer, blacksmiths'.	0.67 to 0.78	Straw yellow	460
Hammer, bush for granite	1.15	Brown yellow	500
Hammer, ball peen	0.80 to 0.85	Straw yellow	460
Hammer, faces	1.05 to 1.10	Very pale yellow	430
Hammer, machinists'	0.90 to 1.00	Very light yellow	420
Hammer, nail machine.	1.05 to 1.10	Straw yellow	460

(To be continued.)

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HEATS SPARKS WELDS

A bright New Year to the blacksmith.

How do you like our handsome calendar?

Be sincere in order to win the truest respect of people.

Down your way is business brisk? Keep your customers awake by advertising.

Now's the time to install system, and carefully note results through the whole year.

A good time to open up new side lines—now when business is lively and the year just new.

Many subscribers are taking advantage of the long time rates to pay their subscriptions several years ahead.

A cheery word goes a long ways in a care-worn world. Make it a rule to have a little sunshine always stored with you.

Don't forget the apprentice; you had to learn your trade once. Put yourself in his place, and lend him a helping hand occasionally.

The biggest mistake ever made by a business man is that of allowing accounts to stand—but this subject has been already talked threadbare.

Grit is the thing that counts. Brains, education, money, influence—all fail to help a man to success if he has not that force of character known as grit.

Large forge shops often sadly lack light and ventilation. Most up-to-date ones are installing systems that carry off all smoke. That improves the lighting too.

A lien law. Do you want one in your State? Will you do just a little to help the cause along? Read what is said about the Lien Law movement in this issue, then act.

Adaptability is the best possible substitute for ability. The man who is not capable of originating an idea may, at least, devote his time to carrying out the ideas of other men.

Grains of sand make up the ocean bed, but each grain is very small in itself. A few cents' advance in price on every piece of work done soon counts up to a nice round sum—absolute gain.

The best way is the one by which a thing is done as well as possible with the least expenditure of time and labor. No method is perfect that does not fulfill these conditions

Standing room only is an appropriate sign for shoeing shops these slippery winter mornings. Horses standing round by the dozen waiting to be sharpened—busy times for the smith!

One asset of the expert mechanic is his store of experience. This he invests in the business, and should make it count in his profits. If he does not, that part of his capital is drawing no interest.

A customer knows what he wants done—or thinks he does. Never allow him to get the idea that you slight his opinion. Talk him out of his error, gently and tactfully. Time thus spent is not wasted.

Frozen out of the trade are many of the men who have worked for cheap John prices. This is cold weather to be out in, and the smith of any degree of wisdom will put up his prices rather than go out.

Hundreds of dollars are lost by countless blacksmiths every year because of bad debts and dead beats. Have you looked into the Lien Law matter and figured how much money it would save you?

Want a calendar? Then be sure your subscription is not in arrears. Not quite too late to tend to this and get the calendar Treat a subscription bill for your trade journal as you like to have others treat your bills.

Kindness and gentle treatment are the rule in breaking in horses now-a-days. Even on ranges the old cruel methods of breaking in horses are being abandoned. The damage done horses by severe methods is being realized by owners.

Good-natured rivalry is a good thing in any trade. No business that keeps up a lively competition can ever stagnate. Two blacksmiths in the same neighborhood, by a mutual understanding, can get up a competition that will prove a benefit to both.

Too much caution may get in the way of advancement. Some people are so afraid of new things—so cautious about accepting anything new—that they go through life in a rut. There's no harm in trying, and it is always possible to return to the old if the new proves unsatisfactory.

Snowed under with work is a state many blacksmiths get into during the rush season. It is bad policy to keep people waiting on you. A wise man will have tools and appliances to handle the maximum amount of work that may come at any time, and call in extra help if necessary.

Shoes that stay on too long are very injurious to a horse's feet. The hoof overgrows and leads to innumerable evils. Yet the smith is blamed if the shoes do not stay on long and is condemned when the horse's feet become lame from too long growth. This is a paradox that confronts the horseshoer.

Some of the best of our prize contest articles are published this month—not all. There so many excellent things about carriage and wagon work in the articles received, that we shall continue to publish them for several months to come. Practical information, all of it—don't miss a single article.

A good fighter is worthy of admiration, and he gets it. The man who stands and meekly takes whatever comes his way is likely to get just what he doesn't want. What's more, the very people from whom he takes it will say he has no grit. The blacksmith, like everybody else now-a-days, must fight for his rights.

As an example of what others think of THE AMERICAN BLACKSMITH, it may be mentioned that within the last ten days no less than twenty-one clubs of subscribers to the paper have been sent in to this office, ranging in size from five subscriptions apiece up. Blacksmiths can do their brother craftsmen a good service by calling their attention to THE AMERICAN BLACKSMITH.

Don't lose faith in your own work. Always believe that you can and will accomplish something in the world. This feeling inspires others and their opinion of you goes up. "Give a dog a bad name and hang him—"is a proverb that works both ways. Give a man a good reputation and with a little care it will last him as long as he wants it. Every man's reputation lies in his own hands.

The old proverb that "honesty is the best policy" is a good one at all times. The step from meanness to absolute dishonesty is so short that the man who is capable of small acts very readily develops into a dishonest man. A reputation for open-handed integrity is worth many times the amount that may be added to the income of a business man by twisting a principle to fit his own gain.

A true balance of work and play is the only sure means of making the best of life. The man who overworks is using energy that belongs to the future, and the time will come when he will find himself bankrupt, mentally or physically, with no satisfaction, either of having seized any pleasure while he was able to enjoy it. On the other hand, the man who idles his time away never develops his best faculties nor his capacity for enjoying well-earned recreation.

A Bugbear—Is that your opinion of a system of books? Many smiths think thus, and there is some reason behind it. A system of any kind should have for its object the simplification of business, and is only useful where it fills this bill. A plain, practical set of books, containing all necessary information and no unnecessary complications cannot but help any business man, first, by saving time in hunting up and reckoning accounts, secondly, by saving endless worry, and thirdly by giving an air of business to the establishment and inspiring confidence in customers.

Cinder in the eye is a common ailment with the man at the forge, but the average smith knows how to get rid of it. A far more wide-spread complaint, and a more fatal one is the total lack of foresight which the average blacksmith exhibits. Instead of taking steps to combine for his own interests, he plods along, cutting his neighbors' prices and his own income. Instead of being brother craftsmen, standing shoulder to shoulder to meet the high living expenses, they become rival craftsmen ready to tear one another to pieces—in reputation at any rate. Such smiths are totally blind to their own interests.

For defective hoofs, a remedy, says a contemporary, is a compound of gutta percha cut into pieces the size of a hazelnut and mixed with an equal proportion of gum ammoniacum and melted in a vessel of tinned iron until thoroughly mixed. The substance then has the color and appearance of chocolate. It can be softened and moulded to any form and applied to the hoof, to which it sticks firmly. Too low a wall may be built up with this artificial horn, or lost portions restored. In sand cracks it closes up the orifice and keeps out dirt. For dropped sole, to raise the bearing surface of the wall in seedy toe, or when the frog is atrophied, this substance is useful.

Tom Tardy was thoughtfully scratching his head when we dropped in the other day to wish our worthy friend the compliments of the season. "Thet there hoss has well nigh drove me crazy. What's the matter? Matter enough. The darned old critter have just made up her mind to cut herself spite o' everything. I have shod her high in front and high behind, high on the outside, high on the inside, heavy outside and heavy inside. and each time she hits worse 'an ever. Tried all the ways I knows on, but ain't no use. Why don't I look for the cause? Don't know as there is any cause. Just hits anyhow."

We asked Tom why he didn't get some books or take good papers and read up.—"I don't take no stock in books—never was much on reading nohow."

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American Association of Blacksmiths and Horseshoers.

Movements of far-reaching Importance.

It is gratifying to be able to report substantial progress towards the ends for which the above association was formed. Every blacksmith, horseshoer and wagon maker, who has his own personal advancement at heart, who thinks that his skill and labor ought to bring him more of the comforts of life, or who is interested in bettering the conditions of his craft as a whole, every such mechanic should follow closely the efforts of The American Association to bring about some much-needed reforms. Further than this, every craftsman should give his earnest sympathy and support, because the work is being done in his interest, and will be of the greatest benefit to him if successful.

State Lien Laws.

The efforts which have been made for some time past by the Association to secure State Lien Laws for blacksmiths and wagon builders are at last beginning to bear fruit. At the next session of the legislature in a number of States a lien law bill will be introduced. This bill has been carefully prepared by the American Association, in conjunction with its attorneys. As drafted, it provides that any blacksmith or wheelwright who has furnished materials or labor in shoeing an animal or repairing a vehicle may file a lien which will hold the animal or vehicle as security to satisfy his claim against the owner. The lien may be filed at any time within six months of the last item of the account and may cover a period of eighteen months' work.

Think how much money such a law in your State would add to your income yearly. It would be worth from one to four hundred dollars to you to be able to collect all the money you earned, that you now lose, and it would enable you to take work unhesitatingly from men that you don't feel like trusting now. Will you support the lien law movement in your State and do your part to get the bill passed? Your aid will count, and it is needed, and best of all not a penny's contribution is asked of you. Write to The American Association or THE AMERICAN BLACKSMITH at Buffalo, N. Y., and you will be told what you can do in your State to help the good work and aid in securing this much-needed legislation.

The New York State Lien Law Bill.

Senator George A. Davis, of Lancaster, N. Y., early in December personally assured a representative of The American Association that he would attend to the introduction of our lien law bill early at the coming session of the New York State legislature and would use his earnest efforts to secure its passage. The American Association and The AMERICAN BLACKSMITH will do everything that is possible to aid the good cause. It will be necessary to have the aid, however, of the craft for whose benefit it is intended. Not much is asked, but every one should do the little that is asked and do it at once. We must leave no stone unturned to get the law passed.

Let every single blacksmith, horseshoer and wagon maker in New York State, whose eye meets these words, remember what a great thing such a law would mean for him, and then let him sit down and write a short, strong letter to his representatives in the State legislature, urging and requesting them to vote in favor of the bill when it comes to a vote. If by any possible chance these Senators and Assemblymen can be seen personally, then by all means call upon them, either alone or with your brother smiths, and urge them to give their vote for the lien law bill. New York State smiths should also spread the news of the bill to as many of their brothers and neighbors as they can possibly write to or call upon, and have them do the same thing. Get every one of the craft in the State interested and working for the bill, and it should be a law within a very few months. If you are a New York State blacksmith or wagon man, and if you think the money you now lose on bad debts is worth saving, then do *at once* the little that is thus asked of you. Write the letters and make the calls the very day you read this.

Those in other States who are interested in this lien law movement and realize the saving it would mean for them, should drop a postal, to-day if possible, for further information, addressing The American Association of Blacksmiths and Horseshoers, and they will write to you in detail.

LOU DILLON.

THE FIRST HORSE TO TROT A MILE IN TWO MINUTES. RECORD MADE AT READVILLE, MASS., AUGUST 24, 1903.

Movement for Better Prices.

Under the auspices of The American Association, blacksmiths and wagon builders in numbers of counties in many different States are now engaged in forming themselves into associations for mutual advantage, better prices and other benefits. They are organizing according to plans furnished by The American Association, and encouraging reports as to the progress of the work in new districts and the success of county associations already formed, are constantly coming in. We would like to see every single county in each State organized, and are only too ready to

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lend our assistance. Owing to lack of space a fuller description of the better-price movement will have to be postponed until next month's issue of THE AMERICAN BLACKSMITH.

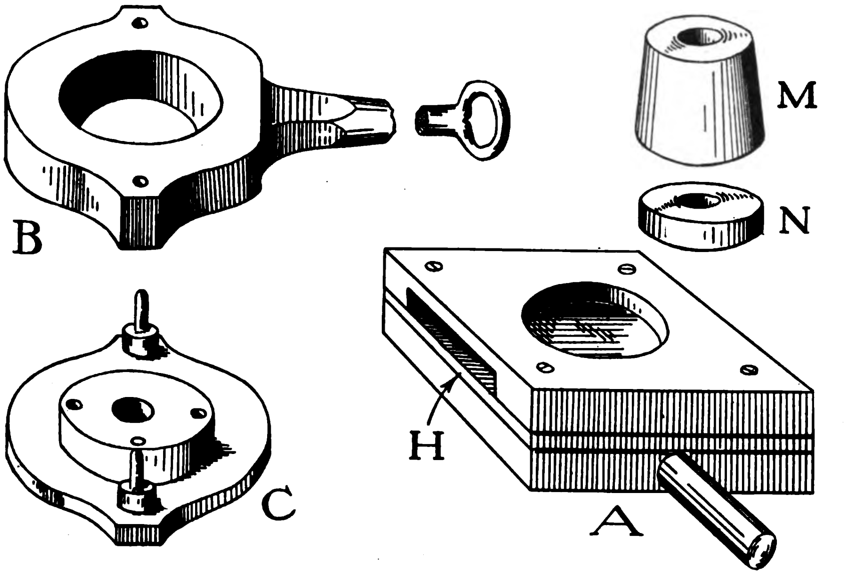

Fig. 60. TOOLS FOR PUNCHING OUT DIFFERENT SIZES OF WASHERS.

The Railroad Blacksmith Shop.—15.

W. B. REID.

Tools in the Blacksmith Shop.

A set of round punching tools for different sizes of washers will be found very useful in the blacksmith shop. They may be made entirely of mild steel, or if available, cast steel plates as shown at H, Fig. 60, rivetted between top and bottom parts of iron, make very durable tools; especially where many mild steel washers have to be punched. M is the punch; N the bottom plate, used when the hole in centre of washer has to be punched. The holes in the punch and plate should be as large as possible. This permits the punching of different sizes of holes in washers, by the insertion of improvised close fitting bushings of steel boiler plate, or ones more substantially finished by machine.

At B, Fig. 60, is shown a cutting tool for the larger sized crank-pin washers 6½ to 7½ inches in diameter. The shape of this tool is incidental to the fact of its being made from the end, or head, of an old, steel side-rod. The handle is drawn down from part of the centre of rod. The two oil cup projectors upon the sides serve naturally for the dowell pin holes. The punch C, Fig. 60, is made in two parts. The larger plate of iron, with a steel disk of sufficient thickness rivetted to it. The dowell pins are turned with small collars, as shown, to prevent the punch from descending too far beneath the necessary shearing point. When cutting crank-pin washers with hubs, or bosses upon them, a plate with hole as large as the boss fits into bottom of tool, (B, Fig. 60). This acts as a guide to hold the boss of washer central with its outer circumference. This plate is allowed to drop out when the punching process is half completed.

Spring gibs or keys are articles of constant requirement in the railroad blacksmith shop. At A, Fig. 61, is shown a large gib 4″x2½″x⅞″ used on heavy engines. These are stamped out in a tool of similar construction to A, Fig. 60. Band C, Fig. 61, are the cutting tool and punch used. From five to eight pieces can be punched from the bar in one heat with this tool. At D, Fig. 61, are shown the swedges for rounding the edges of a gib. The swedges are turned out to show their construction.

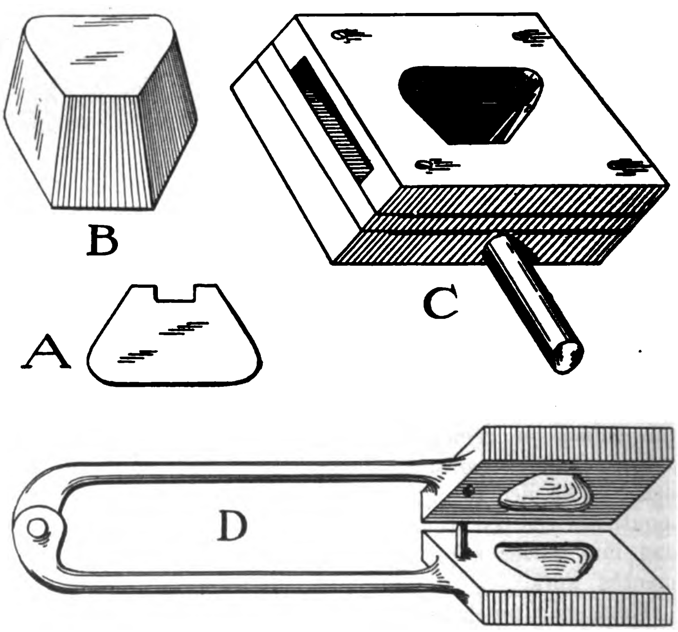

Fig. 61. STAMPING OUT, AND ROUNDING EDGES OF GIBS.

At F and H, Fig. 62, is shown a tool for putting hanger slot in gib, after being rounded in the swedge. The sectional view of this tool will show its construction and operation (E, Fig. 62). The small cast steel pin, G, fits tightly in bottom of F, projecting upward as shown in section, and intercepts the gib when forced downward by the blow of hammer, thereby forming the slot in gib. By this method an exceptionally well formed gib is made.

With regard to eye-bending devices a tool of this kind for turning round eyes is probably an easier proposition than one for forming perfect ovals, such as are desirable for making handles for locomotive fireman's rakes, hoes, etc.

At Fig. 63, is shown a hand tool for this purpose, which works admirably, although probably of an odd, unusual style.

The sketch shows a plate 20″x18″x1″ to which the handle former A, and the backstop opposite N are rivetted. The lever B is held permanently in place, and revolves upon a pin with nut on top as shown. The pin in point of lever C is rivetted in the lever itself to permit the removal and placement of the lever as required.

The movements of the levers are shown by the dotted lines in sketch. At M, the lever B is at first position, with the rod also in position for bending. A movement to the left forms the half bend in long end of rod. Releasing the lever the piece N is slipped in place, thus holding the iron against the backstop, while the lever is swung around to position X, carrying the iron with it. The lever is held here, by a pin inserted in hole shown at corner of plate. Then the lever C is put in place at Y, and carried around to position C, completing the operation. The handle is then slipped easily off the "former," which is tapered upward.

The levers are 1½ inches thick at the working parts, tapered to ⅞ inch at the

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ends. When in use the tool is bolted to a face plate convenient to small furnace in which the rods are heated. Two men can form eighty ¾-inch handles in an hour, with this humble machine.

In closing the subject of tools, we trust enough has been shown to demonstrate the possibilities of facilitating the work of the blacksmith shop by means reasonably within reach of all. The adaptability of such contrivances need only be limited by the requirements, and as said at the outset, by the ingenuity and resourcefulness of the blacksmith. To the small, average railroad shop, such tools will prove invaluable. To the larger and better equipped shop, much has been said that will prove valuable. In making tools and appliances for every other department, the blacksmith foreman too often thinks he has not time to make tools for himself. This is generally a mistake. In the busiest shops, it will pay to reserve a good man for making and repairing tools for the blacksmith shop.

(The end.)

Prices in the Oil and Gas Belt of Southeastern Kansas.

ED LANDER.

Wagon tongue put in	2.25
Buggy pole	2.25
Circle put in	$0.75 to 1.25
New shaft	1.00 to 1.25
Crossbar	65 to .75
Singletrees	35 to .50
Wagon axles	2.50
Bolsters, old irons put on	1.25
Sand boards, old irons put on	1.25
Bow sockets	.50
Buggy or spring wagon beds, $5.00 and up.	

Steel and How to Treat It.—8.

JOSEPH V. WOODWORTH.

Effects of Uneven Heat.—Lead Heating.—Quenching.

To demonstrate the effects of uneven heating in hardening we shall take as an example the cutter blade shown in the sketch, and harden it. We shall have to handle it while in the fire so that the thinnest portions will not reach the hardening heat before the thick portions. If this is not done, the tool will come through the process bent or warped; this coming about, not through the difference of temperature of the different portions, but through the more solid parts being too strong to permit expansion; and when expansion is at length accommodated it has been at the expense of the thin or frail portions.

In the second figure we have a die that is much thinner on one side than on the other. We take this to harden and heat it between the thin and the thick sides to a cherry red; while the sides are barely red hot and the center a cherry red, the latter will be the weakest, and will give way most to accommodate the expansion, as the strength due to its sectional area has been overcome through the reduction in strength due to its increased temperature. Thus the

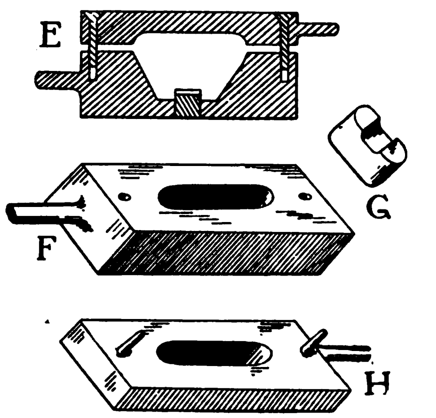

Fig. 62. PUTTING HANGER SLOT IN GIB AFTER BEING ROUNDED IN THE SWEDGE.

necessity of heating a tool according to its shape and size is obvious, and the aim should be to heat it evenly, all over, taking special care not to get the thin parts hot first.

When a large tool is to be hardened the thin parts may be covered partly during the first heating with ashes. However, when the piece is of equal section area all over, it will be necessary to manipulate it in the fire to get the uniform heat all over. In both cases care must be taken not to heat the steel too quickly, unless it is wished to leave

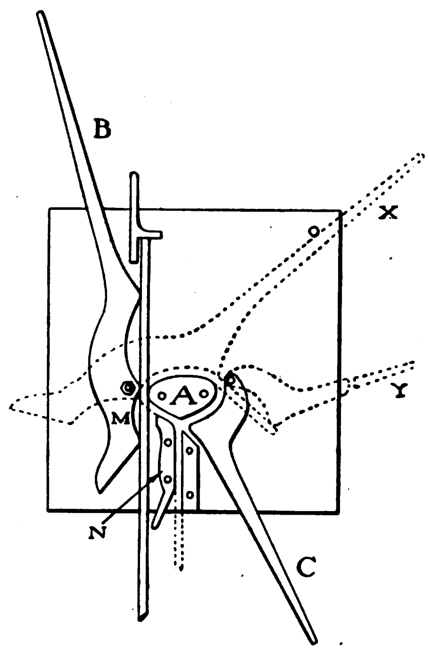

Fig. 63. A GOOD, SERVICEABLE EYE-BENDING DEVICE.

a soft core in the center, which is often desired in tools. Often the outside of tools are heated more than the inside so as to modify the tendency to crack from contraction during the cooling.

An important factor in heating steel in the open fire for hardening is the size of the piece. This is because decarbonization occurs, and the smaller the sectional area of the tool the quicker the decarbonization takes place. In large pieces and tools the decarbonization from one heat will not be sufficient to hurt the steel much, but if the tool has to be heated often the constant reheating will surely spoil it. To prevent decarbonization in the open fire, charcoal is often used, and when there is much hardening done it is good practice, as a few pieces of charcoal can be placed on the fire at a moment's notice. Green coal should never be used for heating for hardening; a coke suitable for the process should be made and always kept on hand. To make the coke, build a large fire of small soft coal well wetted and banked up on the fire, and then make vents for the blast to find egress. When the gas is out of the center and the coal has caked, break it up in chunks and burn the gas out of the outside. Place the coke where it will be handy for use. Good blacksmiths always keep a supply of the coke on hand and use it for welding and annealing heats as well as hardening ones.

There is a large class of work which can be best heated for hardening in red-hot lead. It is a very rapid and satisfactory method for all small tools and parts. What makes the lead particularly valuable for heating accurately small parts is that a uniform heat can be applied without danger of burning or scaling the outside before the center is heated.

When heating in lead a graphite crucible placed so that a uniform heat will be maintained beneath and around the pot will prove the best. As to the lead to use, care must be taken to get a brand with as little sulphur in it as possible. Never use scrap lead, as it will ruin the steel. Chemically pure lead should always be used.

There are a great many compounds in use to prevent the lead from sticking to the work. One of the best is following: One pound of powdered cyanide of potassium dissolved in one gallon of boiling water; allow to cool, and then dip the articles to be heated in the solution, remove and allow to dry thoroughly before putting them into the lead. Moisture will make the lead fly.

Small articles of an even size and thickness throughout can be put into the lead cold, while irregular pieces must be heated nearly red before put-

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ting into the lead, in order to prevent unequal expansion.

By keeping the surface of the lead covered with broken charcoal, drops will be prevented from forming. After the heating has been concluded, empty the crucible.

To get good results when hardening in lead, stir the liquid occasionally so as to equalize the heat, as the bottom will always be hotter than the top. When tools or parts with fine projections or teeth are heated, use a stiff brush and clean off any particles of lead which may stick in them before quenching. This is necessary, for steel will not harden where lead has stuck to it, as the spots do not come in contact with the bath.

Very often the steel worker is confronted with a piece with a hole in the center that is required to be hard around the outside and soft around the hole, or a punch is required to be hard at both ends and soft in the center. To accomplish these results with ease use clay in the following manner: When the stock around the hole it to be left soft and the outer edges of the piece hardened, fill the hole with clay and pad it at both sides, then heat the piece and plunge it into the water. When cool, remove the clay and the stock around the hole will be found to be soft while the edges will be as hard as required. To harden both ends of a punch and leave the center soft, put a bandage of clay around the center, or desired soft portion about ¾ of an inch thick, and bind it with a piece of thin sheet metal. Heat and quench, and the desired result will be accomplished.

When hardening die plates or other tools in which there are holes near the edges, fill them with clay before heating and the tendency to crack will be overcome. When the holes are not filled with clay (when the steel is quenched) steam generates in the holes and cracks start, or excessive warping occurs, due to the fact that the steam does not escape fast enough and the contraction of the metal is unequal.

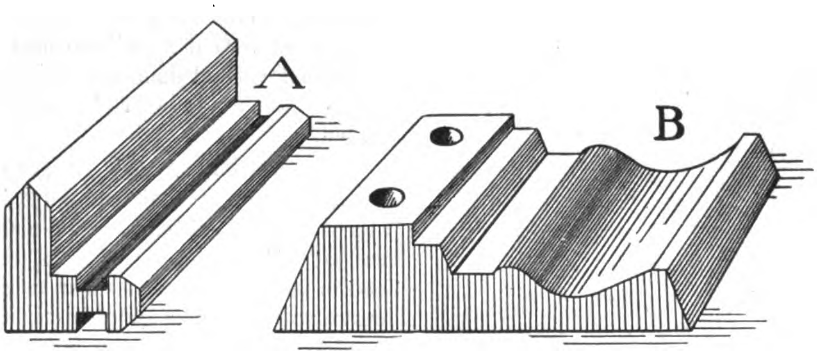
Next to the proper heating, more depends upon the proper quenching than anything else. Of course the effect, use and good qualities of the various kinds of baths should be understood. The most generally used bath is cold water, though not infrequently salt is added or a strong brine is used. The following will be found to answer well for the work mentioned. For very thin and delicate parts, an oil bath should be used for quenching. For small parts, which are required to be very hard, a solution composed of about a pound of citric acid crystals dissolved in a gallon of water will do. For hardening springs, sperm oil; and for cutting tools, raw linseed oil will prove excellent.

Boiled water has often proved the only bath to give good results in a large variety of work, the parts requiring hardening being heated in a closed box or tube to a low red heat and then quenched. Sometimes the water should be boiling, at others quite hot, and then again lukewarm. Experience will teach the operator which is the best for special work. If a cutting tool such as a hollow mill, a spring threading die or a similar tool is to be hardened in a bath of this sort, dip it with the hole up, or the steam will prevent the liquid from entering the hole and leave the walls soft. A tendency to crack will also prevail if this is not done. The generation of steam must be considered when hardening work with holes or depressions in it, and attention must be paid to the dipping of the part so as to prevent the steam from crowding the water away. Clean water steams rapidly, while brine and the different solutions do not.

I have heard a great deal about hardening fluids, for which it is claimed tools can be hardened better than in water or in brine. Such fluids are composed chiefly of acids and will rot the steel, and I should advise keeping away from them, as where it is not possible to harden tool steel in clear water or strong brine, the steel is useless and should be dispensed with. When quenching the heated steel dip down straight and don't shake it about but after keeping it stationary for a few seconds, move it around slowly, keeping it vertical all the time. When the tool is of an intricate shape, about three inches of oil on the top of the water will toughen it and contribute to helping the steel retain its shape while hardening, as well as prevent it from warping or cracking during the process. Lastly, immediately after hardening and before tempering, the steel should be placed on the fire and slightly warmed, to take the chill and contraction strain out and not laid aside for a while, as I have seen tools that were laid aside after hardening, after a few hours, show cracks.

The cooling should be performed with a view to prevent the contraction of the metal from warping the weaker parts. Water for cooling must be kept clean, and in that case becomes better from use. It may be kept heated to about 100° F., which will diminish that risk of having the articles crock. Corners should be made as rounded as possible. If the water is very cold, and the heat hence extracted very rapidly from the outside, the liability to crack is increased; in many cases the water should be heated to nearly the boiling point, so as to retard the extraction of the heat. Since, however, the hardening of the steel is due to the rapid extraction of its heat, increasing the temperature of the water diminishes the hardness of the steel, and it is necessary to counteract this effect as far as possible, which is done by adding salt to the water.

All articles that are straight or of the proper form after leaving the fire should be dipped vertically and lowered steadily into the water; and if of weak section or liable to crack or warp, they should be held, quite still, and low down in the water until cooled quite through to the temperature of the water. If the article is taken from the water too soon, it will crack, and this is a common occurrence. Pieces of blade form should be dipped edgeways, the length of the article lying horizontally and the article lowered vertically, and held quite still, because by moving it laterally, the advancing side becomes cooled the quickest, and warping and cracking



EFFECTS OF EVEN (A) AND UNEVEN (B) HEATING IN HARDENING, OF IRREGULAR SHAPED PIECES.

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may ensue. Straight cylindrical pieces should be dipped endwise and vertically. When, however, the dipping process is performed with a view to leaving a sufficient heat in the body of the article to draw to a lower temper the part dipped, the method of proceeding is slightly varied.

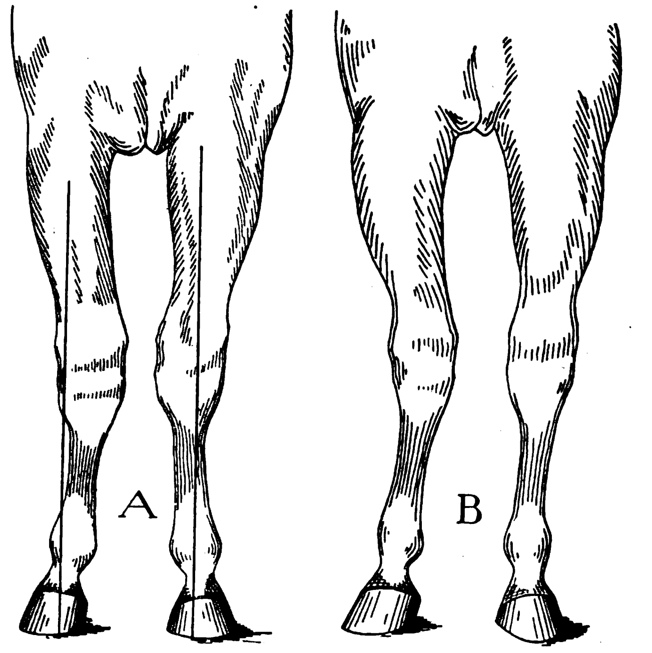

Fig. 5. TWO EXAMPLES OF SHIN HITTERS. A—CALF-KNEED. B—CALF-KNEED, HAVING ONE FORE LEG SLIGHTLY TOE-WIDE.

Often when tool steel is bought, special instructions will be given as to the method of hardening and tempering it. Sometimes these instructions are followed out, and oftener they are not. Now in all cases where such instructions are given, don't forget to go by them, otherwise do not buy that brand of steel; but instead secure a brand which you can harden as you think best. There are various brands of steel on the market which are used for a number of special purposes and which possess qualities which other brands do not (in regard to cutting at high speeds, removing large amounts of stock, etc.) which require hardening at special temperatures.

(To be continued.)

Power in the Shop.

BY B. W. B.

The question often arises in the mind of the blacksmith, whether to put power in his shop or not, and if so, what kind. The writer would like to give brother blacksmiths his experience and conclusions upon this important subject.

The matter of putting in power or not is in the same class as questions about putting in new tools and improving the shop equipment. Now anything which will enable a blacksmith to turn out more work adds just so much to his income, and no live shop ever hesitates about putting in a new tool which will mean more work, or better work commanding a higher price. The question simply is, will not the extra profit on such a tool pay for itself in a reasonable time, and from then on help make clear money for the smith?

And so it is with the power question. The amount of money which one man can make by his hand labor and skill has a limit. When a smith reaches this limit, where he can earn no more, no matter how hard, how long or how skillfully he works, then the only way for him is to resort to other means for turning out more work. The commonest, perhaps, is by putting helpers or other workmen in the shop on salary. Another way is by putting in power. With an engine, a man can accomplish far more, do better and heavier work, increase his income just as far as he can draw trade and provide the machines to turn it out. The cost of running an engine being but a small item, it only remains for the smith to figure out if the profit on the extra work that it makes possible would not in reasonable time pay for the machine. He should remember that such enterprise on his part draws trade, and that his business must either go forward or backward. An engine is a by step in advance. Blacksmiths in every part of the country are testifying to the advantages of power in the shop.

As to the kind of power, the writer thinks the vote overwhelmingly in favor of the gas engine. It is just an ideal power for the small shop. The reliable gas engines on the market to-day are simple, require little attention, are safe, take up little room, consume but little fuel and are complete in themselves. They can be started or stopped just when the smith needs the power, and are altogether the most satisfactory form of power for blacksmith or other small shops. The writer has never heard of a blacksmith, who wanted to do without power once he had put it in.

The Practical Scientific Treatment of Interfering Horses.—2.

S. W. PERRIN.

Shin Hitters.

Shin hitting consists in the animal striking the cannon bone or shin with the opposite foot. The blow causes soreness, and sometimes lameness; usually only one leg is affected. Occasionally a horse hits the shin with one foot and the fetlock with the other. In shin hitting as with all other kinds of interfering, reason suggests a careful analysis of causes.

Causes:—The shin hitter has one or both legs toe-wide. It frequently happens that the calf-kneed horse is a shin hitter, see A, Fig. 5. I have three horses in Little Rock, each having one fore leg slightly toe-wide with its fellow toe-wide and calf-kneed, see B, Fig. 5; and all three horses are shin hitters.

Treatment:—Protect the injured part with a boot, until you know that your patient is going clear. Study your case very carefully with a view to ascertaining the cause; then endeavor to prepare the hoof to conform to the limb. With horses of the conformation corresponding to A, Fig. 5, the hoofs should be left high on the outside, and should be shod with shoe shown at

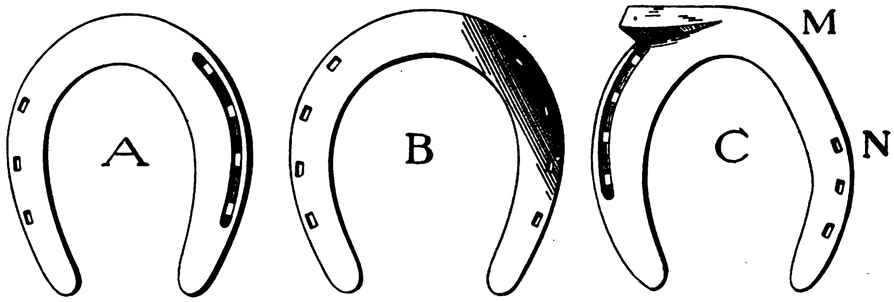

Fig. 6. EXCELLENT STYLES OF SHOES FOR PREVENTING SHIN HITTING.

A, Fig. 6, which has an outside weight. With horses of conformation corresponding to B, Fig. 5, the left foot should be high on the inside, with the outside quarter rolled, and use shoe

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shown at B, Fig. 6. And on the right foot leave the outside high and use shoe C, Fig. 6, fitted close between

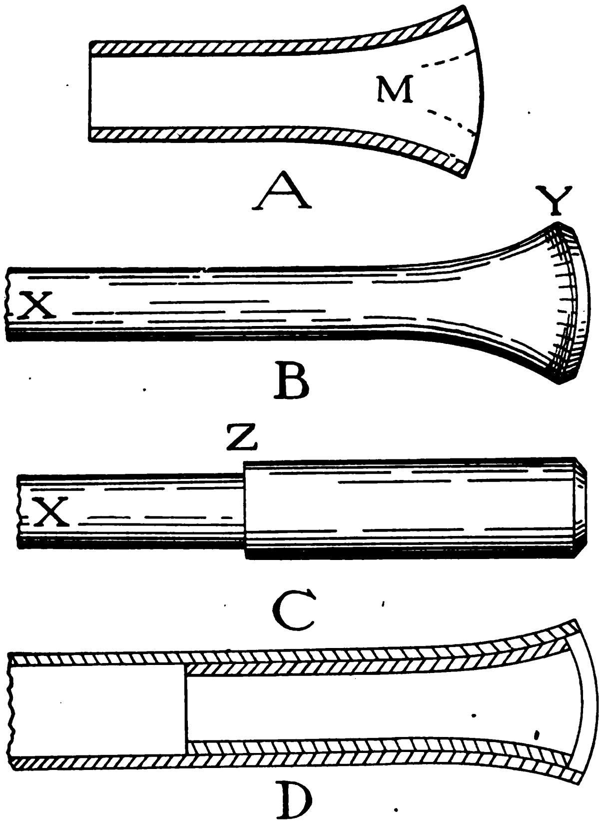

Fig. 1. WELDING AND SHAPING THE PARTS FOR SELF TURNING JARS.

M and N, at which point some of the outer wall may be rasped away.

It should be remembered that horses of such conformation as A and B, Fig. 5, travel dangerously close at best, and it takes but little to make them interfere. Even a corn, thrush in the frog, a splint, ring bone, or side bone, or any thing which causes pain in the foot or limb, may so interfere with the regular movement as to cause such horses to hit. And wherever there is pain in foot or limb, causing interfering, you can hardly hope to prevent it until the cause is removed. If you are in doubt as to conformation, (and I admit that it takes an accurate eye to detect differences in conformation of limbs) and your patient has plenty of hoof, take off the shoes, remove the sharp edge of the outer wall with the rasp, so as to leave a round edge that will not chip. Then use the horse for a few days without the shoes, taking care not to let him get foot sore; the hoofs should be watched closely each day to see that they are not chipping or wearing dangerously close. If the horse goes clear without the shoes, then shoe him with a light plain shoe, with only enough metal to protect his hoofs from wear. In this case *don't* level or rasp the ground surface of the hoof, but bend the shoe to that form which nature has worn the ground surface of the hoof, for if your horse goes clear without the shoes, he will with them, provided you do not change the shape of the plantar surface of the hoof, and do not burden the limb with too much weight.

(*To be continued.*)

Making a Pair of Self Turning Jars.

L. R. SWARTZ.

The following is my plan for making a pair of 5-inch self turning jars for drilling tools, to be used in a 5½-inch hole or larger. For building a pair of such jars the following stock will be required.

One taper joint (box and pin) 2 x 3 inches, standard size.

One piece hydraulic pipe 5 inches external diameter, 3½-inch base by 3 feet long.

Two pieces hydraulic pipe 3½ inches external diameter, 2-inch base by 9 inches long.

One piece mild steel shafting 2 inches or 1$\frac{5}{16}$ inches round by 33 inches long.

heated, also to flare out the end of the pipe to as near the same taper at the upset end of the shaft as convenient. If you should get the pipe flared a trifle too much, slit the end of pipe in three or four places as indicated by the dotted lines at M, Fig. 1. The pipe should not quite reach over the flared end of shaft when slipped over end (X, Fig. 1) of shaft, but reach the point Y within ¾ inches or so of the end.

Now heat both the pipe and shaft to about a welding heat and slip the pipe down over the shaft to within 4 or 5 inches of the upset end and raise to a good welding heat. Drive the pipe to place and dress down under a welding heat until the flare is drawn down to same size as the pipe above the flare, *i. e.*, 3½ inches. You have now made the piston of the jars. In finishing up, it is well to chamfer the end as shown (Fig. 1, C), but leave shoulder Z square. Next proceed to flare one end of the other piece of 3½ x 9-inch pipe slightly and flare one end of the 5-inch by 3-feet pipe to the same taper, but so as to let the smaller go in ¾ or 1 inch past the end of the larger. Heat these flared ends to about welding heat, slip the small end of the smaller into the flared end of the larger so as to let 3 inches or 4 inches of the small pipe extend. Raise a good welding heat, slip end X of the piston in through the small pipe so as to use the shoulder of piston Z as a set to drive the small pipe home under the sledge, then withdraw piston until X reaches just through small pipe and draw down

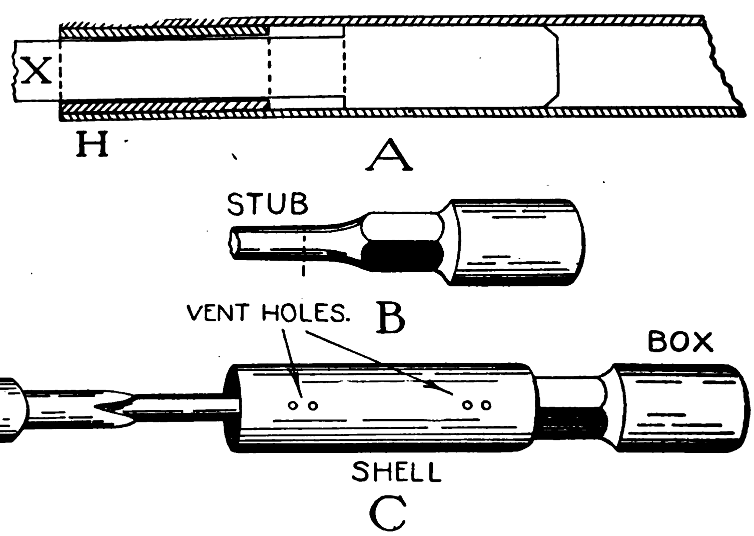

Fig. 2. THE JARS WHEN COMPLETED.

Having procured the stock, proceed to weld one of the short pieces of pipe on the steel shafting. In doing this it is best to upset the end of the shaft by taking a short heat and striking on the end so

under welding heat to 5 inches. Place the end of pipes into the fire and raise to a good running heat and turn down the end of larger pipe over end of small pipe in the fire. If the base of small pipe is

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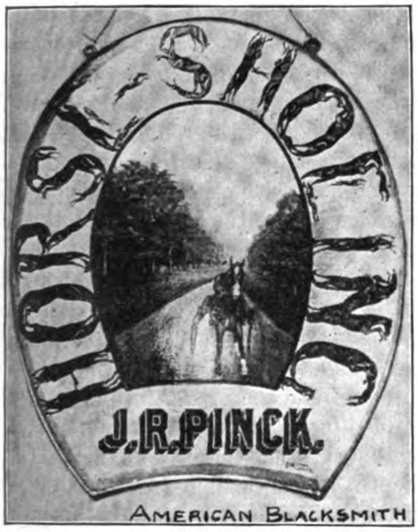
out of shape, straighten it up with a mandrel or with end X of piston so that the shaft of piston will work in and out through it freely, but not too loosely. You have now made the shell and piston and striking head of the jars, which is the important part of such jars. Your next step is to put these parts together.



A SHOP SIGN THAT COMPRISES OVER SEVENTY HORSES.

Shove shaft X, Fig. 2, up through the large pipe and head H, and scarf X for making a cleft weld. Take the pin or male section of joint and draw down and cleave the stub end to receive X. Get up a good heat and clean out your cleft and weld (I advise screwing up the joint and handling the whole joint in order to protect the screw and give a good chance to drive the tongue home in making this weld). Now comes the hardest weld on the job, and one cannot be too well fixed for it.

Screw the box or female of joint onto a bitt or a sinker bar, and draw down and round up the stub to fit snugly in the open end of the jar shell for 3 or 4 inches, allowing the stub to taper to the wrench squares. Flare the open end of shell and slit it for about 3 inches, get both parts lined up in the fire in such a way as to permit them to be turned round to get an even heat without getting out of line. Work them so as to get an even heat for welding before driving together when your heat is right; drive together solid and while in the fire let one man turn the jars round while the other hammers down the lips of the weld. Do not strike too hard and work *down* the weld from the shell of the lips. In this way the weld is solid throughout, and if care has been taken very little turning will be required to make the jars line true.

The tuyere in my fire was a piece of 2-inch gas pipe fastened to $2\frac{1}{2}$-inch hose which I used to carry air from a 16-inch fan on the machine, driven at from 6,000 to 10,000 revolutions per minute. My fire was one foot deep and I burned off three hammer handles making the last weld.

I used one half ton of coal to run the engine and smith fire to do the job. In heating the pieces of pipe, it is best to close the end which is out of the fire to prevent it from burning up in the fire; red clay and salt reduced to a powder is the flux used. The vent holes are $\frac{3}{4}$-inch holes set four on a side. They are made after the jars are welded together and are there to keep the jars from being deadened when under water. These jars cannot become locked by stones getting between the heads and they turn the drill at every stroke, as regularly as clock work.

If desired, the shell may be welded direct to the drill stem, and a piece of hydraulic pipe, large enough to receive the rope, welded to the shaft at X, Fig. 2. This must be of sufficient length to take about a foot of rope, with four or five $\frac{3}{8}$-inch holes drilled through the pipe, at or nearly right angles, to admit rivets to fasten the rope.

An Example of Originality in Shop Signs.

Speaking of originality, just glance at the accompanying engraving which has been reproduced from a photograph of a fine shop sign. This sign is owned by Mr. J. R. Pinck, a prosperous Buffalo smith.

It is a remarkably ingenious piece of work, the two sides being unlike, and containing, in all, about seventy different horse models. The life-like dash and artistic detail worked into the piece are unfortunately lost in reduction of the picture to so small a scale. In the original, the horses are all painted in life-like colors and the positions though fanciful are nevertheless full of life. The entire sign is about four feet by two and a half. It hangs inside the shop just at the entrance, where it is often admired by people passing by.

Mr. Pinck was asked why he does not place the sign outside, above his door. He replied that it would not remain there very long. This very unique piece of work is made of hard wood and about the edge is placed a band of iron.

Mr. Pinck takes justifiable pride in this artistic sign of his, and declares he would not part with it for three hundred dollars.

A Stroll Through An Axle Factory.

It may be interesting to AMERICAN BLACKSMITH readers to see how axles are made in a large shop and to note the important points in their manufacture. The following description of their process of manufacture in the shop of the Dalzell Axle Company at South Egremont, Mass., is here printed and illustrated through the courtesy of that company.

In a large business such as this it is necessary to carry an enormous stock of metal constantly on hand. Hundreds of tons are stored in a suitable yard, conveniently divided for the accommodation of the various sizes of iron and steel, and arranged for their easy handling. From the yard the bars as they are needed, are conveyed to the forging department, Fig. 1, where they are cut up in suitable lengths by means of powerful shears capable of cutting at one clip the largest bar as easily as you would cut a string with a pair of scissors. The metal is fed to the shears on a rack or table and the lengths regulated by a gauge. The pieces drop into trucks, which carry them to the furnaces, where they are heated preparatory to being subjected to the forging process. For convenience and to prevent loss of heat the forging hammers are placed near the furnaces. Petroleum is used as a fuel instead of coal, there being an appreciable amount of sulphur in the latter which is objectionable and from which petroleum is free. One of its best effects is the facility afforded for the nice regulation of its flow, insuring any degree of heat desired. The petroleum is

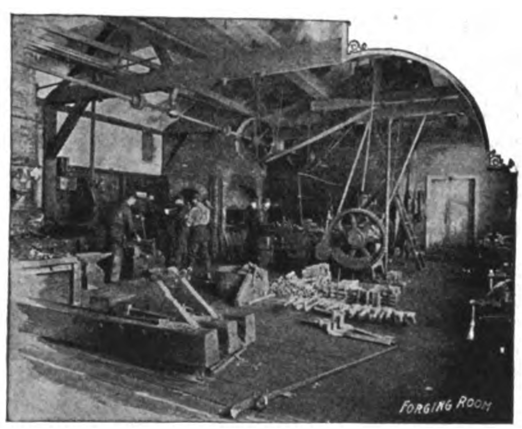


Fig. 1. A WELL EQUIPPED FORGE SHOP FOR TURNING OUT AXLES.

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stored in large tanks and fed directly to the furnaces.

There are a number of hammers in the forging department—some of them trip-hammers, some small hammers for light work and large ones for heavy work. As shown in Fig. 2, one in par-

Fig. 2. LARGE POWER HAMMERS USED IN THE MANUFACTURE OF AXLES.

ticular is worthy of note, being one of the largest power hammers in the country. It is so nicely adjusted that it can deliver a blow of fifteen hundred pounds or one as light as a feather, at the will of the operator. To witness its operation as it varies its strokes with every wish of the manipulator makes it appear as if possessed of intelligence. To deaden the vibration from the powerful blows and secure absolute solidity, the foundations were made of timbers eighteen inches square and eighteen feet long, of which more than six thousand square feet were used. In the forging department also are upsetting machines for making wrought boxes, forges for making flap and crank axles, emery grinders for finishing flaps, and formers for shaping crank axles. In all the forging work, axles are produced of the precise shapes required, all so smooth as to require but little hand work, and what lathe work is necessary is reduced to the minimum. The economies thus effected, however, are in the interests of accurate and beautiful workmanship.

To preserve as much as possible of the original fiber of the material uncut is an important point. The method of forging is that of drawing the metal under the hammer instead of upsetting the collars from small stock. For this reason the material must be of sufficient diameter to form the collar; it is then drawn down by forging under dies until the desired shape of arm and stock is obtained. This process makes a stronger and much more reliable axle than can be obtained by using a smaller size of metal and upsetting the collar, or even of welding it on. Upsetting disturbs the fibre and weakens the axle at its point of greatest strain.

From the forging department the axle is taken to the turning room, where accurate engine lathes and delicately adjusted axle-turning machines accomplish the work desired. On the engine lathes are turned the Collinge axles—that is, those which have no taper. The tapered arms are turned on what are called "rams." These are constructed on the plan of a turret lathe, with a series of box tools having knives conforming to the different shapes which the operator is to produce. These machines are of recent invention, enabling one man to do the work of four men by the old method. The work of this department is intensely interesting, though offering by its quiet and close calculation strong contrast to the exciting scene in the forging department, where all is noise and shock amid furnaces and flying sparks. In the turning room the nicest perfection of detail is watched. Some of the machinery for cutting out cup axle collars, oil grooves in the spindles, milling the edges of collars, nuts, etc., is intricate and very ingenious. Here also are punches, large and small, for various parts of the work.

An axle is not by any means finished when it leaves the turning room. It is purposely left sufficiently large to undergo the process of grinding and fitting. To insure an absolutely perfect bearing, four different processes are necessary. After the turning process the arm is filed with smooth files so as to conform more perfectly to the interior of the box. It is next ground with fine emery and oil until every portion of the arm fits perfectly and has a wearing surface on every part of the interior of the box. This is called "ground fitting" and is done in a separate department, where a finer surface is produced on the spindles than is possible by any other method. Next comes the polishing, which is done with very soft pine clamps, using flour emery and oil, securing a perfectly smooth, even surface. The axle, if it be made of iron, is now ready for the steel covering process.

This is an improvement over the old case-hardening process, carrying the hardening deeper into the metal and toughening it at the same time. It brings an axle finished with the required shape to the tempering department, where it is placed in a retort—an iron box containing about a dozen axles, packed about with ground bone, with a large percentage of carbon admixture—which box, with others, is placed in the furnace, where the heat is evenly distributed to each axle, reaching from the surface of each spindle to its center with the same intensity, so that all axles are heated exactly alike. The boxes are surrounded with charcoal, and are brought to a cherry heat, which is maintained for from three to four hours, according to the size of the axles and the depth of hardening required. When the required degree of heat has been reached, it is not permitted to exceed that point. When ready the axles are taken out and dipped in water or oil, which fixes the temper and hardens the surface.

This process requires an annual consumption of ten thousand bushels of charcoal and is hence very expensive. The tempering has the effect of slightly warping the axles, making it necessary to straighten and refinish them through the ground-fit and polishing processes. When an axle is finished in this manner it possesses all the features of an ideal

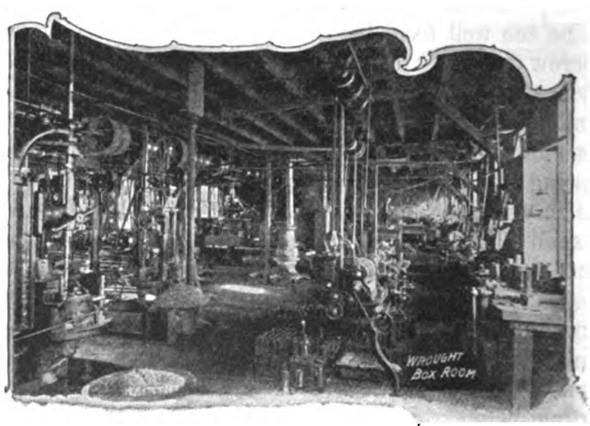

Fig. 3. A DEPARTMENT WHERE AXLE BOXES ARE MADE.

bearing. It is perfectly round and true; the surface is as hard as glass and just as smooth, and if fitted with wrought iron, a case-hardened box will run for years without showing wear.

An axle box is almost, if not quite, as difficult to make as the axle; it has

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been a subject of fully as much study and experiment, if not more. A variety of metals and mixtures of metals have been used with more or less success, but the wrought case-hardened box now made here has proved the most satisfactory.

It is necessary to have a metal that is tough, not liable to break, and with a wearing surface that is practically indestructible. The first efforts in this direction that presaged success were made in 1870, using boxes made of gaspipe, cutting threads on one end, on which a malleable iron collar was screwed. This was very unsatisfactory. The collar would get loose. Attempts were made to upset the pipe enough to form the collar. This was successfully accomplished, and then the case-hardening process was applied to the finished box. Costly machinery was installed to do this forging.

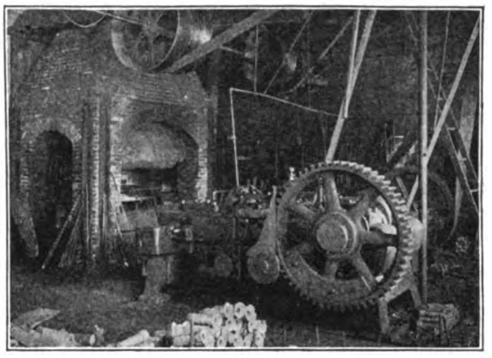

Fig. 4. A MACHINE FOR UPSETTING WROUGHT AXLE BOXES.

The iron pipe is cut into suitable lengths by a machine which works automatically, requiring little attention from morning till night. After being heated and upset as described, the interior of the box is shaped in upright drill presses, where it is bored out with fluted reamers, (see Fig. 3). Then the outside of the box is turned on an engine lathe, when it is ready for the tempering process, which is almost identical with that used on axles. After this it is turned and "ground fit" with oil and emery and then polished until the interior is as fine as a gun barrel. Fig. 4 shows a photographic view of one of the Dalzell machines for upsetting wrought boxes. It is very intricate in construction, weighing more than fifteen tons, and the upsetting plunger exerts a pressure of one hundred and forty-seven tons. There are but two machines in the world of similar construction.

Timely Talks on Carriage Repair Work.—3.

A. J. YEAGER.

As we pass along in the line of carriage repairing we run into the repairing of wheels, coming in contact with all kinds of ailments; loose tires, loose hubs, wheels out of dish and wheels so nearly worn out that it is impossible to to repair them at all. But the customer says, "I want this fixed so that it will do for awhile. I intend to buy a new one in the spring."

Take the first ailment of loose tires, and most smiths know how to repair them. I shall, however, tell how I do this work to best advantage. I use a cold tire setter. My kind is a "Shaw" cold tire setter, made in Kalamazoo Mich., and it will set tires up to 1¼ inch, and do it well. Some smiths will say "what are you going to do with loose spokes that rattle and should be wedged?" But how many spokes do you find that rattle sideways of the rim? It is a very small proportion of them, and when they are worn so that they rattle very badly sideways they should be taken out and new ones put in, for wedging them up will split them so that they are no good, oftentimes splitting three or four inches. Now with a cold setter you take off one felloe plate, cut out a small piece with a hack saw and proceed to shrink your tire. If you have not sawed out enough the first time, cut out some more, and proceed with shrinking until the tire is tight and the proper dish in the wheel. You will find your spokes all tight and your tire will stay tight longer than had you taken it off the wheel and set it the old way.

This same process is followed in case of a wheel that is dished the wrong way. We have a tool called a disher that draws the wheel back into shape, and we cut out the felloe and shrink until we have the proper dish in the wheel, and the right way, too.

Now in case of a wheel that has become slightly loose in the hub on account of being felloe-bound, we again use our cold setter, sawing out and shrinking the tire and driving down on the spokes until we have the spokes tight and the proper dish in the wheel. The Burt Manufacturing Company, Kalamazoo, Mich., make the tire-setter we use.

Now to come to rubber tires, the repair of which has become quite a business in itself. I am of opinion that few smiths have equipped themselves with the proper tools to do this work in a manner to satisfy their customers or themselves.

These tools do not cost so very much and are the best investment, for the money, that a smith can have. Rubber tires have come to stay, and it is only a matter of a little while until nearly every repair man will be called upon to mend them.

The tools can be bought from any tire maker or most of the jobbing houses in heavy hardware throughout the country, and they are being advertised quite extensively through the trade journals. There are quite a variety of them, and some are better than others. I have found those made by the Hartford Rubber Works Co., Hartford, Conn., and Morgan & Wright, Chicago, Ill., to be the most practical.

The repair of rubber tires is a new departure in the blacksmith's line and the most up-to-date fellows are the ones that will reap the benefit derived from the business. I am judging from personal experience, from the number of wheels sent me from out of town to be repaired—from towns of from 500 to 3,000 and over in population. Here is a field for the up-to-date smith that will increase his income vastly in the near future. In future articles I shall explain how to make swedges for welding channels and how to prepare an old tire for remounting.

A Few Interesting Prices From Illinois.

EVERSOLE BROTHERS.

The prices for shoeing, plow work, setting wagon tires, etc., are practically the same all over the State of Illinois, there being slight variations in different parts.

Our shop is very well equipped and we are always prepared to dispose of work quickly during the rush periods.

We have an excellent gasoline engine which answers all practical purposes. Among other useful articles, we have a number of emery wheels, a saw, drills and an engine lathe.

One essential feature to success nowadays is to have up-to-date tools in your shop and where it is possible to increase trade by using power, install an engine. It will pay for itself in a short time.

The following shows about how our prices run:

Four new shoes	$1.50
Four old shoes	.80
Four hand turned shoes	2.00
Sharpening plows, up to 14 in	.25
Sharpening plows, 16 in. and up	.30
Pointing plows	.75
Setting buggy tires, per set	2.00
Setting wagon tires, per set	2.00
Grinding discs up to 16 in., per wheel	.15
Grinding discs, 18 in	.18
Grinding roller cutters, each	.30

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QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

Sharpening Rasps.—Will some brother smith tell me how to sharpen horse shoe rasps so that they will stand as good as new? J. H. BARTHOLOMEW.

Lien Law vs. Cash.—With regard to the Lien Law, in the November number, I saw that one brother advocates a cash basis. I would prefer a Lien Law, from the fact that I find at times my best customers do not have the ready cash. A Lien Law would not hurt them, and it would bring the bad ones to time, and I hope it will soon be perfected in Illinois. E. B. DAVISSON.

Shoeing Racks.—In reply to B. Q. Davis in regard to shoeing racks, would say that I believe the Barcus horse stocks to be the best and the easiest operated. I have shod a mule as small as five hundred pounds, and a horse as large as fifteen hundred pounds, and they work as well on one as on the other.

I saw several different advertisements in THE AMERICAN BLACKSMITH, and I selected the Barcus, and do not want any better. If Mr. Davis will write to the Company, they will answer all questions. I think every man that shoes horses ought to have a pair of Barcus Stocks.

B. B. MALLORY, Racine, Ohio.

How Make a Punch.—I would like to ask some of the brother smiths how to make a machine for punching iron, holes from $\frac{1}{4}$ to $\frac{1}{2}$-inch. T. ROWAN.

Quarter Crack.—In answer to J. S. H., in the November issue as to how to shoe a horse that has quarter crack, the back part of hoof being loose, would say weld a calk in front of the quarter crack and cut the heel calk off. Bend the end of shoe down one-quarter of an inch and flatten it so it will bend easy when the heel grows down. I am shoeing three horses like that every four to six weeks and none of them are lame. FRED RICKERT.

Questions on Axles and Chilled Castings.—I would like to ask some of the brother craftsmen through THE AMERICAN BLACKSMITH, of a quick and correct method to get the pitch and gather in a wagon axle, say from 1 to $1\frac{1}{4}$ inches.

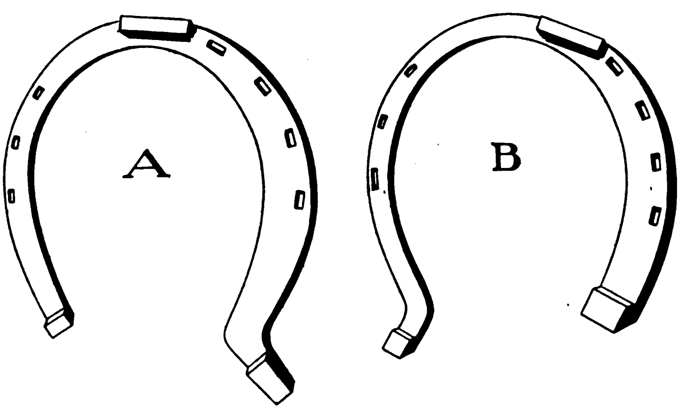
I would also like to know of a way to drill chilled castings. I have tried burning sulphur, but it does not prove satisfactory.

Might add that I am much in favor of a bracksmith's Lien Law, though I have no fault to find with collections myself. Prices, however, are altogether too low. I like THE AMERICAN BLACKSMITH very much, getting a great deal of useful information from it. Will contribute something for its pages later. C. W COOK.

How I Bound My American Blacksmiths.—I first took a piece of linen the size of one of the papers, that is, when it was spread open. Then I got my papers all in rotation. Next I found the centre of the linen and sewed every paper to it seperate, sewing through the centre of the paper with string. When I had sewed them all on I got a piece of black cardboard, large enough to make the two covers, and by taking a piece of linen the width of the thickness of the twelve papers, I fastened them together with paste. Now by taking the linen cover and pasting it to the inside of the outer cover, it is held securely in position. I received one of the beautiful pictures which were sent with the April issue—The Village Smithy. By pasting it on the outside of the front cover it finished the job as if a book-binder had done it. GEO. E. B.

Two Shoes.—In answer to D. W. Cryce's question in the October number, I will give the following shoes, which I think will answer his purposes.

Shoe A, is heavy outside, with trailer calk, and light inside fitted very closely all around to the heel. The calks are of equal height, but the outside calk should have at least four times as much ground surface as the inside one, and the toe calk should extend from a little distance inside the center to outside. Lower the inside of foot as much as possible, or until the foot is level.



TWO GOOD SHOES FOR PREVENTING INTERFERING.

Shoe B, is heavy outside, with calk well under the heel. Light inside, fitted closely to heel and the heel turned out enough to make the horse stand level. The heel calks should be $\frac{3}{8}$ of an inch high, with a calk $\frac{5}{16}$ of an inch high, welded on at toe nail on the outside. This makes the horse break over the centre of the foot and usually stops hitting. The foot should be dressed level if possible. F. W. B.

Power in the Shop.—I have been a subscriber to your paper, or better, to our paper, for sometime, and would not do without it for many times the price. I learn something from every issue.

My partner and I have a shop 25 by 110 feet. About a year ago we put in a $2\frac{1}{2}$ H. P. Weber engine, and have never regretted it one minute. Our trade has improved wonderfully, but we are doing it with the same force. Our engine pulls a blower for three fires, a drill press, band saw, rip saw, grindstone and disc sharpener.

Brother smiths, why don't you handle farming implements? We have sold five grain binders, two mowers, two rakes and four disc plows, and will do $3,500 worth of work in the shop this year. We shall soon want a power hammer. Perhaps some brother can tell us the best kind to get for general repair work.

I am greatly in favor of all smiths organizing. Material is high and something must be done. W. C. POWELL.

Questions on Welding Pump Rods.—I would like to have several brother smiths answer this:

My business at the present is welding pump rods for oil wells. As I have about 8,000 welds to make right soon, I would like to learn of some process which will enable me to weld them rapidly and make first class welds. Could it be done in a forging machine? If so, what kind of a machine?

Is there any small power hammer or pneumatic hammer or welding machine of any type that could be used successfully?

Has any brother any idea of how a home-made hammer or machine could be made. It might be that I would purchase or make a small tool for upsetting and scarfing the rod the same time, and use some other tool for welding. I am at the present time welding rods that will be shipped to India.

The different size joints that I weld are: $\frac{5}{8}$-inch, $\frac{7}{8}$-inch and 1-inch. They are box and pin joints. The square on the joints corresponds with the size of the joint. The rods I weld are both iron and steel, the sizes are $\frac{5}{8}$-inch, $\frac{9}{16}$-inch and $\frac{3}{4}$-inch, and are from 25 to 34 feet long. When finished, the joint (box and pin) are about 9 inches long.

I weld the $\frac{7}{8}$-inch square on $\frac{9}{16}$ and $\frac{5}{8}$-inch rods, and the 1-inch square on $\frac{3}{4}$-inch rods,,and $\frac{5}{8}$-inch square on $\frac{9}{16}$-inch rods. I upset the rods considerably when I scarf them. I would like to have a half dozen at least give their idea on the above as soon as possible. FRED BARNEY.

Horseshoeing—Ice Tongs—I think THE AMERICAN BLACKSMITH is a great source of valuable information to all concerned. I have been taking the journal for about six months, and can certainly say it's my friend and helper. The numerous topics discussed therein are well worth the while of any smith harboring and remembering. Also, the reader has a great advantage of being able to simply ask for anything he desires to know, and he receives the desired information. This, alone, is worth the subscription price.

As to myself, I have a great interest in horseshoeing, and frankly say that any man who undertakes to shoe a horse ought to know more than simply to pare the foot even and nail the shoe on. I believe that the horse often realizes pain from improper shoeing, though it is not noticed by his master. The latter, if slightly scratched by a nail in his shoe, hurries to the shoe maker's shop, pulls off his shoe and declares he can stand it no longer. Here is the difference between man and beast. The journal cannot take up too much space on this subject for me.

I make a very convenient kind of ice-tongs. The main feature of these is that they cross each other in front when closed. By this means a piece of ice, any size, can be securely held when lifting by one handle. Many ice tongs are made so that only one size piece of ice can he held. Care must be exercised that the sharpened ends are bent up just right for any cake of ice. They may be used either with a rope or by hand.

MONROE S. MUMMA.

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THE AMERICAN BLACKSMITH

A PRACTICAL JOURNAL OF BLACKSMITHING.

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State Lien Laws.

Blacksmiths and wagon builders, or repairmen who are interested in securing State Lien Laws to protect themselves from bad debts and losses of this kind, should write to the American Association of Blacksmiths and Horseshoers, Buffalo, N. Y., for particulars of their plans for obtaining Lien Laws. Every craftsman can aid a little, and should write at once. No expense is attached.

A New Prize Article Contest.

The Gas Engine.

A great many readers of this journal are turning over in their minds the question of whether to put power in their shops or not. The experience of other smiths who have bought engines should be of great help to them in arriving at a decision, and hence the following prize offer is made in order to stimulate the writing of articles by craftsmen who are in position to say whether power in the shop is a desirable thing for blacksmiths and wagon builders.

"Does it pay the blacksmith to put in a gas engine, and why?" For the best article on this subject we will give a first prize of ten dollars, a second prize of five dollars, and three third prizes of yearly subscriptions to THE AMERICAN BLACKSMITH. The conditions are few. The articles must not be more than about 800 words in length, and the writers must be AMERICAN BLACKSMITH subscribers who have had practical experience with a gas engine in a blacksmith, wagon or repair shop. The contest closes April 1st, but the sooner the articles are sent in, the better. Those who write should bear in mind the subject—why does it pay the blacksmith to put in gas engine power?

The gas engine has been selected as the power for discussion, because every indication points to its being more suitable for small units in small shops than any other form, and because twenty smiths buy gas engines to one who buys any other kind of engine.

In writing upon this prize topic, the smith can discuss his experience as to the cost of fuel and repairs, the machines that he drives with a certain horsepower, the gain or saving in time, labor or money due to the engine, and the general advantages of the gas engine.

Punctuality and Punctuality.

Punctuality is commonly confounded with the ability to get up and go to work "with the lark." But this is only a semblance of the real punctuality.

The punctual business man is one who is strictly uptodate in all his doings. His catalogues and calendars are out even a little before the date required, showing that he is not only progressive, but aggressive, too, in point of time.

The blacksmith who makes a point of opening his shop on time day in and day out, and of being always at his post from gaslight to gaslight may call himself punctual. But suppose his work is never done when promised, who cares how many hours he spends at the forge? The business world counts only the practical result of labor—the finished product—not the number of hours devoted to it.

"Seizing time by the forelock," doing at this minute what could not have been done a minute earlier, always endeavoring to encroach upon the future—this is punctuality.

Higher Prices for Blacksmithing Work.

All those who are thinking over ways and means for increasing the amount of money which the shop-owning blacksmith receives for his labor, will be interested in the article on page 91 of this issue. If the smith is not paid as well as other mechanics in proportion to his skill and labor, how shall the trouble be remedied? A solution is proposed in the article mentioned.

The Manufacturer's Catalogue.

It would be interesting to know just how many smiths make a practice of writing for catalogues. Manufacturers and dealers are glad to send their catalogues to anyone free upon request; in fact their catalogues are issued for the purpose of placing them in the hands of interested parties. The habit of writing for the printed matter of firms who manufacture machines, tools or supplies is an excellent one, for it greatly aids the progressive craftsman in keeping abreast of the times. A covered shelf or box should be arranged in the shop in which to keep all such catalogues neatly and ready for reference. It is a good plan, therefore, whenever a new tool or labor saving machine is seen advertised, to sit down and write for a catalogue, mentioning where the advertisement was seen. It is surprising how much solid information and real benefit can be gained with so little effort in this way.

The Shoeing Treatise by Adams.

In the January paper it was announced that a special series of articles on horseshoeing by John W. Adams, A. B., V. M. D., would be started in that issue. At the last moment it was found impossible to accommodate the first chapter, owing to lack of space, so that it had to be postponed till the present issue. The delay is regretted, but the series will now proceed to completion

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without interruption. The eminent standing of Professor Adams is more than sufficient to recommend his articles to the careful perusal of all who are in any way interested in shoeing. The order of treatment will be as follows: The anatomy, growth and care of the hoof; types of feet; examination for shoeing; preparation of the hoof; the shoe; hot fitting; the bar shoe; the rubber pad.

Fig. 1. BLACKSMITH SHOP AT THE IROQUOIS IRON WORKS.

The Iroquois Iron Works Forge Shop in Buffalo.

W. G. GAMBLE.

This shop was designed and built in 1896, by W. G. King, the present manager. As shown in Fig. 1, it is 80 by 40 feet, with 18-foot sides half brick and half window-sash ventilator. Through the entire length the side sashes are pivoted on a vertical axis, and connected in sections of three sashes, which open with one ¼-inch rod the entire length of both sides. The end windows are in pairs and open likewise. The top ventilators are in four-sections and can be opened or closed from the floor by pulling a ¼-inch rod. The shop can be cleared of the most dense smoke in 10 minutes by opening all the ventilators. There is a 60-inch induced draught blower, or exhaust, which is piped to hoods over fires to draw the smoke and dust therefrom.

The shop has six smith forges and fire furnaces. One is a coke furnace which will heat angles up to 6 by 6 inches, and 14 feet long. Another furnace heats channels 12 inches wide by 14 feet long. Another takes the place of a hollow fire and can be lighted and ready for a heat on heads, etc., of forgings, in 15 minutes. This furnace well pays for building when there is much machine forging done which would otherwise require a hollow fire, the expense of which from day to day is considerable. Still another furnace is the tire setting furnace, which is built in the wall and therefore takes no space in the shop. This will set about eight heavy tires per hour. The mill-heating furnace has a 3-foot heating chamber for roughing out machine forgings to be finished up by the smiths. It has been used to make double-throw crank-shafts up to 960 pounds, from scrap iron, and for forging square shafts up to 1700 pounds in weight.

There are three boom cranes, all steel, with roller and ball bearings. One man can handle one ton with ease on any of these cranes. One is 16-foot boom, another 14-foot and another 22-foot. They are fitted with triplex and duplex tackles with which one man can raise or lower one ton.

In the center and towards the end of the shop, is a Morgan steam hammer, under which steel billets 5 by 14 inches have been successfully worked into cranks and king pins for steam rollers.

This shop makes forgings of all descriptions and for all purposes, giving estimates on any kind of forge work. It is well-equipped for angle or channel work, as is aptly indicated by the engraving of the steam roller frame, (Fig. 4). They bend these frames from channels, 6 inches up to 12 inches. The frames weigh from 500 pounds to 2,000 pounds.

In the center of the shop is a face plate, 7 by 10 feet, which stands 15 inches from the floor, has 1¼ inch square holes, every 3 inches of its face and is 3 inches thick. It has a full set of moon bars and dogs and pins. An angle, channel or I-beam can be easily handled at will. There is in this shop a Long and Alstatter press which can shear bar iron up to 2½ inches square and can punch holes up to 6 inches diameter and 1¾ inches thick, hot. They have a full set of dies, including coping dies for channels and I-beams. The coping die is used for cutting off channels and I-beams. It is also equipped with scalloped shear-blades for rounds. The work is all laid out and the stock all sheared up before the job is started, which reduces the cost of production considerably.

Talks to the Jobbing Shop Painter.—11.

Fashions to Govern the Painting and Striping of Carriages the Coming Season.

M. C. HILLICK.

Today the carriage painter, regardless of his location, must be very largely governed by the degrees of fashion in respect to the colors and striping employed in painting vehicles. Formerly what was known as "prevailing style" was confined principally to the large towns and cities. But the invasion into rural communities of the telephone, the free mail delivery system, the daily paper, and a hundred other forms of modern conveniences, has brought the question

Fig. 2. ONE OF THE FURNACES AT THE IROQUOIS SHOP.

of style, in its relation to carriage painting, prominently to the fore-front. Isolated country districts are a thing of the past. The farmer boy is no longer

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satisfied with most any color so long as it is nearly all red. He wants the best buggy painted according to the prevailing fashion of the cities. It is, therefore, strictly a matter of business, and not

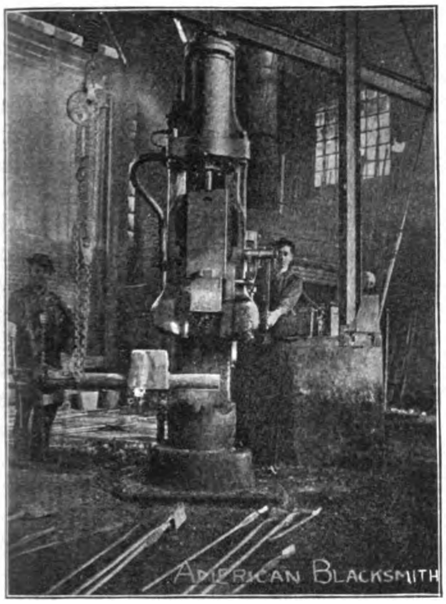

Fig. 3. HAMMER FOR MAKING CRANKS AND KING PINS ON STEAM ROLLERS.

one of sentiment that should move all carriage painters of both city and country to study the latest fashions of painting the vehicle equipment.

Generally speaking a majority of the colors popular during 1903, will retain their popularity during the year 1904. For the extremely light build of buggies and speeding wagons, black bodies and running parts varying from brightest red to gayest yellow, will be very much in evidence. Carmine glazed over an English vermilion ground offers a glorious red for speeding wagon running parts. Light olive, Brewster and Quaker green running parts with seat panels, or spindles, in case of spindle seat, painted with same color, will be popular with a critical class of users who prefer a quiet elegance of effects to the flash of color which the reds and yellows afford. The striping on this class of vehicles, on all classes, as a matter of fact, will be done in lines drawn closer together. In other words, the double-line stripe drawn at a space of 3/8-inch between lines will be contracted to a 1/4-inch space between lines, and the lines will be drawn very fine.

The medium weight buggy, or the buggy better known as "the all-round buggy" of both town and country, will continue, for the most part, to be painted black body and running parts graduated from 75 or more shades of red, to blue, green and black. Dark rich reds for this useful class of vehicles will have the preference, when reds are chosen; such reds, for example, as are obtained by glazing No. 40 carmine over an Indian red ground. There is a class of medium weight buggies handled by liverymen, and popular with drivers who rent vehicles, which are painted usually with some of the high-colored reds such as, for example, Brewster red, 20th century red, coach painter's red, flamingo red, etc. These reds are striped with double fine lines of black, or with a 1/8-inch line of black paralled with a fine line of black on either side, and when the work is nicely executed they afford charming examples of the carriage painter's art.

The medium weight buggy will be seen largely in evidence the coming season with running parts painted Brewster, olive, Quaker and the fine, old-fashioned bottle green, all in medium and dark shades, and striped in lines of black or gold, or carmine, the gold and carmine predominating. And when we speak of gold we mean, of course, gold bronze, which, procured in a powdered form, is mixed with finishing varnish and pale drying japan, and used as a striping color. On the olive and Quaker green surfaces the gold bronze stripe gives a particularly elegant effect. Running parts of dark ultra-marine blue will please some very exclusive drivers, and this blue should be striped with either black or exceedingly fine lines of gold, as fine as they may be drawn. Black bodies will have the preference, although upon a certain style of body the seat panels will be seen painted with the same green or blue used upon the running parts. Surreys and phaetons and cabriolets, black or glazed red, double lines. Seat panels will also be painted in deep shade of ultra-marine blue, with running parts medium shade of same color, striped in 1/16 and 1/8-inch lines of black, the width of lines depending upon the weight and proportion of the vehicle.

In the middle and eastern sections of country, seat panels on above class of vehicles will continue to be painted deep shade of maroon, with a bit lighter shade for running parts, in which case the striping should be done in black.

Seats and panels will also be painted in rose, chatamuc and purple lake; moldings, black; running parts the same color as the panels, and striped in two and three lines of black. Landaus, broughams, rockaways, etc., are painted either black, or panels deep, rich green, or maroon; moldings black, with running parts in colors to harmonize and illuminate the body colors. For this class of carriages the deep carmine or black lines will be accepted as the most fashionable.

The increasingly popular runabout wagon, useful alike on country roads and city boulevards, will be painted in various combinations, dark colors prevailing. The black body and seat panels deep Indian red, with running parts a shade lighter; and striped with two fine lines of a still lighter shade of red, or with fine lines of black, will prove an exceedingly attractive style of painting these luxurious and useful vehicles.

Black bodies and light carmine running parts will also command a fine run of popularity. So, too, the black body, seat panels, dark, rich Brewster, olive or 20th century green, and running parts light shade of these greens, will have its

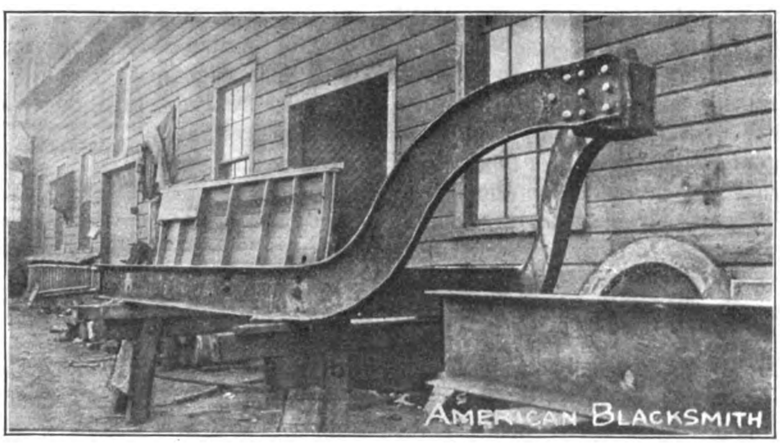

Fig. 4. STEAM ROLLER FRAME. EXAMPLE OF WORK TURNED OUT BY THE IROQUOIS SHOP.

vehicles popular at the present time with rural drivers, will be painted, seat panels dark rich green, body and moldings black, running parts a shade or two lighter green, the striping being done in admirers as a style at once exclusive and elegant.

In the matter of painting business wagons, the tendency is strongly in favor of dark, rich shades of the reds,

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blues and greens. In fact, indications at this writing point toward a perceptible toning down of all colors used upon business vehicles, and the most prominent Eastern manufacturers, it is said, will vigilantly avoid high colored or extreme contrasts.

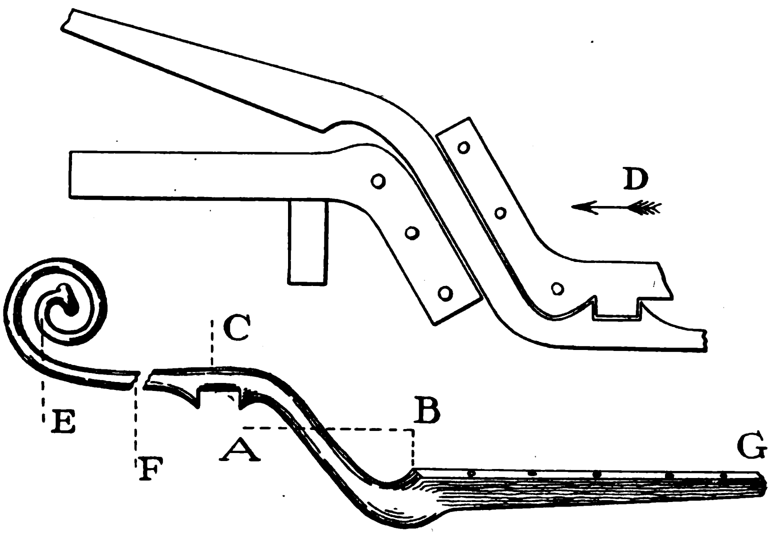

Fig. 2. BODY LOOP FOR A THREE-SPRING, STRAIGHT SILL SURREY.

The ornate and sensationally striped and ornamented wagon is, so far as the coming season would indicate, a style practically obsolete. Especially is this true of the higher grade vehicle which is being painted in dark rich colors with almost severely plain striping effects. Color effects on the cheaper grade wagon will be greatly modified with fancy striping reduced to the minimum.

Wagon Building in the Factory.

Prize Article.—*Continued.*

NEILS PETERSON

The wheels having been unloaded and stacked in the wheel room, are first looked over by an experienced wheel man. If rim bound, they are sawed out at the joints, and the spoke ends projecting over the rim chipped off on a machine built for that purpose. Then a coat of priming is put on, and when dry they are brought into the blacksmith shop and stacked near the forge, where they are to be tired. The smith having this work in charge proceeds by having the tires rolled to the proper shape, and piled near the forge. The wheel is first measured with the traveler, then the tire in the same manner. The tire is marked about 1-16 inch smaller than the measurement of the rim and cut off. The helper takes the end of the tire nearest to him, and by pulling it down and away from the anvil, the tire is sprung in such shape that the top end of the lap will press firmly against the bottom end to prevent it from slipping when in position for taking the heat. The fire being kept in shape to enable the smith to take as short a heat as possible, the tire is placed in the fire and heated to almost a white heat, then removed and some Climax welding compound placed between the lap, (which is made very short) and some on top, the tire replaced in the fire and brought to a welding heat. When taken out and brought to the anvil for welding, the bottom end of the lap is placed directly over the edge of the anvil nearest the smith, and with a few heavy blows with the hammer the tire is scarfed and welded in the same operation. Now the smith turns the tire down to the left, while edging up, again raises it and smoothes the flat surface, then stepping to the right and facing the anvil lengthways, he lets the tire down encircling him and resting on a trestle placed there for that purpose. The edges are thus swaged to shape. The smith, while in position, measures the tire, the amount of draft being judged from the condition of the wheel. (The methods here described for welding tires apply to light work only; heavy tires must be scarfed before welding.) The tire is now set aside and allowed to cool. The helper then takes and heats it in another fire, pulls it over the wheel, and cools it in water. The wheel is then placed in a machine for truing up the tire. This machine consists of a pair of grooved rollers with a screw adjustment for raising and lowering the top roller according to the width of the tire. As soon as the wheel is trued up, the rollers are released, the wheel taken out and stacked near the tire drill. This drill is built especially for drilling tires, and is supplied with three bits, one for drilling the tire, one for counter-sinking, and one for boring the wood. As soon as drilled they are passed on to the tire-bolting machine, where one boy drives in the bolts, puts on the washers and starts the nuts, and another boy tightens up the nuts and clips off the bolt ends. when the wheel is ready for the hub-boring machine. This is run at 1,800 revolutions a minute. With it an experienced man can bore and box several hundred wheels per day. When driving in the box, an axle stub fitting the box is put into it, some white lead applied and with a few blows from the sledge the box is driven home tight. The wheels are then loaded on the elevator and hoisted to the second floor where they are painted, finished, and put into racks located in the assembling room and close at hand for the men setting up the work.

The putting together of gears for vehicles in a factory of this size or larger, where several thousand jobs are turned out each year, constitutes no small portion of the amount of work that must be accomplished to complete the construction of vehicles on a large scale. I shall not attempt here to describe in detail the methods employed in putting up all the different styles of

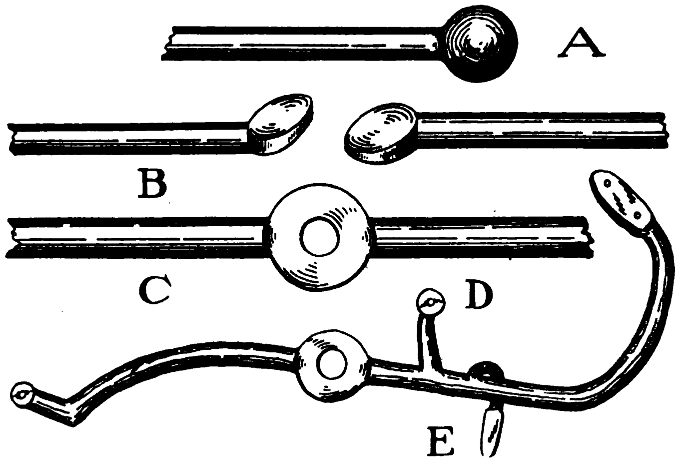

Fig. 3. ARM RAIL FOR AN EXTENSION TOP SURREY.

gears built at this shop, as it would require too much space, but will confine my remarks in this direction to one particular kind of gear, of which we build a large number, a three-spring surrey gear,

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single straight reach, total length over all, six feet three inches, $1\frac{1}{8}$-inch axles, $1\frac{1}{2}$-inch springs, five leaves in front and four leaves for rear springs, single sweep 37 inches long, with $7\frac{1}{2}$-inch opening, three-quarter 14-inch fifth wheel, and wheels 40 and 44 inches high with 1 by $\frac{5}{16}$-inch steel tires or channels for rubber tires, the same width when ordered. The wood-stock having been made and fitted up for say 100 jobs, the irons for each set are forged as follows: One pair of side stays is made, the front part made from $\frac{7}{8}$ by $\frac{1}{4}$-inch bevel edge stock. The front end is bent to a square angle for receiving a bolt through the headblock and extending back 36 inches on the reach, where the stay brace made from $\frac{5}{8}$-inch oval is welded on and runs back to the rear axle, with a branch brace made from the same size stock welded in and bent to a half circle connecting with the reach. One reach and headblock plate, running full length under the reach, is made, with one heel strap to fit over the square center of the axle, also one circle-guard, one kingbolt brace, one front spring brace; and a front springbar, and one rear springbar spanning the two rear springs are forged and fitted over forms, made especially for these particular set of irons. The irons, when forged, are ground where needed, on the emery-wheel, and finished off on the emery-belt, then marked to a pattern for drilling the holes, each set alike, so that any one set of irons would fit any one set of wood made for this gear, and also drilled to pattern.

The workman putting up gears now bolts the side stays, reach and headblockplate, the top part of the fifth-wheel, and the front spring, to which the front spring-bar has previously been clipped on to the reachs, while another man is clipping up the axles. This work is all done on the vice bench. In clipping up the axles, one end is fastened in the vice, a piece of band iron or an axle clip having been wrapped around the spindle and bent over the jaws of the vice, to prevent the axle from slipping down when released for turning around, the other end resting in a forked iron driven either in the floor or bolted to the bench. For spacing the clips, a guage is used. Measuring from the collar of the axle, the workman marks the places for draw shackles, clips, fifth-wheel, and kingbolt, puts them on and tightens them up with a socket wrench.

The various pieces having thus been prepared ready to be put together, they are coupled up and the rear axle squared from the king bolt, on a set of iron trestles. The gears are then elevated to the paint shop, painted, finished and stacked in a room adjoining the assembling room.

All regular work turned out at this factory is built in parts and assembled in a different department, except special work built to order and getting out different designs as patterns for regular work. In this case a draft is made full size, on the blackboard, giving side and end views, drop or arch of the axle as the case may be, shape of reach, whether straight or bent. The wood-stock is then gotten out, the gear ironed off and set upon a level floor near the forge. The body is then suspended over the gear in the exact position it is to have when in use. A two-seated job, a surrey for instance, is hung with the rear end about one-half inch higher than the front, for the reason that when under load the greatest weight falls on the rear spring. The measure for loops is then taken, the loops forged, shaped and fitted to their place, places marked for steps, rub irons, etc., and the irons drilled and put on temporarily. The seats are ironed in like manner, and when the job is complete the irons are taken off and a draft made of each, giving dimensions in a stockbook for reference. Forms are then made to fit each iron, these forms and drafts being numbered corresponding to a catalogue number of the job. The forms are then tied together and hung up when not in use.

In Fig. 2 is shown part of a body loop for a three-spring, straight-sill surrey, which is made from $1\frac{1}{8}$-inch square stock, cut 13 inches long and forged out. The oval part from A to B, six inches in length when finished is first drawn out, then the head, C, is forged with two lips fitting over an iron spring bar at the rear. Next the end fitting under the body is drawn to taper, bevelled, heated and shaped over a form, Fig. 2, D, made to fit in the square hole of the anvil. The scroll or pump handle E, is made from $\frac{7}{8}$-inch oval iron and welded onto the loop at F while straight, and then bent over a form. To complete the job a piece of $1\frac{1}{8}$ by $\frac{5}{16}$-inch iron is welded on at G, extending full under the sill of the body and connected with the front spring bar.

In Fig. 3 is shown the arm rail for an extension top surrey, made from $\frac{7}{16}$-inch round iron, cut to length. The eye is first made by upsetting the ends of the two pieces, forming a ball, Fig. 3 A, then scarfed, as at B, and welded in a die forming the eye C. The post is then welded on at D, and then the lamp finger, E. The ends of the rails are drawn out and finished, then heated and bent over a form, and fitted to the seat.

In Fig. 4 is shown a small machine that I got up for making collars on goose necks, canopy top standards, fender irons, etc. It is made to be fastened

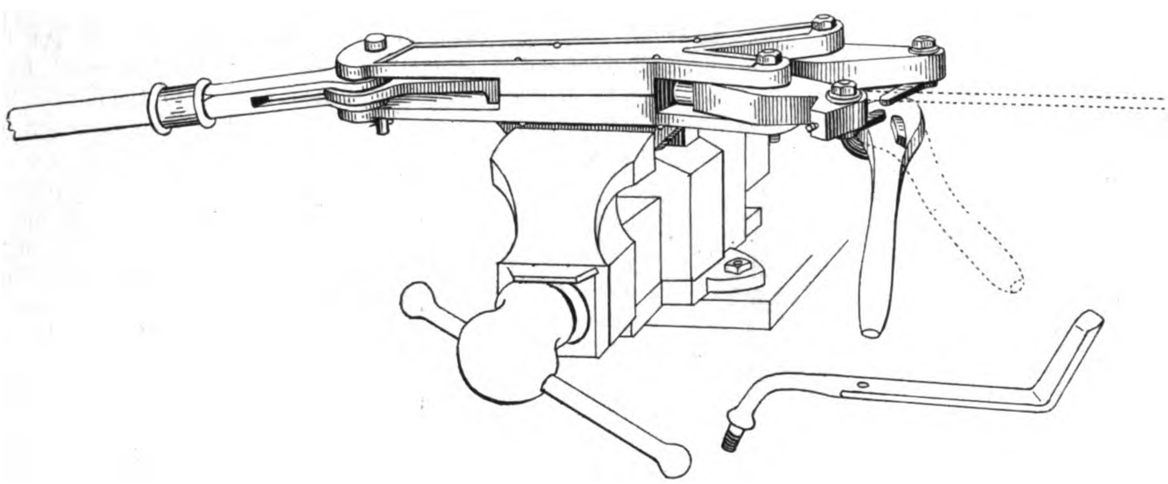

Fig. 4. MACHINE FOR MAKING COLLARS ON CANOPY TOP STANDARDS.

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in the vice by the forge. When in use the heated iron is passed in between a pair of jaws, as indicated by dotted lines into a hole in the plunger, not shown in the figure. The handle to the right is given a turn, closing the jaws and gripping the iron firmly, and then by pulling on the handle to the left the eccentric causes the plunger to move forward, coming in contact with the jaws, thus upsetting the iron and forming a collar. The jaws and plunger are easily removed and others put in for different sizes of iron. This machine is also used for upsetting the iron to form the ball when making arm-rails.

(To be continued.)

How to Build a Farm Wagon of very Light Draft.

Prize Article.

F. W. PRICE.

I have a plan by which I can construct a wagon of exceedingly light draft, besides containing all the other essentials of a first-class farm wagon, i. e., strength, endurance, appearance and—longevity. I will guarantee a 3¼-inch wagon, built according to the following rules, to run equally as light as the average 2¾-inch wagon.

The first thing to do when commencing a wagon is to see that all stock to be used is strictly second growth timber and thoroughly bone dry, after which, select a hub as large in diameter as will contain the required box, say, for a 3x9-inch box use a hub about 9x11 inches and cup the plate one inch and house the heel one inch, thus obtaining a good strong covering for the collars of the skein to protect it from dirt and sand.

The first real construction begins with the wheels, which I build as follows: First take a hub and see that it is mortised for the proper dish, say ½ inch for a front wheel. This may be done by placing a hub on its butt and clamping a straight edge on the point so that it will stand horizontally, directly over a mortise. Then place another straight edge in the mortise, holding it firmly against the front wall. This gives the line that the face of the spoke will follow when driven.

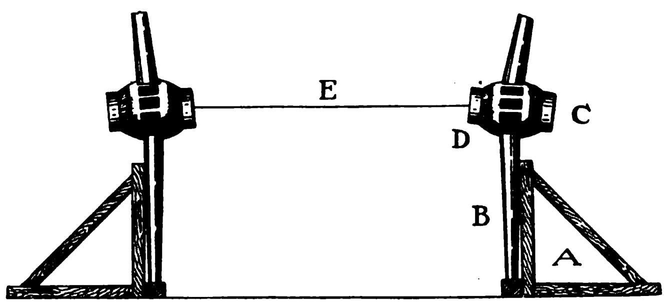
Now run out about 17½ inches on the lower straight edge, and mark. The distance between the straight edges at the hub should exceed the distance at the mark by about ¼ of an inch.

When satisfied that the mortise is right, place the hub on the stool and make a pattern exactly coinciding with the inside of the mortise, and by this pattern fit the entire set of spokes, leaving a scant sixteenth of an inch full all around to insure tight driving.

Now paint all the tenons with a good coat of white lead, and drive by first starting all the spokes, and then going around several times giving each spoke about two smart blows until all are driven up tight against the shoulder.

The spokes being driven, get the radius of your wheel and deduct half the diameter of the hub and measure this distance out from the hub on each spoke and saw off. After this, proceed to bore the tenons as long as the depth of the rim less about $\frac{1}{16}$ of an inch to allow for the rim to settle down against the shoulder firmly when the tire is set.

Now make two felloe patterns (one front and one hind) the exact circle your wheels are to be and of the depth of the rim. Dress the felloes to these patterns exactly. Bore and drive on.



DEVICE FOR DETERMINING THE PITCH AND GATHER OF WHEELS.

After the rims are on, take each two felloes separately and drive the two ends that are farthest apart back from the shoulder about $\frac{3}{16}$ inch and saw through the joint where they butt together, then drive back to place again. This will leave the joints standing open about $\frac{1}{16}$ of an inch at the outside, which, when the tires are set, will come down firm and never cause the chins to gape open, which is the objection in so many wheels after running for a time.

Now that the wheels are built the next move is to find the length, pitch and gather, with which to make the axles. It is done in this way: Make two triangular brackets, (see illustration) and spike them to the floor the exact distance apart that the tread of your wagon is to be plus the width of one tire. Take one pair of wheels, either front or hind, and stand them on the floor between the brackets and clamp the face of a spoke close up against the face of each bracket with the rims exactly parallel to each other. This leaves the spokes perfectly plumb from hub to floor; the principle on which all wagons depend for light draft and strength of wheel.

Now place the skeins in the hubs the way they are to set on the axle and take the distance between collars at bottom of skeins. To this length add twice the length of the hollow in one skein and you will obtain the exact length to cut the axle.

Now take a straight edge the length of the axle and place it in the skeins, from the point of one through and into the point of the other as they set in the holes. Next measure the opening between the straightedge and bottom of the skein and this will be the right amount to take off the bottom of axle to insure a plumb spoke.

Having found the length of axle and pitch of point, the next thing is to get the gather so that the wheel will run freely on the skein and bind neither shoulder nor nut. To get the proper gather, set half as much to the front as is taken from the bottom, that is, set the point of skein as much in front of the central line of the axle as half the amount taken from the bottom. This will set the wheels so that the bottom segment, say to a line drawn horizontally through the wheel about 12 inches from the floor, will stand perfectly parallel to each other with a plumb spoke, allowing them to run in a rut as much as 12 inches deep, without binding either side.

A wheel set in this manner will bind neither shoulder nor nut, but will play from one to the other, giving a perfectly free motion, and will wear the skein in no particular place, but all over alike.

This method of setting axles holds good, not only in new work, but also in repairing where you have to change the tread of a wagon, or put in a new pair of axles where a rig "don't run right" as is often the complaint.

Make the hounds and tongue according to your own fancy, but see that all hounds set perfectly square with the axles. By this, I mean so that the central line of draft (an imaginary line running from point to tongue across the exact centres of axles) will stand at perfect right angles to the trend of the axles. This done the wagon will run as true as a car.

I have abbreviated the foregoing remarks as much as possible, but the intelligent wagon builder, by a little study will see the philosophy of my plans and by putting some into practice, will turn out a wagon which, when well ironed and all joints laid in lead, will give good

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service for 35 years with average care and will be of surprisingly light draft.

A great many of the craft imagine that a factory wagon cannot be successfully constructed by hand. The accompanying engraving shows a wagon built as described above, better in construction and equal in appearance, and may induce more of the craft to take up this branch of work to fill up spare time. This particular wagon sold for $65.00 alongside of various and much cheaper factory work.

Facts and Hints on Wagon Work.

Prize Article.—*Continued.*

GEO. E. BRIERLY.

The first point in making wheels is to select good material. The second is to have the wheel proportion proper. Be sure that your hub is large enough; it should be of such a size that it will allow the spoke to be in the hub as deep as it is wide, and to allow a space of ⅛-inch between the spoke and the box. If the spokes touch the box they will soon become loose.

Always use a dodged hub. It is the best because the dodged spoke acts as a brace, and also the hub is not cut away so much in one place as when mortised straight. Drive the spokes so that the wheel will have ⅛ dish. When the tire is set, the wheel should not pull to dish. If it does, the spokes are bent or they have moved in the hub. Be very careful in mortising the hub. First get the feet of the spokes all on taper, about ⅛-inch for heavy wheels, and $\frac{1}{16}$ for light ones. When the mortise is made it should be exactly the same shape as the foot of the spokes, but ⅛-inch smaller endways, so that it will drive tight. Of course you have to be guided by the material in the hub as to how tight you set the spokes to drive. Take a hammer of suitable weight, dip the spoke in some very thin glue and drive it into the mortise. Do not drive with a wooden mallet, because you cannot drive a spoke as tight with it. Do not set the spoke too tight, for when it is driven it will cause a shoulder to form on the back edge, which will allow the wheel to pull to dish and the spokes will not remain tight. The next move is to cut the spokes off the required length.

When cutting the tenon on the spoke do not cut it straight with the spoke, for if you do, when the rim is put on the joints will be hollow. Always cut the tenon a little back of but straight across the wheel. This will cause the joints to be high, so that when the wheel is screwed down on the platform it will bring the face of the wheel level. When the tenon is cut on the spoke, take a chisel and cut a shaving off the top and bottom. This will prevent it from splitting the rim. There should be a wedge driven in the tenon after the rim is on, to get it up to the shoulder of the spokes so as to enable the workman to cut the correct joint.

Axles have caused a great deal of trouble to a number of workmen. When the principle is understood, the laying out of axles is very simple. A wagon axle when set right without a load on, should measure ⅜-inch less at ground than at the hub. When the wagon is loaded the wheels spread and are then on a plumb spoke, or in other words, the front spoke (if the spokes are dodged) will be square with the center line of the axle. The wheels should also measure ½-inch less in front than behind. This causes the wheel to run up to the shoulder all the time, and takes the strain off the nut. This is called the gather of an axle. If it is gathered too much it will cause the wagon to run hard. Some people have a notion that if a wagon talks loud it runs easier, but this is not the case.

A HAND-BUILT FARM WAGON.

To proceed to lay out an axle, take one side and edge up square and straight. Draw a line up one-quarter from the bottom of the axle. Find the center endways, which is 2 feet 9 inches when the track is 4 feet 8 inches, the axle piece being cut off 5 feet 6 inches long. From the centre measure half the width of the track, and from this point measure back the distance it is from the front of the front spoke to the back of the hub. This shows where the shoulder comes. Now from the bottom line at the shoulder mark place half the size of the arm. Do the same at each shoulder; then draw a straight line the length of the axle through these marks. This is the center line. Now from the center line at the length of the arm from the shoulder, measure $\frac{3}{16}$-inch down. This will cause the axle to be set right if the wheels had no dish. But wheels having dish, find out how much by placing a straight-edge across the wheel and measuring how far it is from the spoke to the straight-edge at the hub. Now take half of this and add to the $\frac{3}{16}$ already mentioned, and place down from the center line, and this will give the correct pitch. Find the size of the arm inside and mark it on the axle, not using the center line, but the line that is drawn from it. For the gather go ⅛-inch forward of the center, and this will give about the right amounts. If both wheels have not the same dish, it will be necessary to lay them out separately. The foregoing is for new work where the two axles are put in at once. Of course for repair work the axle should be set so as to track with the other one. If you have only one brought to the shop, take the pitch of the broken one as near as possible, and make the new one the same. If the whole of the wagon is brought to the shop, you may set the axle the same as for new work, except for allowing the new axle to be longer between the shoulder than the other one, thus making it track right.

The foregoing remarks, if followed closely, will prove of considerable value.

The Shop Apprentice.

J. E. DAVIS.

This is a subject but little discussed, yet one which every craftsman should consider. Under the present circumstances, how long will it be before we cannot employ a journeyman at any price? Masters today are advertising and writing to their fellow craftsmen, trying to get a good floorman or a good man at the fire, simply because there are no young men encouraged to start in and learn the trade. I for one have been without a man for several months, for the simple reason that there are no horseshoers to be had. I have now taken in an apprentice to help me; I intend to teach him all I know, and when he becomes my superior, do not intend to envy him as a great many often do.

Always encourage an apprentice. Tell him not to try to do just as well as you do, but just a little better. Don't scowl,

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but be cheerful and pleasant towards him always. You will gain in the end by such treatment.

There are a great many men in this country who would make excellent shoers if they were but given a chance and a little encouragement. Too often it is as it was with me when I first applied for a job. "Yes, you may go to work, but I won't give you even your board for the first three months." If a young man has any talent for the work he certainly can earn his board from the start. But if you cannot give him a job, tell him so and encourage him to try elsewhere.

I hope to see some opinion on this important subject from older and more experienced men in the craft.

A Case of Interfering.

FRED RICKERT.

I had to shoe a four-year-old that interfered so badly that he tried my patience for six months. I made all the kinds of shoes that I had heard or read about, but he still interfered. At last I made shoes exactly to fit his feet with sharp toes and heels, put toe calks in the center of the shoes, brought the heels of the shoes right around the way his heels had grown, throwing them neither in nor out, and the horse has stopped interfering. After a drive of fifty miles, there was not a sign of a scratch.

No fixed rule can be laid down for shoeing. It is very essential, however, for the practical smith to be acquainted with the different methods and then apply them according to his judgment.

The Progressive Smith as a Business Man.—5.

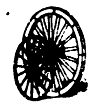
The Blacksmith's Letterhead.

BILLY BUNTZ.

It is sound, business logic for the smith to have a neat, well-worded letterhead. It shows him to be progressive, business-like, established as a smith or dealer; it also advertises him by showing the work he does or the specialties he handles as a dealer.

Sample letterhead No. 1 speaks for itself. When a dealer or business man receives a letter written on such a head he quickly concludes that the writer is doing business on business principles, even though the financial agencies may give him only "a common, blacksmith rating." Any established smith can have references printed on his letter paper by obtaining permission from several of his business friends to use their names in such connection.

REFERENCES:
FIRST NATIONAL BANK.
J. W. MOON, PRES. MANSON MFG. CO.
R. D. GIBSON, FINANCIER.



The Southside Smithy,
W. E. SCOTT, Prop.
SHOEING and CLIPPING, TOOL GRINDING and SHARPENING, BUGGY and WAGON REPAIRING.
Manson, Ill., ... 190

Sample No. 2 shows a letterhead where the smith himself is doing the selling, hence his references are not mentioned. Neither need he say anything about his smith shop, which he may run under some title, such as "The Southside Smithy," as though some one else was the owner—his main object being to show himself as an established dealer, rather than as the proprietor of a smith shop; or, where he conducts all his business on one floor, he may simply mention "Repair Shop In Connection." There is a subtle feeling among some folk that a blacksmith cannot sell to them as well or as cheaply as a full-fledged dealer, while some supply houses have inherited the belief that a regular dealer can sell more goods than could a "blacksmith dealer." However, many smiths are making a success—a good profit, by handling side-lines.

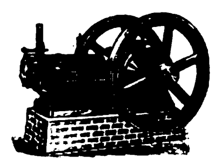
Other points which invite confidence or influence sales may also be shown on the blacksmith-dealer's letterhead—several years in business, goods extensively used and fully guaranteed, large sales, names of buyers or users, etc. The head may be of any convenient size and embellished by an appropriate cut, such as a picture of a wagon, sleigh, plow, gas engine; or, for a repair shop, by an anvil, clipper or horseshoe.

Where the smith is well established as a smith or dealer, he may glean profit by writing a personal letter to farmers and others in his vicinity or adjoining territory, calling their direct attention to his excellent facilities for shoeing or clipping, handling the repair of tools and implements, building wagons, etc.; or, he may enumerate such specialties as he is handling—gas engines, plows, buggies—and send with his letter a circular describing them. Manufacturers are usually glad to supply free printed matter to smiths who are handling their goods, as well as cuts for letterheads or advertising in home newspapers. Some companies even furnish free letterheads, although if the smith devises his own it is likely to meet his needs more directly.

While it is sometimes the case that the smith is not much "on the write," usually because his fingers have become thickened or stiffened, thereby making a pen somewhat light in weight for him to handle conveniently, it is true, nevertheless, that even "scoop-shovel" writing or a letter which is printed or painted is likely to bring custom on repair work, as it shows the writer to be a practical mechanic, rather than "a pretty letter-writer." However, where the smith has not the time to do the writing himself or wishes to solicit trade through the mail on a considerable scale, he may turn the job of writing over to his son or to a bright apprentice boy, writing out a copy first for him to follow, so the letter will contain practical, straight-forward points. Soliciting letters may all contain the same wording, as a letter which

SPECIALTIES
WINDMILLS,
TREADS,
SWEEPS,
GAS ENGINES,
STEAM ENGINES.
SLEIGHS,
WAGONS,
PLOUGHS,
CULTIVATORS,
FEED CUTTERS,
CHOP MILLS,
WOOD SAWS.

ESTABLISHED IN 1890.
BEST KNOWN DEALER IN JOHNSON COUNTY.
Can Supply Anything You Want.



W. E. SCOTT,
FARM MACHINERY.
MANSON, ILL., ... 190

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will appeal to one recipient will likely appeal to all.

To facilitate letter-writing, the smith will find that the most appropriate present for his son is a typewriter, as he can conduct his father's correspondence, and at the same time educate himself in practical business. An enthusiastic daughter also makes a good correspondent. Any boy can learn to run a typewriter in a few weeks, and in the course of a little time be able to take dictation, thereby answering the mail in his father's own words. At the same time, the typewriting experience will be useful to the son in after years, as he can use a typewriter in any line of business. A good typewriter may be bought for as low as $25 or $35, while some of the standard machines come as high as $125. However, a machine like the "Blickensderfer" or "Chicago," at moderate price is admirably adapted to handling smith shop correspondence.

A Good Brick Forge.

W. W. HERRING.

The following is the plan for building about as nice a forge as I ever saw. Commence the forge as large as you want it, building it to the height of the bed just as you would any brick forge. From there on continue the forge up six or eight feet high, the size of the hearth. Make an opening in front high enough to take in a wagon tire, and wide enough to give room to get the work in. There can be an opening at the back to let the work go through. Taper the forge to three bricks square and run the flue above the building, and you will never be bothered with any smoke or dust in the shop.

Table of Tools and Parts Made from Crucible Steel.—*Continued.*

Giving Percentage of Carbon They Should Contain, Temper Colors to Which They Should be Drawn and Degrees of Heat for Producing Different Temper Colors.

COMPILED AND ARRANGED BY JOSEPH V. WOODWORTH.

Tool.	Carbon, Per Cent.	Color.	Deg. of Heat. F.
Hammer, peen	1.15	Brown yellow	500
Hammer, pneumatic	0.60 to 0.70	Brown yellow	500
Hammers and drop dies	1.15	Spotted-red-brown	510
Half-round bits	1.22 to 1.25	Straw yellow	460
Hand springs	1.28	Purple blue	535
Hand tools	1.25	Light yellow	440
Hand plane irons	1.10 to 1.20	Brown yellow	500
Hatchets	1.15 to 1.22	Brown yellow	500
Hobs for dies	0.80 to 0.90	Straw yellow	460
Inserted saw teeth	1.25	Straw yellow	460
Ivory cutting tools	1.10	Very pale yellow	430
Jaw, chuck	0.85 to 0.90	Brown yellow	500
Jaw for pipe machine	1.15	Brown yellow	500
Jaw, gripping	0.85 to 0.90	Straw yellow	460
Jaw pieces	0.95 to 1.05	Purple blue	535
Jaw, vise	0.85 to 0.90	Spotted red-brown	510
Jaw, wire puller	1.10 to 1.18	Straw yellow	460
Jaws	0.73 to 0.78	Straw yellow	460
Key for hammer	0.75 to 0.80	Blue	549
Knife, belt	0.80 to 0.85	Spotted red-brown	510
Knife, blade	1.00	Brown yellow	500
Knife, corn	0.80 to 1.00	Brown yellow	500
Knife, carver	1.00	Brown yellow	500
Knife, draw	1.20 to 1.22	Straw yellow	460
Knife, envelope	1.20 to 1.22	Very pale yellow	430
Knife, hog	1.15	Straw yellow	460
Knife, machine	1.20 to 1.22	Brown yellow	500
Knife, paper	1.15	Straw yellow	460
Knife, putty	0.90 to 1.00	Blue	549
Knife, scarfing	0.90 to 0.95	Brown yellow	500
Knife, shear	0.85 to 0.90	Straw yellow	460
Knife, straw cutter	0.80 to 0.90	Brown yellow	500
Knife, whittler	1.15	Brown yellow	500
Knife, wood working	1.15 to 1.20	Straw yellow	460
Lathe tools for brass	1.15 to 1.20	Very light yellow	420
Leather-cutting dies	1.22 to 1.28	Straw yellow	460
Lining for brick dies	1.20 to 1.25	Straw yellow	460
Mandrels	1.05 to 1.10	Dark yellow	490
Milling cutters for brass	1.20 to 1.25	Very light yellow	420
Milling cutters	1.20 to 1.25	Straw yellow	460
Moulding and planing tools	1.10 to 1.15	Dark purple	550
Needles	1.20 to 1.25	Dark purple	550
Paper cutters	1.25	Very pale yellow	430
Parts subject to shock	1.05 to 1.10	Very dark yellow	505
Penknives	1.18	Straw yellow	460
Percussion tools for metal	0.85 to 0.95	Brown yellow	500
Planer tools for iron	1.05	Straw yellow	460
Planer tools for steel	1.15	Very pale yellow	430
Planer tools for stone	0.70 to 0.80	Brown yellow	500
Planer tools for wood	1.15	Straw yellow	460
Pliers	0.85 to 0.95	Brown yellow	500
Press dies for brass	1.20	Light purple	530
Press dies for cold rolled stock	1.25	Brown yellow	500
Press dies for sheet metal	1.15	Straw yellow	460
Press dies for leather	1.25	Straw yellow	460
Press dies for paper	1.25	Brown yellow	500
Punch, blacksmith	0.80 to 0.85	Brown yellow	500
Punch, cartridge shell	1.20 to 1.22	Straw yellow	460
Punch, file blank	1.20 to 1.22	Blue	549
Punch, hot work	0.85 to 0.90	Brown yellow	500

Tool.	Carbon, Per Cent.	Color.	Deg. of Heat. F.
Punch, oil cloth	0.85 to 0.90	Brown yellow	500
Punch, railroad track	1.85	Blue	549
Punch, skate blade	0.85 to 0.90	Blue	549
Punch, washer	0.80 to 0.88	Blue	549
Reamers, Hand, all kinds	1.20 to 1.23	Straw yellow	460
Rock drills	1.10 to 1.18	Straw yellow	460
Saws, band	0.68 to 0.75	Light purple	530
Saws, circular	0.80 to 0.90	Straw yellow	460
Saws, cross-cut	0.85 to 1.00	Brown yellow	500
Saws for sawing steel	1.60	Light purple	530
Saws, gang	0.90 to 1.00	Straw yellow	460
Saws, mill	1.25 to 1.30	Spotted red-brown	510
Saws for wood	1.15	Dark blue	570
Saws for bone and ivory	1.10	Dark purple	550
Scarfs	1.20 to 1.25	Brown yellow	500
Scrapers, tube	1.20 to 1.22	Brown yellow	500
Scrapers, for brass	1.23	Very pale yellow	430
Scrapers	1.23	Very light yellow	420
Screw drivers	0.95 to 1.05	Dark purple	550
Screw-cutting dies	1.15 to 1.20	Straw yellow	460
Shear blades	0.90 to 1.10	Dark yellow	490
Shell end mills	1.05 to 1.10	Straw yellow	460
Shell reamers	1.10 to 1.20	Brown yellow	500
Shell thread dies	1.15 to 1.25	Dark yellow	490
Slight turning tools	1.20 to 1.25	Very pale yellow	430
Small milling cutters	1.20 to 1.25	Straw yellow	460
Springs	1.15 to 1.23	Very dark blue	601
Springs	1.18 to 1.25	Dark purple	550
Steel-engraving tools	1.20 to 1.28	Very pale yellow	430
Stone-cutting tools	0.95 to 1.05	Straw yellow	460
Taps and Dies, Hand, all kinds	1.20 to 1.25	Straw yellow	460
Taps, nut	1.15	Straw yellow	460
Taps, spindle	1.20 to 1.22	Straw yellow	460
Threading dies for brass	1.18 to 1.20	Light yellow	440
Tools for wood to be filed	1.05	Purple blue	535
Tools for wood, not to be filed	1.18	Spotted red-brown	510
Tool for reaming inside of guns	1.05 to 1.12	Very pale yellow	430
Tool for turning hard rubber	1.05	Straw yellow	460
Tools for cutting soft stock	0.80 to 1.00	Very light yellow	420
Twist drills	1.20	Brown yellow	500

Table of Temper Colors of Steel.

Very light yellow	420
Faint yellow	430
Straw color	460
Dark straw	470
Dark yellow	490
Brown yellow	500
Spotted red-brown	510
Purple	530
Blue	550
Full blue	560
Polish blue	580
Dark blue	600
Pale blue	610
Blue tinged with green	630
Bright red in dark	725
Red hot in twilight	884
Red visible by day	1077

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HEATS SPARKS WELDS

A light heart is a big personal asset.

Drive your business; don't let it drive you.

A mule is very often like the man who "knows it all."

A bright sign over the shop door is often a trade winner.

Living up to your New Year resolutions? What, forgotten them?

Rumors of war in the far East, but wheels hum and anvils ring on unmindful.

Now's the time, when not over busy, to think out schemes for increasing your spring trade.

The days lengthen as the cold strengthens—an old saying but a true one at this time of year.

Sometimes your customer thinks he knows more about it than you. Treat these kind with tact.

Does your neighbor smith take a good craft paper? Tell him about your favorite journal and get him to subscribe.

That 'prentice of yours may yet be a master smith. Your craft pride tells you to teach him all you can. Do you?

A black eye from smut of the forge is a badge of industry, but a black eye from underhand dealings disfigures for years.

A good old world is ours, after all. Most of us contribute some little share towards its betterment and cheerfulness.

Down and out. That's the case with many a mechanic who hasn't the backbone to ask as much as his services are worth. Cultivate backbone.

Did you ever try washing your coal to improve it? Much depends upon its quality, and considerable of the sulphur and dross can be eliminated by washing.

Are you learning anything from the experience of others as given in the prize articles on wagon work in the front of the paper? Good practical experience.

Cause and effect—The farrier who is shoeing interfering horses has a good chance to observe its workings—and to put his close observations to practical use, too.

Abraham Lincoln once said he owed his success largely to the fact that he made it a rule always to be about five minutes early in getting to work and in keeping appointments.

Don't forget that letters or printed circulars mailed to prospective customers to remind them of your line of business, are excellent advertising. They stamp you as progressive and up to date.

A good razor, also a pocket knife, have been added to the list of premiums given for American Blacksmith subscriptions. See the announcement in the advertising pages of this number and the next.

A prize for the best article on the advantages of gas engine power in the blacksmith shop! Have you had any experience with an engine? Yes? Then you have a chance for a prize. There's more than one offered.

Don't think a customer a dead beat because he is "slow pay." Treat such with tact and persistence, and above all, with good nature. Get his promise, or perchance his note, and follow either up closely.

'Tis good to know of men whose sole aim is not personal gain. Such a man is John Mitchell, of the United Mine Workers, who in convention recently used his authority to frown down an attempt to increase his salary as president.

What are the blacksmiths in your neighborhood doing? Send in notices of any meetings that are held, for publication, so that the blacksmith world may know what you are doing. Have you raised prices recently?

Look for the rat holes in your business and stop them up. The less money you lose through any holes the more you make. Bad debts, waste of material "soldiering" employees—can you discover any such holes to stop up?

Daily we hear of the lack of apprentices while the demand for good smiths grows constantly. What are you doing to induce promising young men to take up our good old vocation? What are you doing to keep up the standard of the craft?

Has any kink described in these columns helped you a bit? There are probably many little short cuts which you have learned and which would help brother smiths in turn, especially those just beginning. Write 'em out and mail to the editor.

Look out that the boogie doesn't catch you. The boogie takes many forms—one of the most common is lack of progressiveness; getting in a rut, in other words. What are you doing to wake up trade, to improve your shop methods, to keep up to date?

No man ever gets to the point where study cannot benefit him. Twentieth century libraries, night schools, and correspondence schools place opportunity within the reach of all. But when one studies, he should have some end in view, so as to spend his time to the best advantage.

Get together with the smiths of your town or county and agree on a scale of prices which will give you all a proper living. Let the skilled workman get better prices than the scale if he can command them, but let none charge below the scale. Write the American Association for plans how this may be done.

The best way is not to talk about your neighbor's poor jobs, but to boost your own reputation by skilful work. Actions speak louder than words, and running down a competitor is too often but a plain indication of jealousy. There is no better advertisement than turning out first-class work and attending strictly to business.

A short talk upon any one of the questions asked in this issue under the heading "Queries, Answers, Notes," would be most acceptable. Send it to the editor, who will see that it is correctly printed. Many readers say that department is one of the most interesting in the paper. Perhaps you could help make it more interesting if you took more interest in it.

In West Virginia horse murder is punishable under statute by a penitentiary sentence of from one to five years. A blacksmith there while shoeing a horse a few days ago became enraged at the animal because it playfully nipped him on the hip. Seizing a hammer he killed the horse with a blow on the head. Such an offence deserves the full penalty of the law.

Asleep. Are you among those blacksmiths and wheelwrights who have not awakened to the fact that they are working for starvation wages fairly, that they can secure better prices if they will but put forth the effort, and that each time they pass by an opportunity to organize and co-operate with brother craftsmen for better prices, just so often do they deprive them selves and their families of many of the comforts and conveniences of life? Not only may a man enthusiastically embrace an opportunity to organize with his brother craftsmen for mutual benefit, but he can with profit be the one to start such a movement in his locality.

Any question you would like to ask about your work? Perhaps you want a little advice about some trouble that horse has; perhaps you don't know just what size pulleys to use with that new gas engine; or maybe it is some question about treating that tool steel which is troubling you. At any rate, send in your query, and if The American Blacksmith cannot answer, it will try to find some one with experience on that particular point who can help you. But be sure to explain the trouble clearly and fully.

Tom Tardy's face brightened visably when we strolled into his shop last Friday. 'You can help me," he said. Tom has been shoeing for ten and twenty lately, getting poorer and poorer every day. From some unknown source he had conceived an idea, and so we found him trying to figure out his profit at the prices he charged. 'There's what it costs for a set of shoes," pointing to his figures on a pine board, "and that's for the nails. That leaves a good profit, and I can't figure out just where the trouble is." Tom went on to tell us how he had been cutting his prices down and down, but without getting any greater amount of trade. At last he had realized that something must be done. Hence the figures.

"Where's the trouble?" he asked. We mentioned a few items of expense such as coal, rent, toe calks, oil for his lamp, adding, "you had to pay something, didn't you, Tom, to have the place fixed up after your little fire here a month or so ago? That old bellows is about ready to fall to pieces, and you'll have to repair your chimney soon if you don't want it coming down on your head. You can't buy groceries with the same money it takes for those expenses, can you, Tom?" Our friend threw down his board and figures with a sound that was half-way between a grunt and a groan, but he seemed much relieved when we promised to help him figure out his costs some day. "Never was much good at 'rithmetic," our worthy blacksmith friend said as we parted.

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American Association of Blacksmiths and Horseshoers.

A Movement for Better Prices.

The question of prices for work is one that every live shop-running blacksmith and wheelwright is giving a great deal of thought to in these days of high prices for material and living necessities. It can be taken for granted that there are few sections of the country where blacksmiths receive as much money as they should in proportion to their skill and labor.

To correct this condition of things, the cause must be found. The reason why one shop will not raise its prices when the price of supplies goes up, is simply through fear of losing patronage to other shops. The price-cutting evil brings neighboring craftsmen to work at less than a living profit, the ones who profit being the customers themselves. Occasionally we meet with smiths who have figured out just how much they must charge in order to make a proper living from their work, and who refuse to work for less, and occasionally with others who are not afraid to advance their prices, but it is a fact that the large majority of smiths stand in too great fear of losing patronage by putting up prices, unless their neighbors agree to do likewise, and even then there is no telling when the prices will be cut down again.

The solution of the difficulty lies in getting all shops in a given locality to co-operate in earnest, to organize themselves into a body for mutual protection and interests. It goes without saying that organization is the order of the day. All successful crafts are organized fully. Blacksmiths should see that their interests are identical one with another, and every year they pass in craft jealousy and price cutting means hundreds of dollars out of the pockets of each one. Right-minded customers agree that blacksmiths are not getting what they should; dealers and supply houses would welcome a stand for better prices on the part of the smith. The greatest thing to be overcome is the fear and jealousy of one shop for its neighbor.

The solution of the difficulty lies, therefore, in organization. Let blacksmiths realize that their neighbors are brother wage-earners, with interests and desires the same as their own, and then let them come together, form an association, fix prices and uphold them. One blacksmith, who is progressive and energetic, can start the ball rolling in his county or town. It is a simple matter to calculate how much more money he would earn from even a small raise in prices.

Blacksmiths who are interested should write to the American Association of Blacksmiths and Horseshoers, for plans for forming local city or county associations, under the auspices of the American Association, at Buffalo, N. Y. These plans are furnished free of charge to blacksmiths. They outline how a strong working association may be formed, how the members can be forced to stick to the prices agreed upon by the local county association, and, further, how the blacksmith who takes up the work of educating and organizing his county can make enough money to pay him for the time he may spend on the work. Blacksmiths standing well in any county are invited to write for full particulars. The American Association at Buffalo would like to see a local association in every county of every state in the land. A great many blacksmiths in various sections are already engaged on the work.

The New York State Lien Law Bill.

On January 6th, a bill "to amend the lien law, relative to liens on animals and vehicles for labor done and materials furnished" was introduced in the New York State legislature by Senator George A. Davis, at the request of The American Blacksmith Company and the American Association of Blacksmiths and Horseshoers. No stone must be left unturned to get this bill passed. The Association has written to several thousand blacksmiths in various sections of New York State requesting them to write at once to the Senators and Assemblymen representing them at Albany and urge them to vote for the bill. We are sure that every smith who has thus been notified will do this to help the bill through. The blacksmiths and horseshoers of McClure, Gulf Summit, and Deposit all signed a petition prepared by Mr. C. Hall, Jr., of McClure, N. Y., and sent it to the Assemblyman from their District. We are glad to see such energy as this in helping the Lien Law bill along—the idea is an excellent one. The petition is printed here:

Whereas, the undersigned, understanding that there has been a bill presented at this Session of the State Legislature, providing for a Mechanics' Lien for Blacksmiths and Horseshoers of the State, upon articles upon which repairs are made, and shoeing done to animals, etc., enabling them to recover pay for work done by them as mechanics, which now in many cases is lost by them, and believing that the proposed bill is a necessity and a move in the right direction for this class of tradesmen,

We, therefore, respectfully ask you to give this bill your favorable consideration, and do all that you consistently can in procuring its passage as a law upon the Statute Books of the State, individually, as well as using your influence in having other legislators give it the consideration which its importance deserves.

Let every blacksmith and wagon builder in New York State sit down the very day he sees this article, and write to his representatives at Albany, if he has not already done so, urging their support of the bill. Write at once—there is no time to be lost. Let him also tell his brother smiths to do the same thing.

Clarion County Association.

The blacksmiths of Clarion County, Pa. recently held a meeting at Bethlehem and organized their county under the American Association of Blacksmiths and Horseshoers. Fifteen joined at that time, electing Mr. J. W. Fleming, East Brady, Pa., as president, and Mr. W. M. Armagost, of Rimersburg, Pa., as treasurer. The scale of prices was not fully decided upon, but will be brought up again at the next meeting.

The Railroad Blacksmith Shop.—16.

W. B. REID.

Miscellaneous Work.

Setting locomotive valves generally implies the adjusting of the eccentric rods by the blacksmith. To do this accurately without disturbing the original set and outline of the rod requires considerable expertness on the part of the smith. The method usually followed is for the machinist to tram the rod with short tram or gage (C, Fig. 64) upon its straight part, lengthening or shortening as required. With straight or slightly bent rods this answers the purpose. But when the rods have considerable offset, as in Fig. 64, the use of a long tram, gaged entirely outside of all the points of operation is necessary to secure accurate results. (B, Fig. 64). This will appear very plain from a moment's glance at the sketch.

It is very obvious that lengthening or shortening the rod inside the points of the short tram will to a corresponding degree affect the distance between the end of rod and straight edge. See A, Fig. 64. To adjust this accurately to original position it would then be necessary to change the offsets slightly at points of bends. This being done outside the points of small tram, leaves us really ignorant of the true condition of the rod. By using the long tram, on the contrary, and preserving the same distance at A, the rod can be adjusted with positive accuracy. The use of double tram marks is also commendable in adjusting eccentric rods, securing

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greatest accuracy and dispensing with the use of the straight-edge for side measurements. Simple as these remarks may appear, the writer considers them of some importance, since, in many railroad shops he has found the short tram used alike on straight and bent rods indiscriminately.

While upon the subject of eccentric rods, a word in reference to the forging of the fork or jaw for same, may be of interest. To overcome the obvious weakness of a cross grain iron through the line, E, Fig. 64, when forged in the solid, these jaws are often welded as shown at F, G, and H, Fig. 64. Though this may overcome the weakness mentioned, the welds themselves are equally vulnerable.

The entire welded surfaces being removed at machine in finishing the jaw, renders any advantage thus secured, of a very doubtful quantity. The writer has often been conscious of unnecessary waste of time in making the eccentric rod, reach-rod and other similar jaws in this way, when required to do so. By making them in the solid from mild steel a much superior article can be produced in a third of the time.

At Fig. 65, A and B, is shown a jaw forged in this way. A represents the stock, of mild steel, checked down with triangular fuller, for blade end, and a round or rectangular hole punched, to form the jaw, at opposite end. B shows same with the end drawn down—the stock cut off to right length, and the jaw cut out. The whole operation can easily be done in one or two heats at most; and the job completed at anvil in a comparatively short space of time.

If mild steel is not available, a substantial jaw can be forged in the same way, providing the iron is solidified by working with welding heats throughout. Made either way, by far the greater proportion of breakage in iron jaws occurs at the pin hole E, Fig. 64, the result of the iron not having been finished with welding heats at this point. When made of mild steel all these natural defects are avoided and a much superior job, in every way, secured.

Spring equalizers frequently become so warm in the fulcrum hole as to require re-enforcement of the stock at this point. Fig. 65, C, shows the equalizer scarfed to receive a patch, in dove-tail fashion. This is done by making two slanting incisions with chisel in opposite directions, raising the cut sections upward as shown. The stock in intervening space is then driven downwards restoring the hole to proper shape and proportion, the deficiency thus occasioned being supplied by the patch on outside. In repairing in this way, the mistake is often made of putting the patch in straight, from side as at E, Fig. 65. The result is the piece does

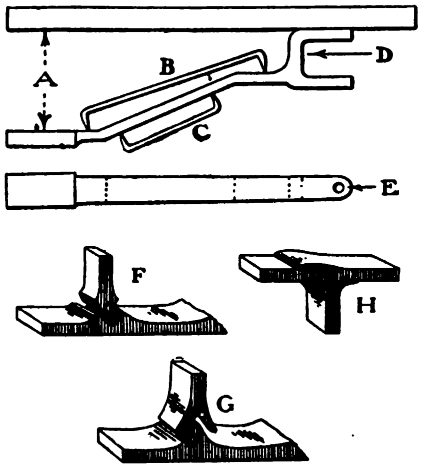

Fig. 64. ADJUSTING ECCENTRIC ROD AND FORGING THE JAW OF A ECCENTRIC.

not fit snugly and becomes still more loose by the expansion of the equalizer in heating; the dirt thus finding an easy entrance, makes a good weld impossible. With the patch from $\frac{3}{4}$ to 1 inch longer than the scarfed cavity, and bent as shown at D, Fig. 65, it will enter easily. And, when driven down at a white heat, under steam hammer, will adjust itself very tightly into place. Heated slowly, to allow the heat to penetrate the iron, a substantial weld can then be effected at the anvil with sledges, the superfluous stock being trimmed from the edges, and the surface smoothed and levelled by a few blows of steam hammer.

During the scarfing and welding operations a flat mandril has, of course, to be inserted in the fulcrum hole to keep it in shape, and to afford a solid resistance to the impact of the hammer. The smaller spring hanger holes at the ends of the

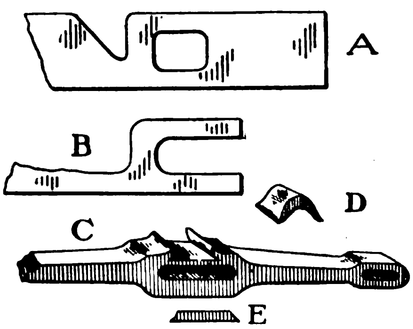

Fig. 65. A B—FORGING JAW FROM ONE PIECE. C—REINFORCING FULCRUM HOLE OF A SPRING EQUALIZER.

equalizer can be repaired in the same way with equal facilty, either upon the face or side. In the hands of competent workmen, many forgings by such means can be restored to service in good shape, saving the substitution of new and expensive forging, and also saving in time, which is an important factor.

(To be continued.)

Making a Polishing Wheel.

T. E. LARSON.

For this purpose I use old felt boots, which can be obtained for little or nothing. Each boot will make two plys. Three pairs of boots will make one wheel about 3 by 7. Put iron plates on each side about $\frac{1}{8}$ of an inch thick, and about one inch smaller than the wheel. Bolt them together. The wheels can be made any thickness desired. To obtain a smooth surface put the wheel on emery stand shaft, use a chisel like those used for wood lathes, and hold up to the wheel on a rest. The wheel must have good speed. This makes fine polishing wheels, as they are soft and will not bump or break.

Correcting the Dish of Wheels.

FRED RICKERT.

Three years ago I rebuilt two hind wheels on a 4-inch lumber wagon. They had been rebuilt four different times before, but would always dish wrong and break down. I fixed them with $\frac{1}{2}$-inch dish and set the $\frac{3}{4}$-inch tires back on them. They had $\frac{3}{4}$-inch dish when they left the shop; in three weeks they came back dished wrong again. I supposed I knew all about a wagon wheel, having built them for years, but I now found out differently and began to study how to keep the dish in a wheel. I drove the spokes with $\frac{1}{4}$-inch dish, bevelled the felloes $\frac{1}{16}$ inch to the outside edge, gave the tires $\frac{1}{2}$ inch draw, and set them again. Those wheels are in use today. I have set the tires on them once since. The wheels have now $\frac{1}{2}$ inch dish and hold up 3,000 to 4,000 feet of lumber.

I have now come to the conclusion that a wheel built smaller on the outside edge will never dish wrong. I have tried a number of buggy wheels that were dished wrong by dishing them right, turning rims and tires, and they hold the dish right along. Of course a smith should see that his wheel is not rim bound, for a rim bound wheel is liable to dish any way at all.

An Approved Tuyere for Large Forges.

The line engraving presented herewith shows a form of tuyere, grate and housing endorsed by Mr. Robert Henderson, before the Buffalo meeting of the National Railroad Master Blacksmiths. His recommendation is for a blast box 6 by 6 inches and 9 inches deep, for heavy work, with drop grate on top in accordance with the figure, and a $3\frac{1}{2}$ to 4-inch

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blast pipe. For lighter work a box 5 by 5 inches, and 8 inches deep is recommended, with top of box 10 inches below top of forge, and a 3-inch blast pipe. A box of this size will meet all the requirements of light or medium work.

A Treatise on Horseshoeing.*

JOHN W. ADAMS V. M. D. LECTURER ON SHOEING, UNIVERSITY OF PENNSYLVANIA.

Introduction.

Bad and indifferent shoeing frequently leads to diseases of the feet and to irregularities of gait which may render a horse unserviceable. It is important, therefore, to consider the principles involved in shoeing healthy hoofs. In this discussion of the subject it is intended to give the intelligent horse owner sufficient information, based on experience and upon the anatomy and physiology of the foot and leg, to enable him to avoid the more serious consequences of improper shoeing.

The Foot.

Let us first examine the mechanism of the foot and learn something of its structure and of the natural movements of its component parts, that we may be prepared to recognize deviations from the normal and to apply the proper corrective.

Gross Anatomy of the Foot.

BONES.—The bones of the foot are four in number, three of which—the long pastern, short pastern, and coffinbone—placed end to end, form a continuous straight column passing downward and forward from the fetlock joint to the ground. A small accessory bone, the navicular, or "shuttle" bone, lies crosswise in the foot between the wings of the coffinbone and forms part of the joint surface of the latter. The short pastern projects about 1½ inches above the hoof and extends about an equal distance into it.

HINGE JOINTS.—The pasterns and coffinbone are held together by strong fibrous cords passing between each two bones and placed at the sides so as not to interfere with the forward and backward movement of the bones. The joints are therefore hinge joints, though imperfect, because, while the chief movements are those of extension and flexion in a single plane, some slight rotation and lateral movements are possible.

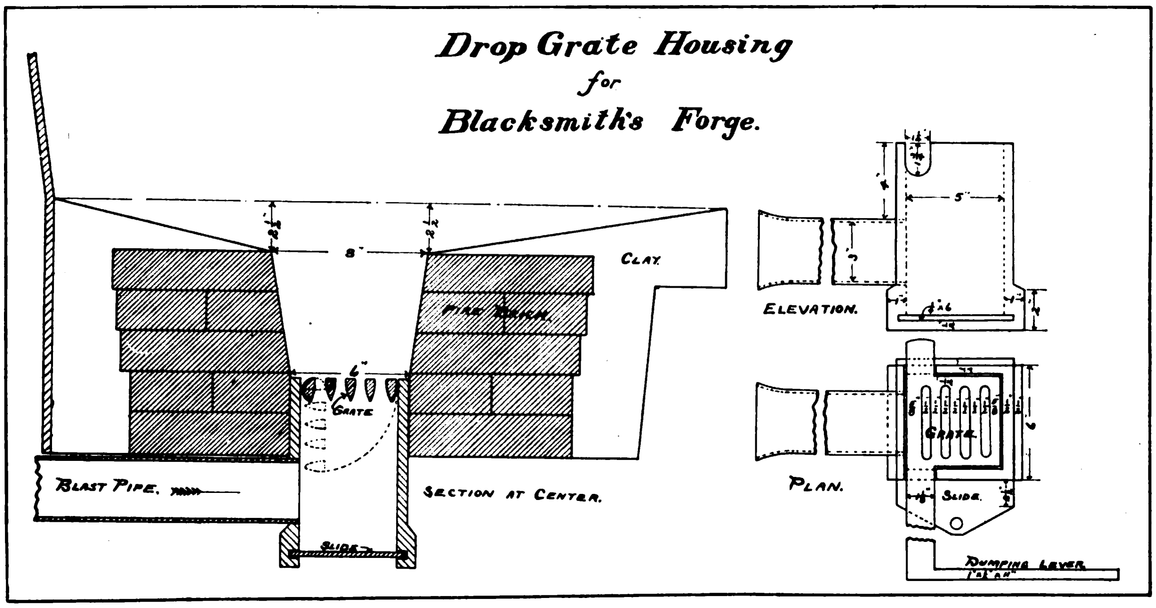
TENDONS AND FLEXORS.—The bones are still further bound together and supported by three long fibrous cords or tendons. One, the extensor tendon of the toe, passes down the front of the pasterns and attaches to the coffinbone just below the edge of the hair; when pulled upon by its muscle this tendon draws the toe forward and enables the horse to place the hoof flat upon the ground. The other two tendons are placed behind the pasterns and are called flexors, because they flex, or bend, the pasterns and coffinbone backward. One of these tendons is attached to the upper end of the short pastern, while the other passes down between the heels, glides over the under surface of the navicular bone, and attaches itself to the under surface of the coffinbone. These two tendons not only flex, or fold up, the foot as the latter leaves the ground, during motion, but at rest assist the suspensory ligament in supporting the fetlock joint.

FOOT-AXIS.—The foot-axis is an imaginary line passing from the fetlock joint through the long axes of the two pasterns and coffinbone. This imaginary line, which shows the direction of the pasterns and coffinbone, should always be straight—that is, never broken, either forward or backward when viewed from the side, or inward or outward when observed from in front. Viewed from one side, the long axis of the long pastern, when prolonged to the ground, should be parallel to the line of the toe. Viewed from in front, the long axis of the long pastern, when prolonged to the ground, should cut the hoof exactly at the middle of the toe.

Raising the heels or shortening the toe not only tilts the coffinbone forward and makes the hoof stand steeper at the toe, but slackens the tendon that attaches to the under surface of the coffinbone, and therefore allows the fetlock joint to sink downward and backward and the long pastern to assume a more nearly horizontal position. The foot-axis, viewed from one side, is now broken forward; that is, the long pastern is less steep than the toe, and the heels are either too long or the toe is too short. On the other hand, raising the toe or lowering the heels of a foot with a straight foot-axis not only tilts the coffinbone backward and renders the toe more nearly horizontal, but tenses the perforans tendon, which then forces the fetlock joint forward, causing the long pastern to stand steeper. The foot-axis, seen from one side, is now broken backward—an indication that the toe is relatively too long or that the heels are relatively too low.

LATERAL CARTILAGES AND PLANTAR CUSHION.—The elastic tissues of the foot are pre-eminently the lateral cartilages and the plantar cushion. The lateral cartilages are two irregular four-sided

*Department of Agriculture Bulletin.



Drop Grate Housing for Blacksmith's Forge.

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plates of gristle, one on either side of the foot, extending from the wings of the coffinbone backward to the heels and upward to a distance of an inch or more above the edge of the hair, where they may be felt by the fingers. When sound, these plates are elastic and yield readily to moderate finger pressure, but from

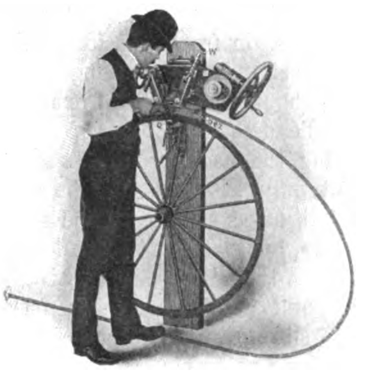

Fig. 1. A RUBBER TIRE SETTER. WHEEL IN PERPENDICULAR POSITION.

various causes may undergo ossification, in which condition they are hard and unyielding. The plantar cushion is a wedge-shaped mass of tough, elastic, fibro-fatty tissue filling all the space between the lateral cartilages, forming the fleshy heels and the fleshy frog, and serving as a buffer to disperse shock when the foot is set to the ground. It extends forward underneath the navicular bone and perforans tendon, and protects these structures from injurious pressure from below. Instantaneous photographs show that at speed the horse sets the heels to the ground before other parts of the foot—conclusive proof that the function of this tough, elastic structure is to dissipate and render harmless violent impact of the foot with the ground.

PODODERM (FOOT SKIN).—The horn-producing membrane, or "quick," as it is commonly termed, is merely a downward prolongation of the "derm," or true skin, and may be conveniently called the pododerm (foot skin). The pododerm closely invests the coffinbone, lateral cartilages, and plantar cushion, much as the sock covers the human foot, and is itself covered by the horny capsule, or hoof. It differs from the external, or hair skin in having no sweat or oil glands, but, like it, is richly supplied with blood vessels and sensitive nerves. And, just as the derm of the hair skin produces upon its outer surface layer upon layer of horny cells (epiderm), which protect the sensitive and vascular derm, so, likewise, in the foot the pododerm produces over its entire surface soft cells, which, pushed away by more recent cells forming beneath, lose moisture by evaporation and are rapidly transformed into the corneous material which we call the hoof. It is proper to regard the hoof as a greatly thickened epiderm, having many of the qualities possessed by such epidermal structures as hair, feathers, nails, claws, etc.

The functions of the pododerm are to produce the hoof and to unite it firmly to the foot.

There are five parts of the pododerm, easily distinguishable when the hoof has been removed, namely: (1) The perioplic band, a narrow ridge from one-sixteenth to one-eighth of an inch wide, running along the edge of the hair from one heel around the toe to the other. This band produces the perioplic horn, the thin varnish-like layer of glistening horn, which forms the surface of the wall, or "crust," and whose purpose seems to be to retard evaporation of moisture from the wall. (2) The coronary band, a prominent fleshy cornice encircling the foot just below and parallel to the per-

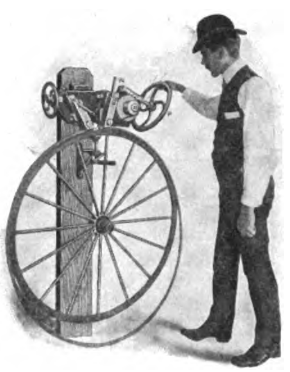

Fig. 2. DRAWING UP THE TIRE.

ioplic band. At the heels it is reflected forward along the sides of the fleshy frog to become lost near the apex of this latter structure. The coronet produces the middle layer of the wall, and the reflected portions produce the "bars," which are, therefore, to be regarded merely as a turning forward of the wall. (3) The fleshy leaves, 500 to 600 in number, parallel to one another, running downward and forward from the lower edge of the coronary band to the margin of the fleshy sole. They produce the soft, light-colored horny leaves which form the deepest layer of the wall, and serve as a strong bond of union between the middle layer of the wall and the fleshy leaves with which they dovetail. (4) The fleshy sole, which covers the entire under surface of the foot, excepting the fleshy frog and bars. The horny sole is produced by the fleshy sole. (5) The fleshy frog, which covers the under surface of the plantar cushion and produces the horny frog.

HORNY BOX, OR HOOF.—The horny box, or hoof, consists of wall and bars, sole and frog. The wall is all that part of the hoof which is visible when the foot is on the ground. As already stated, it consists of three layers—the periople, the middle layer, and the leafy layer.

BARS.—The bars are forward prolongations of the wall, and are gradually lost near the point of the frog. The angle between the wall and a bar is called the "buttress." Each bar lies against the horny frog on one side and incloses a wing of the sole on the other, so that the least expansion or contraction of the horny frog separates or approximates the bars, and through them the lateral cartilages and the walls of the quarters. The lower border of the wall is called the "bearing edge," and is the surface against which the shoe bears. By dividing the entire lower circumference of the wall into five equal parts, a toe, two side walls, and two quarters will be exhibited. The "heels," strictly speaking, are the two rounded soft prominences of the plantar cushion, lying one above each quarter. The outer wall is usually more slanting than the inner, and the more slanting half of a hoof is always the thicker. In front hoofs the wall is thickest at the toe and gradually thins out towards the quarters, where in some horses it may not exceed one-fourth of an inch. In hind hoofs there is much less difference in thickness between the toe, side walls, and quarters. The horny sole from which the flakes of old horn have been removed, is concave and about as thick as the wall at the toe. It is rough, uneven, and often covered by flakes of dead horn in process of being loosened and cast off. Behind, the sole presents an opening into which are received the

Fig. 3. COMPRESSING THE RUBBER.

bars and horny frog. This opening divides the sole into a body and two wings.

The periphery of the sole unites with the lower border of the wall and bars through the medium of the white line, which is the cross section of the leafy

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horn layer of the wall, and of short plugs of horn which grow down from the lower ends of the fleshy leaves. This white line is of much importance to the shoer, since its distance from the outer border of the hoof is the thickness of the wall, and in the white line all nails should be driven.

THE FROG.—The frog, secreted by the pododerm covering the plantar cushion or fatty frog, and presenting almost the same form as the latter, lies as a soft and very elastic wedge between the bars and between the edges of the sole just in front of the bars. A broad and shallow depression in its center divides it into two branches, which diverge as they pass backward into the horny bulbs of the heel. In front of the middle cleft the two branches unite to form the body of the frog, which ends in the point of the frog. The bar of a bar shoe should rest on the branches of the frog. In un-shod hoofs, the bearing edge of the wall the sole, frog, and bars are all on a level, that is, the under surface of the foot is perfectly flat, and each of these structures assists in bearing the body weight.

(To be continued.)

How a Rubber Tire Setter is Operated.

BILLY BUNTZ.

Although many smiths are using setters for *steel* tires, yet not many smiths know much about *rubber* tire setters, notwithstanding that rubber tire work is profitable on account of there being so many rubber-tired vehicles.

Although a rubber tire setter is a simple machine, some instruction is necessary where the smith is uninitiated in applying rubber tires. There is a deal more in a good rubber tire setter than a mere clamp, i. e. to render good service the setter must be of absolutely

Fig. 4. COMPLETING THE SCARFING.

perfect adjustment; therefore, in explaining the operation of a machine of this kind it is necessary to describe some setter in particular. The one here explained is that of the Goodyear Co. of Akron, Ohio.

This machine may be set up perpendicularly, as shown in Fig. 1, or horizontally, although the position here shown is generally used, the machine being attached firmly to a substantial post at a convenient height for the man operating it. The bracket Q, Fig. 1, supports the wheel. Take a piece of rubber of proper length, lay it full length on floor and insert wires, which should be at least a foot longer than the rubber. Manufacturers furnish schedules giving proper sizes of wire and rubber when a machine is ordered.

About six inches back from one end of the wires attach firmly double clamp D 92, taking care that ends of wires are even and the thumb-screws in clamp very tight. Fasten ends thus clamped, firmly in right-hand tire machine jaw, with bottom of tire upward and the ends extending through the jaw about 1½ inches. Scarf the ends of the wires for about ¾ inch. Loosen jaws to re-

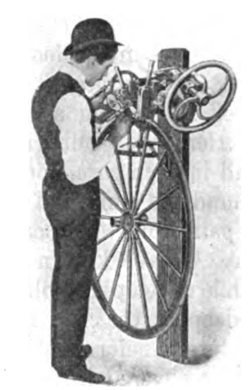

Fig. 5. BRAZING THE ENDS OF THE RETAINING WIRE TOGETHER.

lease wires, then turn tire right-side up and insert scarfed wires into grooves in right-hand jaw so that the ends are slightly past the middle of the space between the two jaws—*the filed or scarfed surface down.* Tighten jaws by first turning nut T moderately tight, then push upward right-hand lever W.

Fig. 2 shows the operation in drawing the tire up. Remove double clamp and force rubber firmly against outside of right-hand jaw. Pass rubber tire, with wire in it, around wheel, threading free ends of wire through grooves of left-hand jaw, then through opening in right-hand jaw, and after pulling out with hands as much wire as possible, see that the two ends extend exactly the same distance, and then fasten wires in winding drum or vise. To make sure that wires are firmly held, close temporarily left-hand jaw and draw wire to tension, then loosen left-hand jaw and draw up wires by turning hand-wheel P, thus drawing tire into channel.

Fig. 3 shows how the rubber is compressed. Draw rubber around wheel by hand from right to left, clamping it to the rim with rubber clamp at point Z, about 30 inches from left-hand jaw, which will leave a loop of rubber be-

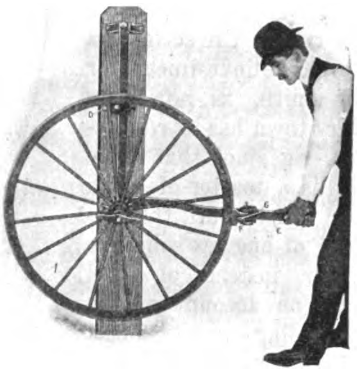

Fig. 6. JOINT CLOSING MACHINE.

tween left-hand jaw and rim clamp; that, when wires are pulled up, will contain all the extra rubber that is to fill space left between jaws. Paint channel with paste between clamp Z and left-hand jaw, also between jaws, to make tire slide easily when closing joint. Turn hand-wheel P until this loop is forced firmly into channel, drawing up very tight. Take care that rubber is not "buckled up" against outside of left-hand jaw.

Fig. 4 illustrates the completing of the scarfing. Tighten left-hand jaw same as the right and while wires between two jaws are held at tension, scarf them at a point exactly above the other two scarfed ends, filing the wires until they break, but do not cut wires before scarfing, this being an important admonition. By using a small hammer the wires may readily be brought into proper position with scarfed ends exactly lapping, when the wires are ready for brazing.

Fig. 5 shows a small handwheel which may be used to increase or decrease the tension and to assist in making ends fit perfectly. Place a small piece of asbestos under the wires and apply brazing torch. When wires are red hot apply compound and spelter. Put no strain on joint until cold; when nearly cold it may be cooled off by applying strong soap-suds with a brush, and the braze tested by a little pressure on left-hand handwheel. Loosen both jaws by dropping levers, and turning nuts, Fig. 4.

Fig. 6 shows joint closing machine. Before closing joint, clean or trim ends of rubber and apply rubber cement. D is a rubber-coated clamp for holding the wheel, E the lever, F the clamp,

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which slides over the rubber, i. e. does not pull it. When tire has been brought together the lever E will have been worked to where the opening of the tire ends, as positioned in illustration and the joint held firmly by G being slid down to F.

A rubber tire setter is a profitable investment for any smith, as nowadays every town has its rubber-tired rigs; not that alone —it is a matter of but a year or two until the majority of buggies will have rubber instead of steel tires, on account of the easy-riding quality of a rubber tire vehicle.

An Engine Repair.

W. W. HERRING.

I would like to warn those that have gasoline engines against letting them freeze. The water in the jacket of my engine froze, bursting the cylinder casting. I ordered a new one, but it would not fit, so that I had to either wait for another or fix my broken one. I went to work and cleaned the cylinder well, filed the break bright and soldered it. The engine is now working as well as it ever did. I suppose it would have been better to braze it, but I did not have any means of doing that.

The Practical Scientific Treatment of Interfering Horses.—3.

Interfering. Fetlock Striking.

E. W. PERRIN.

Fetlock striking in front, commonly called ankle hitting, is the most common of all interfering. It consists in the animal striking the inside of the fetlock joint with the inside of the opposite foot. Sometimes both ankles are affected, but more frequently only one. Sometimes the injury is so severe as to cause the animal to fall as a result of the blow. Some neglected cases cause chronic enlargements and serious complications of the joint.

CAUSES: There may be one or more causes all operating together to produce this result, but invariably the prime factor of them all is defective conformation of the limbs. It is common to find some young horses interfering when first broken in to work, or upon starting to work again, after a long spell of idleness in a sale stable or in the pasture. But in these cases the animal interferes because he is not in working condition, and I need hardly say that no system of shoeing will remedy the trouble in such cases. Reason suggests the protection of the injured parts with properly fitting boots until the animal is in working condition. Again, an animal may interfere as a result of pain in the foot or limb. For instance, on two occasions I have been accused of causing a customer's horse to interfere, as a result of indifferent shoeing, and in each case, upon investigation, I found the horse had picked up a nail, the pain from which caused him to interfere. I have known horses to interfere while developing splints, ringbones or sidebones, that had never been known to interfere before, but as soon as these horses recovered from the lameness, they ceased to interfere.

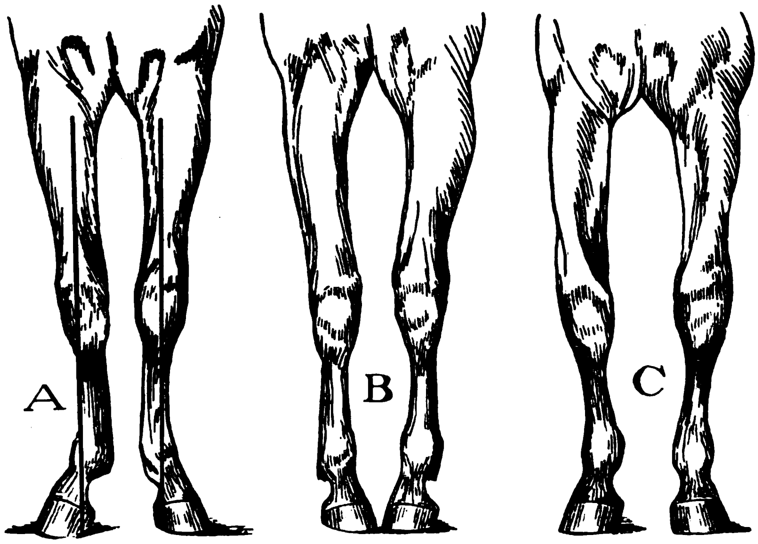

Fig. 7. POSITIONS OF HORSES THAT INTERFERE.

It is easy to understand how pain in a person's foot, ankle or knee might so interfere with regular locomotion as to cause him to hit his ankles together. Again some horses interfere as a result of being overworked; but the horse with a perfectly sound, well-formed set of limbs does not interfere, only when out of condition, from sickness, or some other cause.

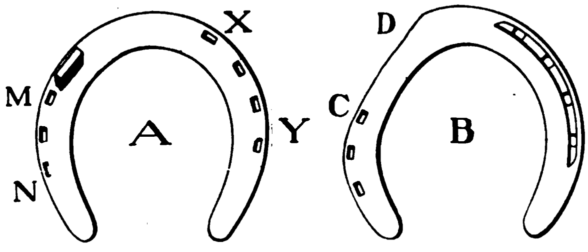

Fig. 8. TWO GOOD SHOES FOR HORSES THAT INTERFERE.

As to defective conformation of the limbs, the form of all others is the toe-wide position with twisted cannon bones. The explanation of this lies in the fact that the twisted limb forms a mechanical impediment. The knee, being a true hinge joint, it will readily be seen that if the horse's knees are set square to the chest, when the front foot is raised, it will point to the hind one on the same side. If the front leg is set at an angle to the chest, as is the case with the toe-wide horse, (A, Fig. 7) then when the foot is raised it points more or less across the body, to the opposite hind leg. Hence it is very difficult for it to extend in action, without striking the opposite leg. To illustrate this, take an ordinary large strap hinge, hold it open square to, and behind the horse's knee, now bend the hinge and you see it points straight back to the hind leg on the same side. But if you hold the hinge at a slight angle to the right or left, then when the hinge is bent it will point under and across the body or outside of the body. So when the legs are twisted outwards—toe-wide—the feet raise up under the body. When the legs are twisted inward—pigeon-toed—(B, Fig. 7) the feet raise outside the body. Have a toe-wide horse trotted toward you and you will see the front feet describe a semi-circle to the inside, while on the other hand the pigeon-toed horse describes a semi-circle to the outside. If you sit immediately behind a pigeon-toed horse in driving you can see the bottom of the fore foot at every step by glancing over the horse's shoulder, but you cannot see the bottom of the foot in the toe-wide horse, unless you sit to one side, because the "pick-up" is under the body. It is this mechanical impediment which makes it so hard to prevent interfering in the toe-wide horse.

The calf-kneed horse, (see A, Fig. 5, January issue) may strike the ankle, but if he has high action he will hit the knee on account of the knee being so close to the passing foot. It will be observed that the knees of this horse are about three inches out of plumb, thus leaving that much less room for the foot to pass. Added to this, the legs from the knee down incline outward—toe-wide—in which case the feet will describe a semi-circle to the inside, hence the interfering. Fig. 7, C, shows a bow-legged and buck-kneed horse. This particular horse is an ankle hitter. It will be observed that his legs are wide apart, but they are

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not set on square to the shoulder. They are twisted slightly outwards, hence they move to the inside, striking the opposite ankle.

The remedy consists in preparing the hoofs in conformity with the limb, and the application of suitable shoes. For the toe-wide horse, leave the hoof slightly high on the inside, and roll the outside quarter. Use shoe shown at A, Fig. 8, and bend the shoe up at the outside quarter, from X to Y. Fit close between M and N, the point of contact. But fit full at the outside toe where the slug is welded on.

For the calf-kneed horse, (A, Fig. 5, January issue) the hoofs should be lower on the inside than on the outside. The inside toe is the point of contact in this case. Use shoe shown at B, Fig. 8, fitted close between C and D, at which point a little of the hoof may be rasped away. For the buck-kneed horse the hoofs will naturally be high at the heels. If, however, the hoofs have been rasped too low at the heels, then shoe with heels with weight on the outside quarter of the shoe and roll the shoe where the wear is greatest. In this illustration, (C, Fig. 7) the wear will be at the outside quarter, but in some cases it will be at the outside toe or even at the toe.

It may seem strange to say that in some cases it is necessary to leave one foot high on the inside while its fellow is high on the outside, yet this is true, for some horses have one leg calf-kneed with its fellow toe-wide and twisted outwards. I found this out many years ago through the lessons of practical experience. A chronic interferer lost a shoe while on a long journey, and when he got back to town he was lame from soreness. I observed that the hoof was very low on the inside. As it was impossible to level it on account of its being worn so low, I fitted the shoe to the hoof with the inside low, and to my surprise the horse ceased to interfere. Hence I discovered that in this case, which I had thought incurable, the horse travelled perfectly clear with one foot high on the outside, and its fellow high on the inside.

Do not infer from the above paragraph that it is wise and the idea to be encouraged, that of experimenting with horses' hoofs. Where you have a perplexing case, study it well and shoe the horse to the best of your judgment. Wherever possible, follow up such cases.

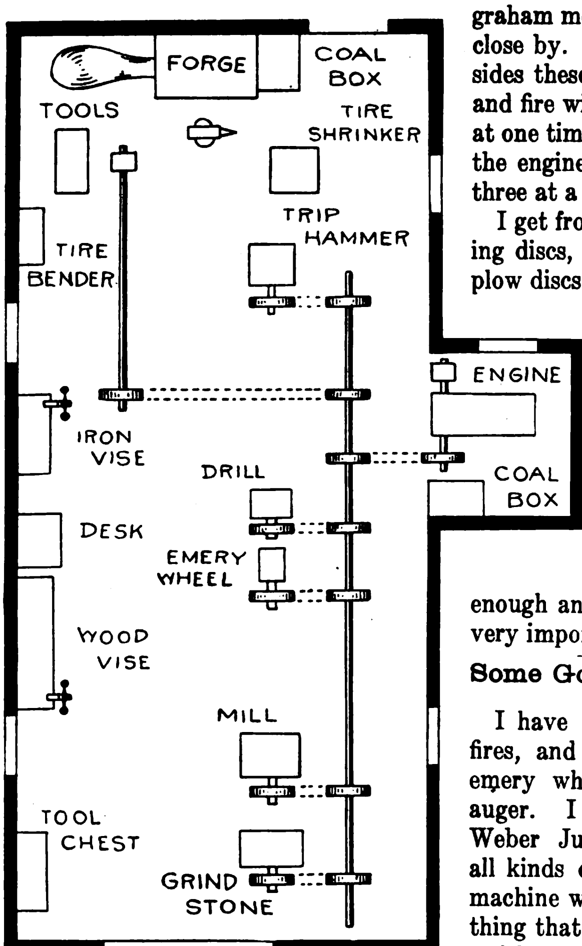
Sometimes a corn, even though it does not cause lameness, may cause a horse to interfere. Do not shoe heavier than is necessary for a month's wear, except when you need weight to balance the action. Above all, the study of causes is the most important point, as each case has some peculiarity of its own.

(To be continued.)

Improvements in a Blacksmith Shop.

A. BRUTON.

I have been enlarging my shop and putting in some new machinery since last writing. Recently I installed a Weber Junior 2½-horse power engine, and an emery wheel. I think the Weber engine is the one for the blacksmith. I also put in a trip hammer, making the same myself, at a cost of $30.00, counting time and expenses, and it is worth as much as a high-priced hammer for plow work and other work calling for knife steel and light forgings on other iron and steel. I can sharpen two or three lays with it where I could only sharpen one the old way and do it better and smoother. If any brother smith would like my plan for making a trip hammer I will gladly send it on request.



PLAN OF SHOP OF A. BRUTON, HILL CITY, KANSAS.

I have also installed a Friction Rotary Disc Holder, to hold discs on emery wheel, while it runs, the disc revolving and keeping from heating. It can grind any bevel desired and any size disc. I bought mine from the Novelty Manufacturing Company, of Council Bluffs, Iowa, at a cost of five dollars, and would advise every blacksmith to get one as it will pay for itself in one day's work. I have already ground fifteen dollars' worth of discs and would not take twenty-five dollars for it. It will grind a disc while the smith does something else.

I also am running a small feed mill in connection with my shop work. It grinds from 4½ to 12 bushels per hour, according to the grain and how ground. I have a great deal of table meal and graham meal to grind as there is no mill close by. I also have chop feed. Besides these, I run my drill, grindstone and fire with my engine. Of course not at one time, as it would be too much for the engine, but am able to run two or three at a time.

I get from 25 cents to $1.00 for grinding discs, from 12-inch up to the large plow discs. I have given up horseshoeing altogether, as I had so much other work, preferring this to shoeing. I gave this part of my work to a man who makes a specialty of it.

I give herewith plan of my shop as it is now, 18 by 38 feet with engine room, 6 by 8 feet. It is plenty large enough and I have good light, which is very important.

Some Good Prices from Kansas.

W. S. HENNINGER.

I have a shop 24x50 feet, run two fires, and have a Boss Trip Hammer, emery wheel, power drill, and tenon auger. I run all of these with a 2½-Weber Junior gasoline engine, and do all kinds of plow work, carriage and machine work, horseshoeing and everything that is done in a general blacksmith shop. Jewell City is a town of about 900 inhabitants and has three blacksmith shops. We agree on prices and therefore get pretty fair compensation for our work.

Four new shoes	$1.50
Four old shoes	1.00
Sharpening plows	.25
Pointing plows	.75
Sharpening cultivator shovels, per set	.50
Grinding cultivator shovels	.75
Pointing cultivator shovels	.50
Setting tires, per set	2.00
Single felloes	.25
Single spokes	.20

I think THE AMERICAN BLACKSMITH indespensable to every up-to-date blacksmith. Also, I believe your effort to have better laws placed on the statute books of each State for collecting blacksmiths' bills is a good one.

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QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

How to Point Plows.—Will some brother smith give the latest and best plan for pointing old plows? A READER.

Gasoline Engines.—Will some brother smith tell me which is the best gasoline engine to buy? WM. E. GIDDINGS.

For Brother Smiths.—Will some one of the craft tell me how to make a pair of dividers or compasses; also a pole axe? It would help me much. T. H. LONG.

In Appreciation.—During the past thirty years I have done my best to become a good horseshoer. I regard THE AMERICAN BLACKSMITH as indispensable. GEO. FRASK.

Mixing Paints.—Will some of the readers of THE AMERICAN BLACKSMITH tell me how to mix paint so as to obtain different colors, especially a good wine color? A READER.

A Hint on Lead Hardening.—Answering the question of J. F. in the December issue, as to hardening in lead, he should oil the steel before dipping, and it will come out nice and clean. E. B. F.

Tempering a Gaff.—I would like some of the readers of THE AMERICAN BLACKSMITH to tell me the best way of tempering a gaff used in fighting game cocks. WALTER D. WHITE.

Gun Springs.—I should like to learn from some of my brother gun doctors a recipe for tempering gun springs by simply heating to a cherry red and then dropping in a solution of some kind, without drawing any temper. J. SUMMS.

Book on Steam Engine.—Can some brother craftsman direct me to a book of instructions on upright steam engines of the Buckeye or other make? I have one I wish to repair, and would like some instructions as to how to do it. JOSEPH MILSTEAD.

Questions for Smiths.—I would like to hear from brother smiths what power hammer they consider best for small shops. Also, what shoeing stocks is the best. I would like to hear from some one who has tried the Barcus stocks. W. W. HERRING.

A Horse That Wings?—Will some brother horseshoer tell me how to shoe a horse that wings with one foot? I have such a horse and have tried everything I can think of, but still he will wing with his right foot eight or ten inches. J. E. DAVIS.

Who Can Say.—I would like to inquire of brother blacksmiths who have had experience, whether it pays to put in a power hammer or not. I have a gas engine and am thinking over the hammer question. Who has found that it pays, and on what kind of work? AN INDIANA SMITH.

Success in Business.—L. H. Morgan, Defoe, Ky., reports an excellent fall and winter trade in his section, which he attributes greatly to promptness in filling orders. He desires to know the best way to put on steel toe calks, and also what brother craftsmen consider the best welding compound.

Boring Steam Cylinder.—I would like to have the following information through these columns,—how to bore a steam cylinder in a lathe, illustrated with cuts and diagrams, showing the proper tool to use in bar. Who can give me the information I desire? J. H. MASTEN.

Highland Park College.—Des Moines, Iowa, has recently added to its engineering shops a number of new forges and a large blower, purchased of the Buffalo Forge Company. This increase was found to be necessary to meet the growing popularity of the institution.

The Address of Mr. F. L. Morgan, over whose name an item appeared in our December issue, is Gladstone, Illinois. Such a large number of letters have come to us asking for his address that it is given here for the benefit of those who may wish to write to Mr. Morgan. [THE EDITOR.]

Shop Power.—In my opinion steam is cheaper than oil for power. If a person doesn't need much power, he can get a larger boiler, say double his engine's capacity, and it will steam much better, take less fuel, and require less attention. I prefer steam to gasoline. W. W. HERRING.

Spokes.—In reply to Mr. A. J. Rooks, I should say the spokes did not come through the felloe far enough or were not sound timber next to the tire. Never gauge the end of a tenon next to the tire. Leave it flush with the outside of felloe and the spoke will not sink in the inside of the felloe. D. A. DICKSON.

About Wheels.—I would like to have some men who have had good, long experience, tell me which is the best kind of wheel for ordinary wagons, everything considered, the Sarven flanged hub wheel or the wood hub wheel with staggered spokes. Why is one better than the other? NO NOTHING.

A Tire Query.—I would like to have some readers of THE AMERICAN BLACKSMITH give me some help on tire setting. What is the best way for telling just how much draw to give when re-setting a tire? I do not get as good results in tire work as I ought to. How do you find just what dish to give a wheel, and how big to make the tire? JOHN G.

From Oregon.—I am in favor of a Lien Law for blacksmiths, heartily so. I also favor forcing blacksmiths to stand examinations to prove their qualifications before allowing them to practice the trade. As to shoeing, I agree with Mr. E. W. Perrin and Mr. A. M. Meisner. It is against common sense to think that all interfering horses can be shod alike. W. A. P.

Grinding Oyster Knives.—I am interested in grinding and polishing, and want some information as to what I need to grind oyster knives, and polish the same without drawing the temper. An oyster knife is about five inches long, sharp on both edges about two-thirds its length, and about 1/4-inch wide at the small end and 3/8-inch at the large end. CHAS. D. BRIDDELL.

Some Texas Prices.—In our State we seem to have an unusual number of poor workmen, who keep prices down. In my town, however, we get pretty good prices, as follows: Shoeing, $1 to $1.50; welding shaft irons, .35; poles, .35; wood axles, $3; tongues, $2.50; buggy shafts, $1.25; reaches, $1; spokes, .20; setting tires, $2 to $3; sharpening plows, .10 to .25. J. HANSON.

Pitch and Gather of Wooden Axles.—In answer to Mr. J. N. McDonald would say that in order to give wood axles the proper gather and pitch, draw a straight line through the center of the axle at each end. For the pitch I give 3/8-inch below the line and for the gather I give 1/4-inch in front of the line. Take the compass and draw a circle the size of the point of the axle, and work to that. J. M. MILES.

A Special Request.—I know that some readers of THE AMERICAN BLACKSMITH can tell me what I want to know. First, I would like a description and illustration of the best kind of ice-grips or ice-tongs for lifting ice from a river. Second, I would like the best and simplest plan of making an iron boot to raise a lame boy about three inches. Can anyone send in to THE AMERICAN BLACKSMITH description and drawing of either of these? J. F. SEMPLE.

Recutting Horse Rasps.—In answer to J. H. Bartholomew in the January number in regard to recutting horse rasps my method is to draw the temper in a wood fire. Recut the rasp with three-cornered file the same as you would file a handsaw. Heat red hot and then plunge in brine. Put on a little oil and brush the rasp with a coarse brush. I use Heller Bros.' tanged rasps, and they stand the wear excellently. L. E. BALLON.

How to Pull Wagon Spokes.—I have seen so many ways of pulling spokes from hubs, that I will now give my way, which I think is much simpler than any I have seen. Put the wheel on wheel-jack and screw it down solid. Take two or three pound hammer and give a few sharp blows on the top of the spoke about two or three inches from the hub. This will loosen it so that it can be easily pulled out. Do not strike too hard or the spoke will break next to hub. T. E. LARSON.

A Difference of Opinion.—I was very much interested in the articles in the December number by A. M. Meisner and E. W. Perrin. Mr. A. M. Meisner gives six rules on horseshoeing, five of which I think are good. The one with which I disagree is the fifth, namely, "beware of opening the heels." I believe in most cases the heels should be opened and kept open. I would like to hear his reasons for not opening heels and also Mr. Perrin's opinion on the matter. DONALD M. FRASER.

A Michigan Shop.—I have a nice shop with basement, but do not do any horseshoeing. I have all the blacksmithing and wood work I can do, having been in the business for twenty-five years. My shop is equipped with a six horse-power gasoline engine, with rip saw and buzz planer, together with other machinery, all up to date. As yet, I have no power hammer, but expect to buy one this coming summer, to use especially for welding tires, as I build about twenty or more new wagons a year. F. L. HILTON.

One of Many.—Enclosed please find money order for one dollar for my renewal subscription to THE AMERICAN BLACKSMITH, which I can say I would not do without for $5 a year if I could not get it for less. I have received a great deal of information out of your valuable paper which I had never heard of and would not have heard if it had not been for your paper. I am heartily in favor of higher prices for our labor, and will do all I can to help raise the prices equal to that of skilled labor. G. H. NOWNER.

Prices in Iowa.—I noticed in the December paper that our brother smiths in Canada have raised the prices of shoeing, so I will give them a few prices, as we have also raised the prices in this part of the State: New shoes, $.45 each, per span, $3.60; re-setting old shoes, $.30 each, per span, $2.40; Neverslip shoes, $.75 each, per span, $5.00; bar shoes, each $.75; half bar

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shoes, each $.50; hand-made shoes, each $.75. We think the horseshoer should have good pay for his work. E. C. Lewis.

An Inquiry.—Noting in the January American Blacksmith an axle shaping block and a tool for measuring axles, I would like to have the smith who wrote the article, or some one who has had experience in that line of work to give me the dimensions of the two devices as I have a great deal of arched axle work. I would like to hear from some one who has used the Freeport Power Hammer, as I would like to know what they will do and whether they will help a man in place of a striker.
G. P. Blanchard.

Request for Advice.—I live in a little country place about four miles from any kind of a town. I have worked in the same shop for five years, having learned my trade here under a party who had a good business, horseshoeing and wagon repairing, horses being brought to him for miles around, as he was an expert. (We have no plow work here at all.)

At last a change took place. He went to his brother smiths and asked them to put up the price, which they did. But soon one of them cut it down again and my boss lost a lot of his trade, so that he, too, cut the price. Though he got most of it back again, he could not make a good living, so he sold out to me. I put the price up, but my business has been poor ever since. I wish some brother would advise me what to do in such a case, whether to cut down the price or give up the shop J. J. Mullen.

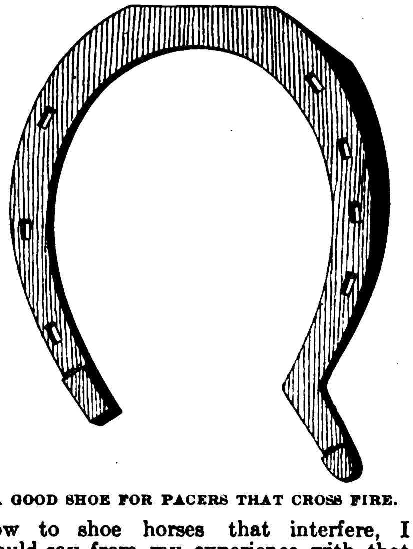
Against a Cash Basis.—I notice that Brother A. C. Green thinks cash dealings, if adoted by the craft, would be of greater benefit than any Lien Law. I cannot agree with him. In the first place, there are many customers who cannot raise cash for every little job they have done, and these men would have to go to the implement man and get a new piece. Here he can get credit for six months. We have lots of customers who would let their horses go bare-footed if they had to pay cash. They are all good pay, but have money only about once a year. Hence, on a cash basis, many a job would go undone. Therefore, I say that this Lien Law is just what we want. It is something which will bring our customers around when they have the money, and that is all we need. I have two men working for me and we have all we we can do. Everything is all right, except one thing, and that is, we need a Lien Law to insure us our pay for every job we do. I wish the craft to consider me in the swim from start to finish on the Lien Law proposition. L. V. Coulter.

Treating a Stifled Horse.—A customer of mine has a horse which has a weak stifle. What is there which can be done to help it? T. H. Briggs.

In Reply—A stifle is usually due to a displacement of the knee-cap. Very often a sudden jerk will be all that is necessary to spring the knee-cap back into place. In case of a weak stifle, the trouble may be often overcome by drawing the leg which is affected well forward by means of a rope attached to the lower end, and then grasping the knee cap with the hand and forcibly pushing it forward and inward until the bone suddenly slips into position. The unusual stiffness of the legs should suddenly cease with a spasmodic jerk and the horse should be able to walk or trot without lameness. Although this may end the trouble for a time a repetition of it may subsequently take place and eventually lead to a habitual weakness. To correct this tendency, warm poultices and douches of cold water will often help, and liberty in a box stall or in the field is also beneficial. The use of a high heel shoe is often recommended. The part may be strengthened and toned up by the use of stimulating liniment, friction or even by blisters.

Gather of Axles.—I notice from the January issue that I have won one of the prizes on wagon work, which I much appreciate. I also congratulate Mr. Nels. Peterson on winning the top prize. I have read his article so far with much interest, although I must criticise him on one point, and yet partly agree with him at the same time. He states that the factory has omitted the gather on axles, from the fact that it causes the wheels to run in and the taxing to bind at the shoulder axle, thus causing friction. That is right to a certain extent, while the job is new and is a perfect fit. But later on the axles become worn and loose in the boxings. As the vehicle moves forward the pressure is directly in front of the spindle, and the wheels drop back and adjust themselves to the spindle. Now, in this position the wheels are wider in front than in the rear. This will cause the wheels to run out, and you have the same friction with the nut as you had with the shoulder of the spindle. A wagon of any kind is used much more after it is worn than before. I think a wagon of any description will run easier without any gather while new, but not after it has been worn. Please explain. M. A. Foster.

Reply to Interfering Query.—In answer to D. W. Cryce in the October number of The American Blacksmith on



A GOOD SHOE FOR PACERS THAT CROSS FIRE.

how to shoe horses that interfere, I would say from my experience with that kind of shoeing the best way is to shoe with inside toe and heel calk and no calk on the outside. Have inside of the foot as high as practicable. For pacers that crossfire, we use what we call a crossfiring shoe like the accompanying drawing.
J. M. Miles.

Repairing Rubber Tires.—I will answer Frank Teuber's question about repairing rubber tires. I use a Sweet machine and it works all right. Campbell Iron Company, of St. Louis, Mo., sells them for $18.00, full instructions with illustrations going with each. However I will give you a few points which troubled me somewhat. I broke the wire at first. This was caused by drawing up the wires too tight before fastening them in the machine. They should be fastened so that they will wrap nearly around the sleeve before the wires are too tight. This will take the bearing off the sharp corner and keep them from breaking. Be careful to follow instructions closely. Cut your rubbers five or six inches longer than the distance around the wheel so that the joints will not pull apart. To scraf wires, file your first wire so that the ends will pass each other ¾ of an inch. Then scarf with a three-cornered file eight or ten inches long, fit the ends of this wire nicely, push it down in channel so that you can get to other wire, cut your next wire and scarf the same as the first one. Fit each wire separately, and be careful not to let the brass run from one to the other of the wires. If you do, you will have trouble in pulling up your rubber. You will find full instructions for brazing with your torch. W. A. Short.

Remedy for Low Prices.—To my mind the plan which would be ahead of any other for the benefit of the craft, is to get a law enacted to compel every wheelwright and blacksmith to stand an examination relating to his trade.

On passing such examination he will receive a diploma, which will show him to be in possession of such knowledge that he may open a shop. This would keep out all unskilled men, which is the class that usually cut prices. The skillful workman who knows the cost of material and knows what his labor is worth is not so apt to cut prices as the poor workman. Skillful workmen that have spent their time and money to learn the trade should have some protection against those who have merely picked up the trade and don't know enough about it to earn good wages.

The craft, as a rule, is slaving for just a scant living. My experience has been, that in the last 12 years all timber that goes to make up a vehicle of any description has steadily increased in price, with no chance for it to ever be any cheaper owing to the scarcity of wagon timber.

During this time and much longer, the prices of work have decreased. No one can dispute this. As the prices of material advance our labor should advance in proportion. But it has been the reverse. If every workman was compelled to pass an examination just as when he enters the civil service, then we would not have to contend with the lower class of workmen.
M. A. Foster.

Something More With Regard to the Farmer.—I noticed in the December number the article, by a farmer, from the Farmer's Sun. It is my opinion human nature is the same in Illinois as in Canada. He says 20 cents will pay for the shoes and five cents for coal and nails and all the rest is net profit for the blacksmith's few minutes' work. As your fire insurance agent will tell you, property decreases in value at the rate of about 2% a year. Taking my own property for an example, which is rated at $1,200, a decrease of 2% would mean $24.00 per year. Then again the roof repairing averages about $15.00 per year. Investment in tools and shops is about $150. I have about four hundred dollars' worth of tools, and having run a shop for twenty-one years, in that time I have worn out two bellows and one blower, two sets of taps and dies, and the third set almost worn, one drill and the second nearly so, a ninety-dollar sewing machine and a box-setting machine, a tire shrinker, a shear, a vise and innumerable other tools. These together with lights, coal, taxes and a helper amount to about $800 a year. Now our farmer friend never thought of these expenses. Not only the above do we have to number among expenses, but also bad material and bad accounts. Now, when prices of stock and living expenses are so high, I feel sorry for the smith who charges but 10 to 20 cents for re-setting old shoes and 80 cents to $1 for new shoes. My advice is to charge a good fair price for your work and give them a good fair return. You will always have plenty of work. Let the kickers go. S. B. Bryant.

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Cash vs. Lien Laws.—In regard to the Lien Law vs. cash basis, I think if such a thing as credit was not known to the world, we all would get along better. The cash basis would be very nice, but it would be very hard to get the smiths to stay with the idea of no pay, no work. If a man breaks his wagon down and hasn't got the price to have it repaired and you know he is perfectly honest, it is hard to deny him. How many men in a community do you find, that if they were compelled to put up the cash for all their work, would not limit the amount of work done? I think it a good plan to get the Lien Law, consolidate, and get the prices up to a good living point. Then give a small discount for cash, and after 60 days add on a per cent. This will have a tendency to make the customers a little more careful in letting their accounts run. The small discount would have a tendency to encourage the customer to pay cash and hence be a very good thing.

I don't think there is any class of people any more imposed on than the blacksmith or wheelwright, who pays out his hard-earned money for material, adds his labor, which at the present prices is only a little more than common day labor, and then has to wait the customers' convenience, regardless of bills coming due and other expenses which occur every day in the shop.

Materials used in the shops are steadily advancing in price also. I would like to hear from some brother smith or wheelwright on this subject. M. A. FOSTER.

Trade Journals—Horse Racks—Plow Work.—I do not think any up-to-date smith should be without a good trade journal—the expense of one is nothing compared with the good one can get out of them.

No one shoeing rule applies to more than one horse, because no two horses are exactly alike. Every man who has much shoeing to do ought to have a rack. I raise the horse so he can stand straight, and so that moving the foot in any direction, makes it clear the floor. I think it is a mistake to tie all of a horse's feet at once.

Some time ago I noticed an article on making plow lays, where the writer said to fit the short landside to the long one, bolt fast, fit the lay, bore the holes, bolt on the lay, then take landside, lay and braces off together and weld up. I can see no real need of taking it to pieces after it is once bolted together. The handles and beam would be but very little more in the way than the landside and braces, not to consider the trouble of putting them together again.

My way of making a lay is first to fit the landside and clamp on, and then the lay and clamp it. Begin welding at the heel. Take heat enough to stick well. Knock clamp off, take a good heat and weld the heel solid. Put it on the plow, seeing that it fits. My neighbor smith makes them the same way I do, with the exception that he commences to weld at the point. I once worked for a smith who put the landside and lay in the fire separately, having the helper take the landside out while he took the lay, and welded as you would an ordinary piece of iron. B. E. ROBINSON.

Hoof Contraction.—I wish to call attention to the fact that much harm is done to the craft by giving wrong instruction in shoeing and other pathological matters. Especially is this so in the case of contraction.

Contraction develops in phases or stages, and may be more or less serious, although I consider it easier to cure than any other trouble of the hoof. Contraction is nothing more nor less than a partial or entire interruption to the peculiar spring-like opening and shutting process of the hind or rear center of the hoof shell. This portion of the foot is naturally adapted to make the necessary protection for the enclosed foot and its blood circulation.

Chronic contraction is the worst, as it produces counter-pressure upon the inflamed foot. It really means a dead hoof on a live horse, which is about the worst torture a horse may have to suffer. This should not be carelessly neglected. By the proper use of a good pair of heel expanders, contraction may be removed in a few days. I do not use poultices, water-soaking or ointments of any kind. By the simple use of expanders the moisture and elasticity of the hoof will return in a few weeks.

In case of high fevers, poultices may be used, either hot or cold, according to conditions.

It is true that artificial moisture brings relief to contractions for a term of say three or four weeks, or perhaps for as many months. But it means only temporary relief at best. K. C. MOSER.

How to Treat Corns.—Regarding Mr. J. S. Jennings' query concerning corns in the December issue, the following remarks may be of use: Corns are caused by under pressure of the shoe upon the inner heel, or at the angle between the bar and the crust. They are especially likely to occur when the wall breaks down or is cut away, so that the shoe rests upon the sole, or if the shoe should be nailed too far back on the outside and toe. In this latter case, if the shoe is left on too long, it will be drawn outward and forward, so that the inner heel will be drawn under the quarter and rest upon it, causing a bruise. The effused blood then mixes with the horny matter and forms a red spot. When the irritation is continued, so as to produce very much inflammation the place may ulcerate, even affecting the inner wing of the coffin bone discharging at the coronet. Should the quarter become very much contracted, the space between it and the bar being greatly lessened, there is great bruising and pressure upon the soft parts, exciting inflammation and causing a corn. Generally the horseshoer cuts away the parts so that the shoe does not rest upon them, and puts on a little caustic, or touches it with a hot iron, destroying the sensibility. He puts on a bar shoe so as to remove all pressure from the part. This relieves the horse for a time, but should the shoe be left on a little too long, or press upon the parts in the least, or should gravel or dirt settle between the shoe and the corn, the horse will go lame. This treatment seems to answer for a while, but soon the horse will be worse than ever. A far better way is to fit an ordinary shoe to the afflicted foot, mark on it with a pencil the position of the corn, and then remove that part of the shoe, cutting out the piece that would press upon the corn. The corn will gradually disappear and the horse may be shod with an ordinary shoe. This method allows the animal to be used steadily during the cure. E. M.

A Hardening Problem.—I have a question as follows, which I would like to have answered. I use a lead pot in which to harden a piece of four-inch gas pipe, plugged at one end and lay it on the fire at angles of about 45 degrees. When work is dipped in bath it seems to have a thick skin on the outside and will not harden. It is not the steel, as the same piece will harden in the open fire all right. J. F.

In reply, it is rather difficult to answer the question intelligently, for in stating his case he says, "that when the work is dipped in the bath it seems to have a thin skin on the outside and will not harden." It is not clear to me whether he means that the thin shell is the depth of hardness or softness. It is rather unusual for a piece of steel to have a thin shell on it and will not harden. If this is the case and it hardens perfectly in the open fire it must be due to the impurities in the lead which form a thin coating of oxide on the surface, thus preventing hardening. This can be remedied by selecting a lead free from impurities. I believe his trouble is with shell hardening, and is due to the lead being heated too hot, thereby applying the heat faster than the steel will properly conduct it. If a piece of steel is heated too rapidly the transformation will complete itself only on the surface; furthermore to harden a piece of steel perfectly time must be allowed for the cement carbon to be transformed into the hardening carbon throughout the whole mass before the desired results can be attained.

It is the practice in some places to use two lead pots; in the first pot the lead is kept at a lower temperature than the hardening heat, the tools are preheated in this, then transferred to the second pot where the lead is kept at the proper temperature to give the necessary hardness. This will give the required time for the chemical change to complete itself throughout the whole mass. Besides, the temperature of the lead in this second pot can be kept almost constant, which is impossible if the steel is cold when submerged in it. H. W. RUSHMER.

Spring Welding.—I thought I would give my way of welding springs, because I have not seen it described in THE AMERICAN BLACKSMITH since I have been taking it. I prize the paper very much; there is not a copy but I get something from it of benefit to me.

Now, about welding springs; I think at least three-fourths of the springs that come to my shop for welding are broken where there is a hole through them. I mention this because I know that some object to using a rivet to hold the pieces together while welding. I use a rivet every time, getting my pieces ready for the rivet in this way: I take the pieces of spring, heat the ends and cut off enough of the end to take all the hole off. Now I heat the end of piece for about three inches, take it from fire and dip end in slack tub to cool it some, so that it will not upset right at the end, as I want the upset about one and one-half inches from the end. Be careful not to cool too much or too long as it would break in upsetting. Now, having upset it sufficiently, I heat again if necessary and scarf it by drawing down a long scarf, wedge shaped, and then I punch a hole about one-half inch from the end. Having made ready the pieces in this way, I next take a piece of steel the same size as the spring and measure one and one-quarter inches, or about that, and mark. I scarf the end but the scarf is shorter than on ends of spring. Now I cut off at mark, scarf other end, and punch a hole in center of piece. I am ready now for the rivet, which is a piece of one-quarter inch iron. I do not use regular rivets, as the head will spread out and leave too much iron on spring. I put the ends of spring together, and if the leaf I am mending is from the bottom or lower half of spring, I put a short piece which I have prepared on top of the leaf, but if it is from top half I put a short piece on bottom. In welding a break where there is no hole at the broken place, I use a rivet made of old fork tine or other steel. What I claim for the above method is this: It gives a piece of solid new steel at the weakest point, *i. e.* the hole. It also gives material enough to leave the place mended a trifle larger than before broken, and as for the rivet it is right where I want to drill the hole, so that it is taken out with the drill. H. C. BURK.

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THE AMERICAN BLACKSMITH

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The Pulse of the Craft.

The extensive correspondence of THE AMERICAN BLACKSMITH with the craft in all sections of the country places us in a position to judge with considerable accuracy the sentiments of its individual members. There seems to be little doubt that blacksmiths are everywhere awakening to the need of taking steps to advance their welfare and improve their condition. Let the sentiment grow. There are few classes of mechanics who are as poorly paid today in proportion to their skill and labor.

Advice on Minor Diseases of Horses.

In a great many cases readers of THE AMERICAN BLACKSMITH wish advice upon the treatment of various minor diseases of horses. It is our desire to encourage questions of this kind. We do not wish, of course, to take the place of a veterinarian in any sense, for it is both undesirable and impossible to try to fill the position of a trained specialist on the spot. Nevertheless, there are many cases of minor ailments in which a veterinarian could not or would not be called, and in such as these much harm or suffering can be avoided by proper advice. Here we have arranged that any questions sent us as to horse ills will be given careful attention and the best possible advice as to treatment, this, of course, without charge to the questioners. The greatest care should be taken to name the trouble carefully and state symptoms clearly.

That Gas Engine Article Contest.

In last month's paper was announced the offering of five prizes for the best articles on the advantage of gas engine power for smith shops. It has been decided to increase the number of prizes, because of the great interest which has been shown, so that a first prize of ten dollars, two second prizes of five dollars each, and three third prizes, yearly subscriptions to THE AMERICAN BLACKSMITH, are now offered. The articles should be limited to about 800 or a thousand words in length, and must be in Buffalo by April 1st. The subject is—Why does it pay blacksmiths to put in gas engine power?—though, of course, contestants may take the opposite stand if they desire. The articles will be judged upon the weight of the practical arguments advanced. We hope a great many smiths will take part.

The Handling of Horses.

The management of horses is a subject worthy of much study. Like children, horses can have their dispositions spoiled by improper treatment, for much depends upon how they are handled, or brought up, as it were. In the first place, a driver or other person in charge of an animal should always remember that he is dealing with an intelligence of a lower order than his own. He should never be unreasonable, and never guilty of losing his temper. The best results are obtained by coolness, quietness and kindness. The horse should, of course, be made to know who is master, but with gentleness as well as firmness. Horses which are well behaved are the result of kindness and careful handling, while others are too often made dangerous by unreasonable treatment, fear, fright and undue punishment. Thus it is seen how the value of a horse may be considerably affected by the handling he receives, especially in his younger years.

Nonsense About Metals.

In a recent issue of the Inventive Age appears an article dealing with what is termed "diseases of metals." It is pointed out that sharp changes of temperatures produce alterations of structure, and cases are cited where metal parts have crumbled away without apparent cause. Finally the statement is made that it appears to have been demonstrated that metals can be infected with disease, that they may be poisoned, and may suffer structural changes that lead to the question, are metals alive? It is to be regretted that publicity is given to views so absured upon their face. Of course, it does no harm to apply the terms of animal life changes to metals by analogy, but to attribute the properties of organic bodies, such as plants and animals, to inorganic metals, is more than misleading,—it borders on the sensational, which of all qualities should be absent from discussions of a scientific character. It is well known that metals under a large number of repeated stresses undergo a weakening or lowering of their tensile strength. This very aptly is termed fatigue, but would it not be equally illogical to bring this phenomenon forward as another indisputable proof that metals are alive?

Floating Blacksmith Shops.

Such is the multiplicity of machinery in a fleet of modern warships, to say nothing of the delicacy and fineness due in a large measure to a striving for minimum weights, that repairs are in order with much frequency. Rather than bring the ships to the repair shop, it has been found advisable often to send the shops to the ships, and so we hear of the equipment of repair ships, or floating workshops fully prepared to take care of all ordinary shipboard repairs. Such vessels have their machine shops with lathes, drills, shapers, punches, shears

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and screw-cutting machines. Sometimes a small foundry is included. By no means of least importance is the blacksmith shop. A recent vessel of this type, built in England, has its smith shop equipped with forges, anvils, straightening blocks and a steam hammer. In spite of the immense horsepower represented in modern war vessels, however, it is safe to say that no shoeing will be done in such blacksmith shops.

Samples of Lamp and Balcony Iron Work.

The accompanying illustration shows a handsome design of wrought iron work as used in a small lookout balcony for a private residence in Detroit. The scroll work in combination with the vertical uprights gives a pleasing effect, and the size of the steel is in proportion to harmonize, without too clumsy an effect, as is often the case with many designs executed for this purpose. The floor is made of plain wrought iron bars, securely riveted to a wrought iron frame, the ornamental brackets bolted through the wall with nut and washer so as to make it absolutely secure for as many people as it will hold.

This work was manufactured by the J. E. Bolles Iron & Wire Works, Detroit, Mich. From their forge also came the wrought iron lamp of striking design, shown herewith. The effect is pleasing for its graceful strength.

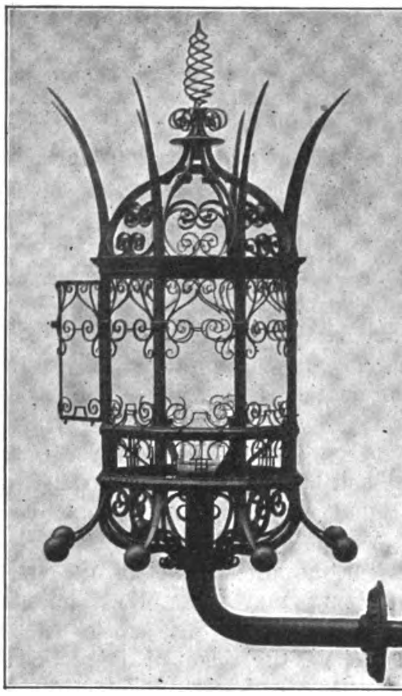
Talks to the Jobbing Shop Painter.—12.

Advertising the Paint Shop.—The Paint Burning Lamp.—Carriage Tops and Top Dressings, Formulas, Etc.—Profits From Selling Paints and Varnishes.—Choice of Up-to-Date Colors.—Shop Conveniences. — Runways, Etc.

M. C. HILLICK.

Now is the time when the wise painter actively proceeds to carry out plans for a hustling spring and summer campaign. It is folly to wait until the rush of spring work is really on before completing arrangements by which it may be handled with the largest profit. In a former issue, painters, and possibly vehicle dealers and repairers who conduct a painting business in connection with their other enterprises, have been advised concerning the value of advertising. Publicity today is as necessary in conducting the painting business as is the public. And in the estimation of the writer, there is no form of advertising equal, in point of results obtained, to that afforded by the local or general newspaper. Advertising matter, if attractively written, is sure to reach the public eye in the newspaper as nowhere else. A brief, crisp card, right to the point, and changed weekly, is the most telling ad. for the vehicle painting business; and now is the accepted time to get such matter before the reading public.

The suitable advertising of one's business attended to, it is always in order to prepare tools and fixtures, and the shop itself, for the rush of work shortly due to make its appearance. A good burning lamp is an indespensable intensil in the paint shop, and for the small shop a lamp made of 18-gauge seamless brass, with a tank capacity of



EXAMPLE OF WROUGHT IRON WORK. ORNAMENTED LAMP.

one quart, and carrying a heavy burner, with a heating capacity of 2,000° F., is about right. Such a lamp should weigh not to exceed 4½ pounds, and preferably it should be made on the coil system, so as to retain heat to the maximum limit. The cost of such a lamp will be from $4 to $5.

Two or three broad, non-elastic glazing knives will be needed to use in connection with the lamp in the paint-burning work. These knives are to be used on the flat surfaces of carriage bodies. For running parts which have to be burned the small putty knife will be needed, or perhaps better still, a short piece of steel with a blade ¾ to 1 inch wide, and ground quite sharp on one edge, will be found desirable. It is not often now-a-days that the running parts of a carriage are burned off. It is worth from $3.50 to $5 to burn the paint from the running parts of a carriage complete, and most carriage owners prefer to put this amount where it will show more, relying upon the painter to build up a satisfactory foundation and finish over the old paint, which on the rounded surfaces of running parts he can do very successfully. The care and dressing of the carriage top, dash, storm apron, and other leather or rubber furnishings of the carriage, has grown to be an important item or part of the regular work of repainting. A good many painters elect to make their own top dressing, in which case it is advisable to prepare the dressing well in advance of actual needs. It always costs more to make such material during the busy season. A good formula for a dressing, adapted to use upon both rubber and leather, consists of ½-gallon liquid asphaltum; ½-gallon elastic finishing varnish; ¼-gallon each of boiled linseed oil, and coach japan; 2 pounds drop black. Thin the mass with turpentine, of which it will require about ½-gallon. Confine in an air-tight can and shake repeatedly to obtain a perfect assimilation of all the parts. Another formula of approved merit provides for the use of elastic finishing varnish, ½-gallon; ½-pound drop black; 2 oz. beeswax, the whole cut to a brushing consistency with turpentine. For an all-leather top upon which it is not desired to use the regular enamel dressings, darken out neatsfoot oil with drop black, and add a little melted beeswax to give the mixture a cooling property. Apply this with a soft piece of cloth and rub out thin and smooth.

While preparing dressings it is likewise a good time to prepare a place for the storage of tops, cushions and other furnishings of the carriage. Such a place should be as clean and secluded as possible. If a rack is made, the ordinary storage place for such parts of a carriage can be easily doubled in capacity. At an expense not to exceed $2, a rack may be built which will hold at least two tiers of tops with a section above this for cushions, dashes, fenders, carpets, etc. Make the rack of a size proportioned to the size of your shop, but in order to economize space, arrange to have two tiers. Locate such a rack, if possible, in a clean quarter of the shop, and enclose it with a common muslin curtain to afford greater cleanliness.

By advertising the fact, and arranging accordingly, the jobbing shop painter

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may do a considerable trade in the sale of oils, turpentine, varnishes and special colors. Spring is the time when people make an effort to not only put their carriages, but their furniture and apartments in order, and if aware that they can obtain the necessary paint and varnish supplies of the local painter, they are, as a rule, prompt to patronize him. A considerable profit may be realized from this source during the next two or three months, at least, at a small outlay of labor.

It is always desirable, regardless of location or size of shop, to be strictly up to date in all matters of the paint shop, whether of shop practices or business methods. Study all the latest and most approved ways of doing work, and especially study to know the most fashionable colors for the season, as they apply to the various classes of vehicles. The catalogues of leading factory manufacturers of carriages will furnish one line of information relative to the most popular color combination. The color cards furnished by leading color and paint grinders will also materially assist in choosing and uniting desirable colors and color combinations. Other things being equal, the painter who produces the latest and handsomest color effects will get the best class of trade in the community, and the most of it. To follow on with the old colors and the old combinations will not suffice. The public —even the public of the rural districts— has grown more discriminating, and, generally speaking, it knows something of the most popular colors, as one sees them displayed on fashionable turnouts along city driveways.

It is a good plan to look the labor-saving devices of the shop sharply over, about this time and make necessary repairs and additions. It is an unwise policy to wait until the shop is in the turmoil of the busy season before making whatever additions or improvements in the shop or shop fixtures as are thought necessary. However small the paint shop may be, make it as handy as possible. It will pay, not only for the present, but for all time. The conveniently arranged and completely furnished paint shop is an excellent aid—or rather a chief aid—in meeting the ferocious competition which stalketh abroad in unoffending guise.

How about the shop runway—the outside runway—if it be supplied with one? Is it strong, and firm, and suitable? If undecided, now is the time to investigate. Not long ago a paint shop runway, with nothing in appearance to suggest a weakness, collapsed, and an expensive brougham went to the scrap heap as a result. And in addition to being strong, it should have a platform at the top sufficiently large to hold a couple of carriages at least. A good deal of work, both washing and rough painting, may be done on the runway landing. In fact, it is a paint shop of itself when the sun shines on a spring day.

(To be continued.)

Repairing Axles, Wheels and Springs.

Prize Article.

CHARLES D. BRIDDELL.

There are a great many smiths that want to know how to do certain kinds of work, while others know how to do the work, but I think in busy seasons when the smith is crowded with work, that if he knew just how to turn off the work faster and just as good, and with no more labor it would be of great benefit to him, for it would mean time and hence money for him.

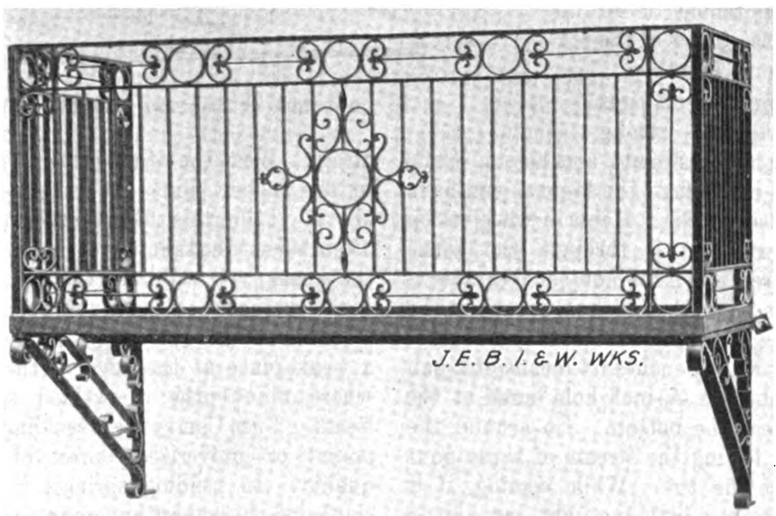
I will give one of my ways of saving time on handling vehicles from heavy farm wagons to the lightest kind of buggies. I have in my shop several hooks made fast to the floor beams of the second floor. Then I have what is known as the safety rope-hoist, one that you can lock at any height without making fast to cleats or holding it, as it is self-locked. A hoist of this kind will enable you to raise one thousand pounds. I have made hooks to go with it to fasten on to a wagon body or anything that I want to raise. A hoist of this kind can be bought from Sears, Roebuck & Co., Chicago, Ill., for the small sum of 80 cents, and the rope that it will take for its use will only cost about 75 cents.

If the smith has a new king-bolt to put in a wagon or buggy, he pulls the vehicle under one of the hooks, makes fast and with all ease raises up the front of the vehicle, giving all of the room that is wanted with no props or benches to bother.

Now we will say that we are going to put new arms on a wagon or buggy; this is the way I proceed. I pull buggy under hooks, make fast to the front spring, hoist wheels off the floor, take off the wheels, take out front axle, put two small benches under the body, lower down on them and proceed with the rear axle the same way.

The hoist can be used for anything that you wish to lift, and a great many other things besides.

I will give my way of welding axles. To prevent them from slipping while welding, I cut them the length I want, allowing about ½ or ⅝ inch for welding. Chamfer with fuller, (see Fig. 1, A.) Then with a corner of the swage hammer make dents like stairsteps all along the scarf, as at B. Then take a welding heat, let your helper place one piece on the anvil and hold solidly, while you place the other on top. Then strike heavy, slow blows, put back in fire, take another welding heat, using Cherry Heat welding compound for axles high in carbon, and a little sand for iron or soft steel axles. After you have the second heat take out and weld up the edges and dress up the job. The way I scarf heavy axles is to first cut them the length I want, heat and draw with sledge hammer about one-third or one-half of the scarf, then take fuller with handle or top fuller, as you may call it, place on the axle and let helper strike (see Fig. 1.)



A SIMPLE, BUT HANDSOME WROUGHT IRON BALCONY.

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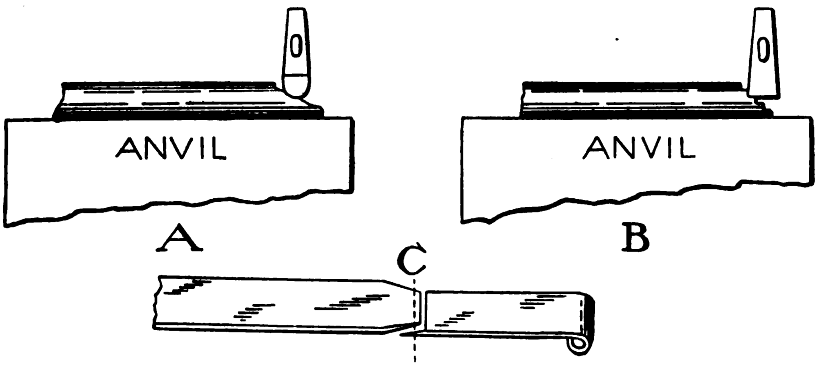
This same method can be used on heavy tires with very good success, as the fuller only draws the iron endwise where the sledge hammer draws both endwise and sidewise.

I will now say something about wheels. For instance we have a set of wheels badly dished, from about one and one-half to two and one-half inches dish. To straighten them up I take off the tires; have the wheel screwed down solid on the wheel block and remove rim. Then I take and cut the tenons back a little, according to the amount of dish that they have, say about 1/16 inch for badly dished wheels. Then I remove every other one of the spokes and turn them around and drive up solid, by means of an oak or hickory block, with a hole of the same size as the tenon or a fraction larger. The way I remove the spokes is to thump a solid crack on the face of the spoke at hub to break the glue, and then work it out. When you put on the rim, bearing down on one spoke and raising upon the spoke you have changed, brings the wheel about straight. Then put on the tire. The reason you should cut some of the end of the tenons is to make the joints of the rims come together.

In putting on tires I have two strong trestle benches made, and have a staple driven in the floor the same as you have for wheel blocks. Hook in wheel-block screw and run it through the wheel and screw down solid on benches, screwing the amount of dish you want in the wheel. Then put on the tire and cool it while on the benches by means of a pail with about a 5/16-inch hole bored at the side near the bottom. Go around the wheel, letting the stream of water pour against the tire. While cooling, if it seems to be a little too tight, saw a little out of the point of rim with a fine saw and strike a few solid cracks over each spoke. By doing this you can set spokes solid in hub. Putting tires on in this way, you have the wheel solid, and at the same time can get the dish just as you like.

The above rule of taking dish out of wheels is very good for Warner patent wheels, and shell-band wheels, and will work on Sarven patent wheels by removing rivets, but if your customer can wait a few days or a week, it is best to do it in this way: Remove tires and rims, cut some of tenons off as above stated, and drive rims back on. Screw down on bench, screwing the dish the other way, about the amount it was dished in the first place. Let it stay so for a few days; when you slack up the dish will be about right; then put on tires as above stated.

Now we will take the broken carriage spring to mend, one of the worst jobs that a smith has to contend with. He may make a good weld, but often the spring will break at the edge of the weld. For a good job, upset the end of spring a little, champer, and then with the corner of a sharp-ended hammer make the champer as rough as possible to prevent slipping while welding. Then take one piece of the spring and weld a soft piece of iron to it. Screw up in vise and file with a heavy file, across the point of the champers, as at Fig. 1, C. Then take another heat and weld up nicely. Weld the other piece of spring to the latter, filing the champers as above. I do this filing because very often when you take a welding heat on the spring, you will burn the thin edges of the champer. Then if you weld down to make the job smooth, you will make a weak place at the edge of the weld where nine-tenths of welded springs break. I use Cherry Heat welding compound or pulverized borax of good quality. In welding springs, if for a cheap job, just upset and champer both ends of broken spring, making rough with corner of hammer to prevent slipping. Take first heat and stick together, not trying to finish at one heat, but screw in vise and file as above. Then take second or third heat if necessary. In welding spring, have a clean fire and do not get your spring too hot, as it is not as injurious to the steel. After having the spring shaped like you want it, heat to a dark red and pour linseed oil over. This will toughen and harden the spring.



EXAMPLE OF AXLE AND SPRING WELDING.

It always pays to finish up any work neatly, it gives a workmanlike appearance to the job and increases your reputation as a skilled mechanic.

Carriage Repair Work.

Prize Article.

J. VESTAL.

I shall start at the wheels and go up. A wheel comes in, tire loose and open spokes broken and needing half a rim. I first remove the tire bolts by cutting the nuts off them and drive them out. Then I mark my tire and rim on the inside, take the tire off, remove the wheel rivets over whatever spokes need to come out, put the wheel on the bench and fasten it down tight. I then remove the rim, lay it aside, cut a notch in top of the spokes that need to come out; and with a heavy hammer held under the spoke a sharp blow or two on top in the notch brings it out. If broken off short I bore a ¾-inch hole, ¾-inch deep or not deep enough to strike the hub. With a ¼ or 5/16-inch bit I bore through to the box and remove it by a lag screw to pull it, or chisel and hammer.

Next I fit my new spokes snugly from one end of the mortise to the other. Dipping the spokes in good hot glue I drive them home all but one, which may need a little more fitting Get it snug, glue it and drive. Lay aside for glue to set. Then put in new wheel rivets, set the spoke augur to fit the old tenons on spokes and bore down the old spokes that are left in the wheel just enough to make a good shoulder on them. Then get the measure from them, mark and cut off new ones by them. Put back your old half rim that is good, dress up top side of new half rim, set your mortise gage for the outside point to the width of the rim and the inside point for holes. Mark and bore. Round up inside, glue tenons, put on rim and finish on the wheel.

Run the wheel and tire, and set with ¼-inch draw. Wet the rim in water and don't set tire hot enough to burn wheel. Put in new bolts as they are too cheap to bother with old ones. After the wheel is dry, paint the new work with a coat of oil with a little white lead and black enough in it to make a lead color. Touch up all bare spots on the old part. After it is dry, sand-paper slightly and put on a coat of some good coach paint.

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For a repair job you will find it all right.

We must now put on a new axle stub. Best and cheapest in the long run is to buy long arm axles and weld in center. I usually go by the old axle bed for length in repair work, but you can use the following rule: Take the distance from the front of the spoke on wheel to the butt of the hub, double the amount and subtract it from the width of track. That leaves what you want between collars. Say your hub measures 7 inches from the front of spoke to butt of hub. Take 14 inches from the track, say 62 inches. That would be 48 inches between the collars for a track of 5 feet 2 inches. Upset your stub ends good and heavy—it is better to get them ⅛ or $\frac{1}{16}$-inch short, for I set my axles nearly straight on front and bottom.

I then put on two wheels and measure with a straight edge from the butt of one hub to inside edge of tire on the other wheel. Reverse and see that both are alike. Measure top of wheel from centre of tire, and then the bottom, as they ought to set nearly on a plumb spoke. Next I clean off my axle and axle bed, glue the bed to the axle, put on six clamps to hold it and set aside to dry. With an old file, sand-paper and black putty, I fix the point so that it can't be seen.

As all clips and bolts were cut off when put on at the factory they need to be run over again with the plate and oiled so as to work well. After putting on tight I hit them a blow with a sharp riveting hammer so as to make them stay.

If the fifth wheel is not good now is the time to put on a new one. They don't cost much and you can get a good price for them.

Now we will mend the broken spring. Stave up both ends of the broken spring well and with the clipper cut or split the spring up ¾ inch. Scarf one ½ inch on one side and the other ½ inch on the other side. Fix a piece of another old spring the same way. When you put them together they fork in and when hammered down they hold good and fast. I use nothing but borax and clean sand to keep it from burning. I see that all the heat is applied on it at the point, hence am never bothered with its breaking above or below the weld. I take a slow, steady heat, and use no helper until I weld up good and get ready for the use of the flatter. The next step is to get the right length and fix the end of it to fit the forked end of the other part of spring and weld the same way. It is impossible to weld a spring so it will stand unless you put in an extra piece, as the spring will either be too short or to thin where the weld is at—hence worthless. If you have the spring to paint, do so all over, just alike.

If the job needs a reach, I make it just the size and length of the old one or mate to it. I bore my first bolt hole in one end, put the iron on the bottom and put in this bolt. With a twist bit that bores wood or iron I proceed to bore the balance of the holes by putting my bit through the holes in the iron first. By so doing I never get them too close or too far apart. Every time I make a hole I put in a bolt, and so on. I also prime all my work as I go with oil and lead. See that your spring or side bars hang perfectly snug and well-balanced. See that your body loops are all set the same and none sprung out of line.

The body now needs one side, one end and one sill. I first knock out the bottom, clean it off and put aside. Then with a ½-inch chisel I raise the plugs from screw heads and save them. I take out screws, then take off side and end, and take out broken sill. Make the sill like old one, ash or oak, and see that you get the right bevels, and don't get the jogs too large. Now is the time to clean off all the old parts you aim to save. Clean out corners well. Put on the joints with good hot glue, and clamp all joints tight. Do it as quickly as possible after you put on the glue. Put aside until the glue sets. After that put the screws in the corners of the frame and the uprights that support the seats. Now take a piece of poplar or magnolia wood ⅜ inch thick, lay it off and cut to fit. With the glue again, put it on all the frame that your side is to cover and clamp it tight. You may put in a few little pins—set them well with a nail set. When dry, bore for the plugs, put in screws, dip plugs in glue and drive them in. Be sure to get the grain of the wood in the plugs to run or set like the grain in the side. After the glue sets well, work plugs off even with the surface on your side. Then with a good sharp steel scraper and steel wool, get it all nice and smooth. Then I apply a coat of good wood filler and rough stuff. After it drys well, I put on my irons, rub this coat of filler with wool good and smooth. Dust off and apply another coat of the same.

I then look after the pole. We find it is bent down in the center too much, one brace is broken, and the doubletree bolt broken. I take off both braces and the circular bar with a very thin saw. I cut in at the little end underneath and rip this pole back past the bow that is in it, say a ½ or ⅜-inch on the bottom. After I rip it back as far as need be, I take out my saw and put the pole in a place where my helper can sit on one end and spring it straight. While he holds it straight I take screws and hot glue, and fasten the piece. I then weld the broken brace by staving up well and putting in a short piece just a fraction larger in diameter than the brace is, so that I can swage down to proper size. I dress the point with a file while it is hot. Then I put on my circular bar and fasten the braces to it, but not to the pole, and with a tape line I line the pole from little end to the eye in the brace and see that it is in perfect line before I put in the upper bolts. After I get it lined up I then bolt lightly, put in a new doubletree bolt, and brace it slightly as they have a tendency to come off when in use.

The top needs a new lining, a bow and two sockets. I always keep in stock a few bows and a few bow sockets. They don't cost much. They come 29 and 30 inches long. I always buy the 30-inch, for if I need 29 inches I can cut off one inch. I take off top props, braces, etc., remove the main top, rip them, take out the old lining and put in my new bow, next the bow sockets. Then I put back top props and cut my lining as the old one was, sew it up and tack it back. Next I put on the roof, then the top braces, and with some warm water wash off the roof well. After it gets nearly dry I rub it off with a rag wet with tallow and sweet oil. After it sets I put on a coat of good make of top dressing; also on the dash and boot, and all leather parts, except back and cushions.

I now go back to my gear and proceed to finish up. I have primed all new parts and touched up all bare parts on the other. I now put in the pole, rub everything good and smooth, and apply a coat of good color varnish. Then I go to the body, put it up on a good revolving trestle, and rub it well. I putty up all joints and screw heads with colored putty, and put on a coat of varnish, the color that I want it to be, and after it gets good and hard, I take my sponge, ground pumice and chamois, and rub it down with good clean water. I dry off as I go with the chamois skin. The next day I go over it with a clean duster and a little hair, and clean it perfectly. Then I put on a coat of quick rubbing varnish, and after it dries well, I rub off again with hair, and then put on a coat of

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finishing varnish. After it dries I hang the body to gear, put on the top, put in the carpet, dust off the cushions, put them in, and the job is ready to go out.

Read the trade journals and put some power in your shop, with a band saw, rip saw, boring machine and jointer, and see how easy it goes.

Wagon Building in the Factory.

Prize Article.—*Continued.*

NEIS PETERSON.

This factory carries about thirty-two hands in the trimming department. I will not attempt to describe in detail the methods for trimming bodies and seats, making tops, cushions, etc., but as my article would not be complete without mentioning some of the work done in this department, I will give an idea of how we start getting out a top for a buggy. Fig. 5 is a draft for a four-bow buggy top. First the seat must be set level. Then start draft on paper or blackboard by getting the square of the top, which, according to draft, is 45 inches high and 46 inches long. Then find the height of goose-neck from bottom of seat which is 6½ inches from base line. To locate goose-neck from rear to front, take the flare of the back into consideration, which on draft from rear base line to center of rear prop is 3½ inches. Then measure from center of rear prop to center of goose-neck, which is 16 inches. Then locate the flare of the back bow, which is found by placing straight-edge on a line with the back proper, at about 36 inches from bottom of shifting rail up. Then take plum bob, placing at upper part, letting it drop down, which will give about 3½ inches as indicated on draft. Then you have a line to go on to get length of top, starting from rear base line to the length of top wanted, which in this case is 36 inches. To get drop of front bow, measure down from top base line 6 inches, for second bow, 7 inches, for third, 8 inches. Run line to extreme base line. For fourth bow, drop 2½ inches. Then find the lower part of quarter line which is 11½ inches. Then get your bow sockets, place eye of socket directly over goose-neck on draft, spread them out, making sure that the outer edges of front and back socket do not extend over draft lines. Having done this, measure from top ends of socket to top of bow, as is indicated on draft. Then take a piece of paper and set down the figures as follows; First bow, 5½ inches; second bow, 7 inches; third, 8; fourth, 6½ inches. Those measurements are for the wood-worker to get an idea where the bows meet the socket ends, he measuring from top of bows. He would then have to find where the filling comes, on inside of socket, and add that measurement to the measurement given him from draft on paper. Then he would have, after fitting bows and driving them to the measurement given, a set of bows ready for props.

The prop measurement can be had from draft, and put on some paper for the wood-worker. To get props on drafts, take one front and one rear prop, place front prop on front bow with bottom edge on quarter line; place second prop on third bow ⅝-inch from top of quarter line. Then take measurement from top of props to top of bows as indicated on draft, giving measurement for first prop and second prop. Put those measurements on paper with draft for bows, and have wood-worker put on prop after having fitted bows. We now have bows ready to set up on seat from which the draft was taken. Get some stout cord, fasten to shifting rail, run over and around fourth bow, in like manner over the other bows. Then fasten to floor in front of job. Next proceed to spread bows, commencing with back bow, making sure that your have the right flare with the back proper. Then take measurement from extreme outer edge of back bow to extreme outer edge of front bow. Then divide second and third bow as per draft, which should be equal distances from each other, having your top cord very tight so as not to let the bows slip away. Now having made your measurement correctly according to draft, your bows and props should come all right, ready for joints. Having your props in position held fast with top cord, you proceed to get measurement for rear or long joint. To get draft board ready for blacksmith, get a nice, plain board about 5 inches wide, 1 inch thick, and about 36 inches long. Drive in one end two ordinary drive knobs, where the upper eye of joint should come, on draft board. Then draw a heavy pencil mark on a straight line from knob to the exact length of the long and short joints. Now go back to your top, take measurement from rear lower prop on shifting rail to upper prop on third bow, using center to center measurement. Take this measurement to joint draft board, getting exact measure from knob driven in board to another drive knob, which will indicate the lower eye of long joint. In a like manner you get measurement from prop on third bow to prop on first bow. To get break or knuckle of joints, get two pieces of leather dash, punch one hole in leather the size of props, and one hole large enough to run a piece of tufting twine through. Make two of them, put one on lower prop and other on upper prop on third bow, and run twine from one leather to other on different props. This is to represent joints. On rear or long one tie on a loose piece of twine so as to shift it on long twine to represent

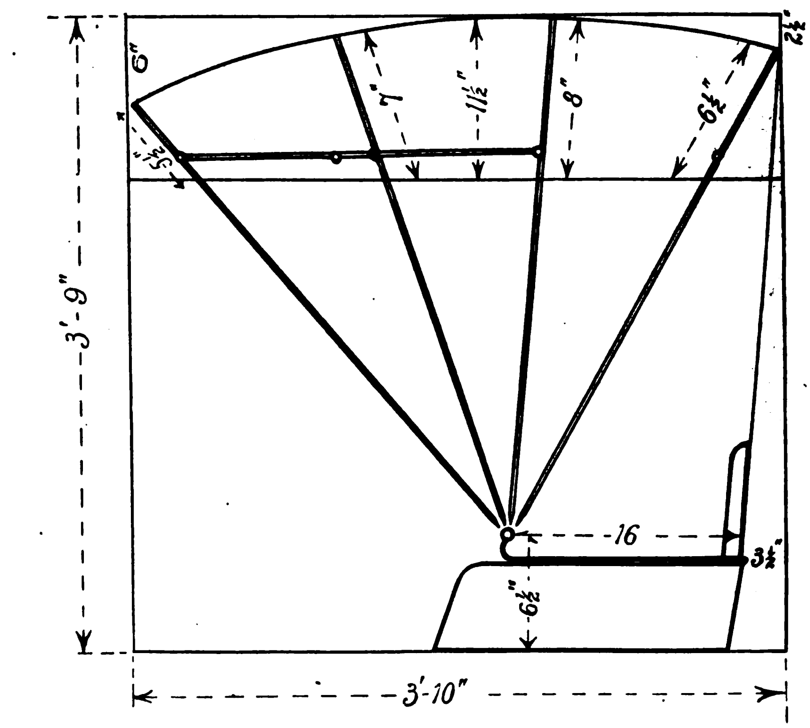

Fig. 5. LAYING OUT A BUGGY TOP.

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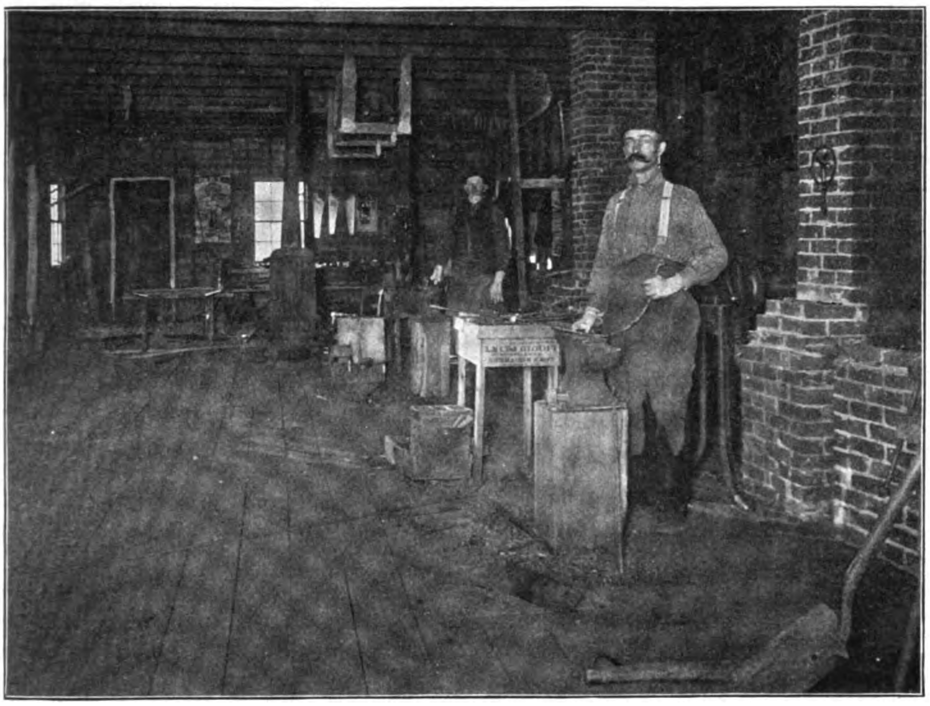
knuckle. Having the long piece of twine drawn to you, now loosen your top cord, drop top to position. When folded you can then adjust sliding loop to where the knuckle should come. Take the latter and twine off the top gently, take it to your draft joint board, placing your leathers over knobs. These on, drive a japan nail where the knuckles should come on draft board. In like manner you take the leathers with the twine attached, placing them on first and second props to get the short joints. Having your joints made and put on top, the top is now ready for the trimmer. Time and space forbid describing the methods for trimming top.



INTERIOR OF SHOP OF MR. ELMER WHEELER

The various parts finished, the job is set up in the assembling room, the wheels and washers put on, axle nuts tightened up, the wheels tested to see that they turn without binding, the body put on, the gear and loop bolts put in dash, lamps, rub-irons and steps bolted on, bolts trimmed off. The top is then put on, back-stays and side curtains fitted up, fender irons bolted to the steps and fender irons fitted to place. The job is looked over to see that each and every piece is on properly, is then inspected by the superintendent. If satisfactory, it is taken to the elevator and brought down to the shipping room, the floor of which is on a level with the floor of a box car, standing on the track. The wheels are then taken off and crated, the top taken off and let down, resting on the top of the seats, and secured with ropes, a crate built over the job and sent to its destination. I feel that the above description of wagon building in a shop of some size will be of interest.

An Illinois Shop Where There is Plenty of Light.

ELMER WHEELER.

I have recently finished building a new shop. One feature that we are proud of is its good light, it having ten good sized windows. Smiths, as a rule, are not particular enough about having plenty of light, and I am certain that I have injured my eyesight by working in dark shops. We also have two large lamps, by the use of which we are able to work until six o'clock on wintry evenings. A picture of our shop is shown here.

One year ago last November the horseshoers and blacksmiths of Edgar County, Ill., met at Paris, the county seat, organized, and raised our prices all over the county to correspond to the advance in prices of other things.

The paper has been very helpful to me in my work, beside the enjoyment I get in reading its columns.

The Progressive Smith as a Business Man.—6.

BILLY BUNTZ.

Buying.

Not only does a smith need to be *progressive* in order to obtain the best supplies or tools, but he must be *shrewd*, a clever business man.

When buying, *something* should be known as to the reliability of the dealer or manufacturer from whom an article is bought, as well as whether the article itself is first-class, for, where these conditions are unknown, costly purchases oftentimes result. The shrewd smith writes his brothers to obtain their opinion of an article or its dealer, as no brother could have good reason for misrepresenting the facts.

It may be said, too, that the smith need have no misapprehension of the dealers or manufacturers who advertise in THE AMERICAN BLACKSMITH, as they are as honest and as reliable a class of advertisers as could be found. In contradistinction, he has but to read some of the "Cheap John" journals and magazines with their "catchy" advertisements. Such papers are usually published under some big-sounding title, while the publisher knows many of his advertisers to be unreliable or on the lookout for unwary folk. (The smith who buys from advertisers should read this paragraph a second time—Ed.)

To enable him to describe just such goods as he wants to buy, he can learn much by studying his work and the material he has been using, as, for instance, by observing the tempering, bending, pulling, etc., a certain grade of iron or steel will stand; or his experience may have taught him that it is best to apply a tire a certain way, hence, in buying a setter, he would want one that performed the work in accordance with his experience.

An article of first quality should be compared with its price. Although prices may vary, so also does quality, while some goods sell on their *name* at a standard price. However, it is a fact, that several samples of goods of the same kind but selling at different prices may not be readily distinguished, one from the other, when placed side by side.

The rule, "Learn to Do by Doing," is not altogether a good one to follow in the purchasing department, although many old-time business men, by keeping wide awake and studying the cause and effect of every transaction, met with considerable success through the avenue of practical experience; but as experience is a harsh teacher, sometimes even a costly one, the shrewd smith deems it wise to follow a few well-established principles, such a those previously mentioned, rather than to go haphazard or buy something offhand and then find he paid a handsome price by being hasty or rash.

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Before buying new tools or machinery, it is well for him to study the class of work he wishes to perform, and, having satisfied himself as to the most feasible way of doing it, proceed to find what make of machinery his brothers are using, as well as mail a postal for the catalogues of different manufacturers.

He should remember that manufacturers cannot consistently recommend a machine to give "satisfaction," as the service which any machine will render depends to some extent upon the way it is operated. As a rule, tools and machinery are guaranteed to come up to a certain specified standard; therefore, if they are not handled properly the manufacturer cannot justly be blamed.

When quotations read "F. O. B." a certain city, he knows that when goods have been delivered to a railroad company, the purchase has been fully made, provided he has promised to buy them or paid the cash. Should they arrive in a damaged condition, the railroad, not the dealer or factory, is responsible, and claim for reimbursement must be sent to the transportation company. Goods are usually O. K. and well-boxed when presented for shipment, otherwise the railroad has the right to refuse to transport them. "F. O. B. Factory" also means that purchaser pays freight charges.

Knowing just what kind of tool he needs for certain work, and a good firm from which to purchase it, the smith is not likely to make any serious mistakes. He may buy of dealer or manufacturer, although machinery such as a trip-hammer or gas engine is more generally bought from the manufacturer direct, as he is in better position to explain the setting, operation and details of his machine than anybody else. However, large manufacturers have reliable representatives in many sections of the country. THE AMERICAN BLACKSMITH contains ads of standard-build engines and trip-hammers.

Where the smith wishes to become agent or dealer for the machinery purchased, he should mention this when asking for catalogue, as he may be offered special inducements; anyway, most manufacturers fit their agents out with printed matter, placards, electrotype for letterhead or advertising, etc., while he would lose nothing if he afterwards found he was unable to make any sales. However, a progressive smith makes a good agent for farm machinery, heating-furnaces, cutlery and other lines.

Read Chapter 7, of this series in the next issue of THE AMERICAN BLACKSMITH, entitled "Selling."

The terms "agent" and "dealer," although meaning the same in general, yet, technically, an agent is usually a direct representative of a firm, for whose acts the firm is responsible; while a "dealer" is one who handles goods for another and responsible unto himself for what he says, because he simply buys to sell again. Generally, a "dealer" can hold a firm responsible only on its written or printed statements.

Aside from smithing, he may use shrewdness in all transactions of daily life, therefore it is deemed timely to give a couple of examples of how the unwary are sometimes fooled, somewhat as the Swede who bought an English book of a glib agent, although he could not read a word in it. Sometime an unshrewd man may sign an insignificant looking scrap of paper which says little, yet which afterwards proves to contain all the elements of a "full-grown" contract, as a chattel mortgage, etc.

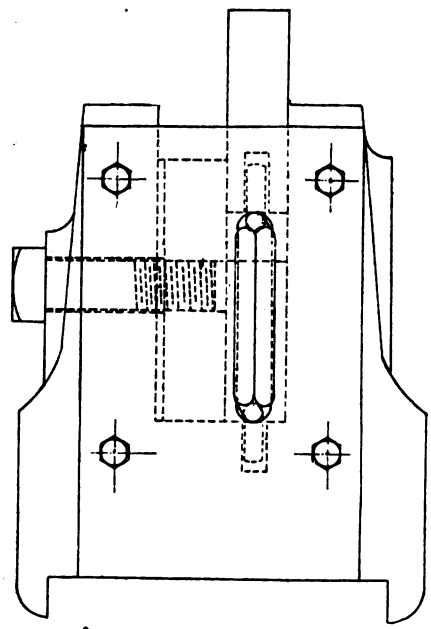

Fig. 1. THE ASSEMBLED SHEAR. SIDE VIEW OF UPPER SKETCH IN FIG. 2.

Beware of the oily-tongued individual who has some brilliant proposition to make. A man who entered this arena found that the gate which swung open so easily had a spring lock that forestalled any departure, somewhat on the principle of a rat-trap. It is not overstating facts to say that in our day there are more seductive, ingenious, high-sounding, "hot-air" schemes for taking a man's money away from him, than at any epoch since creation. So smooth are some of these individuals that a Court of Justice can only say of them, "They're doubly-shrewd," hence the necessity for the smith being *trebly so*. Who are these concerns; what do they handle? Read some of the inferior papers that do not guarantee their advertisements.

(*To be continued.*)

Shear for Cutting Off Iron.

LEO J. BRUNNER.

The sketches shown here are of a shear to be used on a steam hammer. In a shop where there are no shears this will be found to be a very valuable tool for cutting off iron cold. This sketch represents one of the shears I am using for cutting off iron from ½ to 1⅝ inches round. I also have one for cutting off two inches round and one for flat iron I have an eight-hundred pound hammer with which I can cut two-inch round or four by one-inch flat iron with two or three blows.

The upper view in Fig. 2 shows the tool as put together. The lower views show the details. I have given no sizes for the reason that it will have to be made to conform with the size of the hammer on which it is to be used. A is the base that fits loosely on the bottom die of the hammer, A being a right side view of the piece. It is a steel casting. B is the bottom knife, which fits in the base and is held in place with two ¾-inch tap bolts marked F. C is the top knife, which works loosely between bottom knife and side of base and is held in place by a spring on each side, a hole being drilled in bottom of the knife and in bottom of base as per sketch, large enough to receive the bent ends of spring loosely. The knives are made of good shear steel. The springs, E, are made of ⅜-inch round spring steel. The guide plates for springs on end of the base marked D are made of $\frac{3}{16}$ or ¼ inch tank steel and are held in place by four ½-inch tap bolts, as shown. Narrow slots cut in these two plates allow the spring to work up and down. The cutting edges of knives should be filed back a trifle for clearance to make them cut better. If the above is not clearly understood I will be pleased to explain further.

Gas Engine Power Versus Steam Power.

BILLY BUNTZ.

The immense advantage the gas engine has over the steam engine as a direct power-producer in the smith shop, admits of no argument. In fact, the whole story is told when it is stated that the gas engine costs only from one-third to one-half what a steam engine

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does for fuel; that the few repairs it may need from time to time are as nothing in comparison with those necessary on a steam engine; that, being a simple power—yet a thoroughly efficient one—it requires no engineer or mechanic to run it; in fact, little if any attention need be given its operation, as it practically runs itself.

The loss in fuel energy by a steam engine is readily accounted for and the fuel extravagance demonstrated when the performance of the boiler is measured in thermal units—a thermal unit being the heat required to raise one pound of water one degree Fahrenheit. Recently, a practical test showed that out of 13,500 thermal units only 1,171 were delivered to the belt, the balance being lost in ashes, gases, exhaust steam, radiation from boiler and pipes, etc. In other words, it takes a pound of coal to evaporate every eight or nine pounds of water, or, out of a hundred pounds of coal burned to make steam, only from six to twelve pounds actually produces power on account of the loss of energy mentioned above.

In order to gain a unit or two in fuel economy with a steam engine it is necessary to install a fuel economizer, a feed water purifier and heater, temperature or other regulators, indicators, soot-suckers, etc.

Without going into any elaborate figures, suffice to say that a small gas engine will run all day on a gallon or two of gasoline, which, with gasoline at say twenty-five cents a gallon, means only fifty cents fuel expense for running several small machines, such as emery wheel, trip-hammer, drill, saw and blower.

Again, with the steam engine, there is the question of repairs—keeping the fire box, boiler, flues, smokestack, as well as the engine itself, in serviceable condition. This cost is difficult to determine, yet it is absolutely certain—"a dead cinch"—that the gas engine, with only a piston, connecting rod and a crank to repair, is the cheaper on repairs, even were it necessary to renew these parts every six months. The fact is, however, that nearly all gas engines are guaranteed by their builders against defects for one or two years, as a good gas engine will easily run from two to six years without any repair at all, when it is not overloaded, is kept clean and given attention as to oiling.

In fact, a gas engine cannot be approached by any other power for efficiency in the smith shop. It delivers 35% of its fuel energy to the driving pulley, while the steam engine delivers only about 10%. Generally speaking, the repairs of a small gas engine would cost no more than a dollar a year, and they may be made by the smith himself, such as renewing a cylinder ring, repacking a journal box, readjusting the connecting rod for any lost motion, etc.

A small gas engine costs only $100 or $200 and will practically last a life-time if properly cared for.

There are many cases on record where steam engines have been replaced by gas engines, principally to save the cost of an engineer's services, where, after a time, it has been found the fuel bill is only half what it was when coal was used. For small powers, gas or gasoline engines are cheaper.

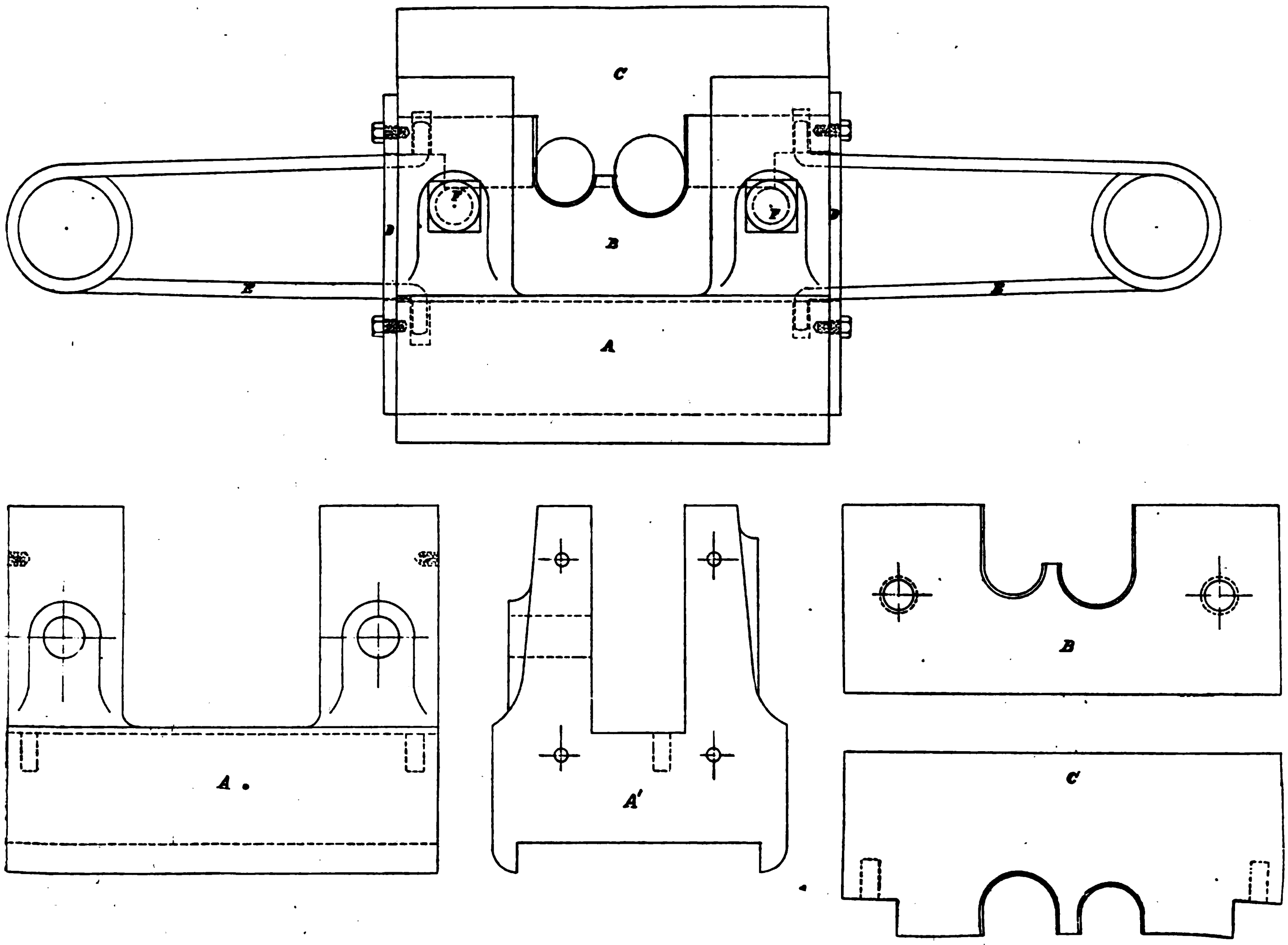

Fig. 2. UPPER VIEW IS A SIDE ELEVATION OF COMPLETE SHEAR. LOWER VIEWS ARE DETAILS OF PARTS.

The Passing of the Horse.

Every little while they tell us that the horse
has got to go;
First the trolley was invented 'cause the
horses went so slow,
And they told us that we'd better not keep
raisin' colts no more;
When the street cars got to moting that the
horses pulled before.
I thought it was all over for old Fan and
Doll and Kit,
S'posed the horse was up and done for,
But he ain't went yit!

When the bike craze first got started people
told us right away
As you probably remember, that the horse
had saw his day;
People put away their buggeis and went
kitin' round on wheels;
There were lots and lots of horses didn't
even earn their meals.
I used to stand and watch 'em with their
bloomers as they'd flit,
And I thought the horse was goin',
But he ain't went yit!

Then they got the horseless carriage, and
they said the horse was done,
And the story's been repeated twenty times
by Edison;
Every time he gets another of his batteries
to go
He comes whoopin' out to tell us that the
horse don't stand a show.
And you'd think to see these chauffeurs,
as they go a'chauffin', it
Was good-bye to Mr. Dobbin,
But he ain't went yit!

When the people git to flying in the air I
spose' they'll say,
As we long have been a-sayin', that the
horse has had his day,
And I s'pose that some old feller just about
like me'll stand
Where it's safe, and watch the horses haulin'
stuff across the land.
And he'll mebby think as I do, while the
crows above him flit,
"Oh," they say the horse is done for,
But he ain't went yit!"

—*Exchange.*

HEATS SPARKS WELDS

March—by no means spring yet.

Do today what you could not possibly have done yesterday.

Keep a hustling—success comes to no man without persistent effort.

A name for honest dealing is often worth more than a big bank account.

Any complaints to make? Send them in. Glad to have them and to straighten them out right to your satisfaction.

Russia has the largest number of soldiers and reserves of any country on earth except Germany.

Gas, oil or coke—which do you prefer for your heating furnaces? Let us hear from you as to your experience.

Good timber for rims, shafts, bows, spokes and other vehicle parts is reported to be very scarce at the present time.

Corruption is declared to be unknown in Japanese politics. Japan is indeed far removed from the United States.

Put your eggs all in one basket and then watch that basket. Thus spoke Andrew Carnegie,—and he ought to know.

When your engine balks in cold weather, remember that the colder it is the less freely gasoline vaporizes.

Prizes to the extent of seven thousand dollars will be offered at the World's Fair for exhibits of French draft horses.

Have you written that article on power in the shop? Of course you are going to try for one of the prizes—not much time left however.

The cottage in which the grandfather of the late President McKinley was born, in Ireland, will be reproduced at the St. Louis World's Fair.

Anthracite coal to the extent of over forty million tons, together with two hundred and sixty millions, was produced in the year 1903.

Doomed to disappear is the Eiffel Tower in Paris. This renowned structure, towering a thousand feet in height is to be razed, because it is beginning to lean to one side.

Be sure you know just exactly which machine is right for your purposes, then go ahead and place your order for it. No mistake is made in getting labor saving tools for the shop.

What steps have you taken for better prices in your locality to correspond to the higher cost of supplies? Some smiths seem to think prices for work will raise themselves. Is that your idea, too?

A high wind blowing at the rate of thirty-five miles per hour is estimated to exert a pressure of about six pounds on every square foot blown against.

No two horses have feet exactly alike. General shoeing rules may apply in most cases, but the details in each case will vary. It is always a help to observe the horse in motion.

New tools don't pay. The man who says that is in the same class with the one who says advertising doesn't pay. It's equivalent to declaring against progressiveness. New tools don't pay unless you want to get ahead.

Tom Tardy's latest acquisition is a horse. We found it standing in a rude stall clumsily made of old planks in a far corner of his shop. What Tom wants with a horse no one has discovered and Tom hasn't seen fit to say anything about it yet. In appearance it is like most of his customers' horses, more bones than flesh.

Gasoline mixed with the proper quantity of air will burn; but, like gunpowder in order for it to develop its full power it must be confined and compressed before igniting. The power is a direct result of high temperature which is generated in a limited space.

An ancient statue of a blacksmith has recently been unearthed in France, dating back to the first century after Christ, when the Romans held supremacy over the Gauls. It is interesting for the testimony it incidently bears of the blacksmith's importance in those olden days.

Electricity has been applied to the production of iron and steel, very high temperatures being attainable by its use. The high cost of electrical energy, however, has prevented these processes from passing much beyond the experimental stage, up to this date.

This month will be a good one to try to get at least one new subscriber to The American Blacksmith. You do us and your brother smith both a good turn when you induce him to take the paper. And remember, we offer a reward for your trouble, no matter if you get but one new name—a prize of $25.00 is offered to him who sends the greatest number before April 1st.

The Japanese Army in time of peace numbers 421,000 men. Private soldiers are paid seventy cents a month, so that the cost of maintaining an army is not very great. They are fed on rice, salted fish, dried seaweed and pickled plums—a diet that is almost universal in Japan, except in the navy, where rations of meat are served. Soldiers are allowed meat when on campaign, but rarely eat it.

Afraid to move. That's the case with many a smith. His jobber, not being in business for health, insists on payment when bills are due. His farmer-customers threaten to take their trade away at the first suggestion of a raise in prices; they let his bills lie, so that the only thing collected on them is dust; and they ask good cash prices for anything the smith buys of them. And yet the smith is afraid to make a move in the direction of higher prices, better conditions and just deserts.

The veterinary profession today is one of the few that is not overcrowded, and good veterinarians in large cities command from $5,000 to $20,000 a year in wages. The practice of this profession has made many advances of late years, and cases are now undertaken which a few years ago were thought to call for shooting. Where the patients are race horses of value, the "vet" is sure of a substantial fee. A story is told how a certain owner, whose horse had been successully treated, placed a fifty-dollar bet at odds 20 to 1, for the veterinarian. The horse won its race, and a substantial addition to the surgeon's fee.

A great problem now confronting railroads is the supply of lumber for ties. It has been estimated that an area equal to that of several states would have to be devoted exclusively to timber growing in order to provide the ties necessary for future new and repair work. The present supply is being rapidly depleted. Experiments have been made with steel and concrete ties. Another proposed solution is the catalpa tree, common in Illinois and Indiana. Its growth is extremely rapid. Catalpa ties in use for over thirty years have shown no signs of decay, whereas the average life of the oak tie now used is but little over seven or eight years. The gain is apparent.

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American Association of Blacksmiths and Horseshoers.

For a number of months we have been agitating the subject of better prices for blacksmithing, and under plans furnished by us the work has been taken up in many localities. Not in every instance has it been found possible to get every single craftsman to join the proposed branch association, and indeed this is not to be expected at the start. But in almost every case a strong, whole-hearted effect in a given locality has resulted in higher prices and better conditions for a body of smiths.

We wish to point out here that we must not expect in a day or a week to change conditions that have existed for years. Patient, persistent effort is necessary to bring complete success. Those who do not at first fall in with the idea of organizing must be labored with, or rather educated up to the benefits of membership in the Association.

Do not forget that much good is almost sure to flow from any attempt to organize. Enthusiasm and energy should be given the work at all times. There is scarcely any locality where things could not be improved by the blacksmiths and wagon men getting together. Every smith knows perfectly well what he *ought* to be getting for his work. Think what a slight increase on each piece of work would mean. He might then be able to give his family some of the good things of this life, and not merely the bare necessities. Perhaps it would mean a better education for his son or music lessons for his daughters. Isn't the effort worth while? Any smith can make a start of the movement for better prices in his neighborhood. Drop a postal to the American Association of Blacksmiths and Horseshoers at Buffalo for plans to follow in carrying out the work.

One of the many questions which greatly affect craft welfare is,—what about the "botch" workman, the man who shoes for ten and twenty and whose work isn't worth any more than that? Legislation is being aimed at such as these, with the idea of protecting skilled workmen by forcing a man to stand examination before he can practice. We invite discussion upon this topic. What is the best solution of the problem?

We wish to refer briefly to some of the active Association work. The movement for better prices which has been agitated in central New York during the past month or two took shape early in February. Cayuga, Seneca and Tompkins counties branch associations were organized and are growing in strength with each of the frequent meetings now being held throughout the counties.

Much good work has been done throughout New York State in arousing State representatives to the urgent need of Lien Law legislation. Those New York craftsmen who have not as yet written to their representatives at Albany urging passage of the bill, should do so the very day their eyes fall upon these words. We hope for early action upon the measure.

How One Smith Managed to Prosper.

Some years since a couple of young blacksmiths had learned the trade in one of the Eastern States, and after their apprenticeship worked together as journeymen. When they had saved up a stake, they concluded to come west, locating each one on the line of the C. B. & Q. R. R. in county seats in Iowa, about fifty miles apart. A short time ago one of them decided he would pay his old chum a visit, and came down to spend a day with him. Going from the depot he was not long finding the shop of his friend, and then the following conversation took place:

"Hello, Tom, old boy, how are you," as he entered the shop and found his old chum busily pounding away on his anvil. "Why George, glad to see you. It is some years since we came out here together, and how are you, and how have you been making it?" "Well Tom, from your surroundings I have not done so well as you appear to have done. Why, you have a dandy new brick shop, large enough for all purposes, a fine gas engine, a power drill, a good lathe and every tool necessary to do any kind of work that comes to you. I am plodding along in the old place, have plenty of work, but somehow I do not make the showing you present. I have been industrious, worked hard, saved my money, but have too much on my books, and not enough in my shop. I can't understand it. The county I am in is just as good as this one you are in. We have the same number of shops you have, but somehow, I cannot make the showing you do. Tell me how this is." "Well, George, come up to the house and spend the night with me, see Mrs. Campbell, my good wife, and our little family, and perhaps I can give you a pointer."

After a hearty reception from Tom's good, smiling wife, and a supper served up by her for her husband and his old chum, the evening was spent in detailing the ups and downs of work from the time they parted up to that evening. The cheerful supper done, George was ready to put his old friend in a way to mend his condition. "Well, Tom, up to three years ago I plodded along with all the smiths here in our territory, just as you have done. Had plenty of work, made money enough, but it was scattered all over the neighborhood, in the hands of farmers mostly, whose bank accounts would run from $500 to $5,000 of deposits, while we could not get enough cash from them to pay our bills and keep the wolf from the door. Three years since, in October, I had corralled three pigs, which I intended to feed and fatten for our winter's meat. A farmer came along one day, who had a large crop of corn, and I asked him to bring me a load. He would bring a load of corn for me, he said, but must have the cash for the corn as soon as delivered, for he could get cash from the shipper; this in spite of his owing me for work from the previous January enough to pay for half a dozen loads of corn. Like the boy after the woodchuck, I must have the corn, as the pigs must be fed, but it set me to thinking. I called on my nearest blacksmith neighbor, told him my story, and we together went to the third shop, at that time there being three shops in the town, and the experience of all of us was the same. We put our heads together, and concluded something ought to be done. Alek Crandall, one of the smiths is somewhat of a philosopher, and he said, 'Well boys, we are up against it, and we want to organize. Organization is the order of the day, and from organization has come the prosperity we are enjoying in America at this time. Let us be friends, let us organize, and let us get the smiths in our township and from the township to the county, and see what will come of it.' We had a meeting of the smiths in the township and harmony from the first prevailed. The first move we made was to say to our farmer friends, 'You insist on cash when you deliver any product of your farm, and you are right; we have concluded that our material and our labor are what we must depend on, and from this date we will insist on settlement of our bills when the work is done.' Our farmer friends went foraging around to all the shops to break the combination, but we stood pat, and in a very short time, after a few meetings, we not only insisted on our money, but revised

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prices. Well, from that came my new shop, the engine and all the fine tools to do any work that comes in, and the other shops also have the same increased machinery and tools. So I want to say to you, Tom, that the first thing you do is to organize the smiths in your township and county, and in a short time you will have everything just as you see it here. Try it and don't let anything stand in the way of good fellowship among the smiths in your county."

A Simple Farm Wagon and How to Build It.

J. LAWRENCE HILL.

With this issue we present the working drawing of a farm wagon of simple construction, one which any blacksmith with a few tools can build. One of the advantages and novel features is the arch, or wheel house. This does not go through from one side to the other, but only part way, thus giving plenty of lock and increasing very materially the carrying capacity, besides permitting of articles the full length of the wagon being carried without protruding over the rear end.

The easiest way to build the body is at first to pay no attention to the arch; just cut sills or bottom sides full length, and frame into back bar. Gage ½ inch on the top, from the outside of sill and chamfer this off. The panel is then placed on top of sill close up to the chamfer, and is screwed up through the sill with 3-inch No. 16 screws, about 9 inches apart. The top rail is put on in precisely the same manner, but in addition it is mortised on to the back corner pillow and extends beyond so as to form a scroll.

The back pillow is mortised into the back bar and is screwed by a strap bolt screwed up underneath the bar. This pillow and the top rail is ½ inch wide, the panel only one inch, so that a rabbet to receive the panel has to be cut out in order that the panel, top rail, and corner pillow will be flush on the inside.

By referring to Fig. 2, A, which represents the half front view, it will be noticed that the front board is not so high as either the back or sides, but it has a rail all the same. A recess is cut into the side panels in the front to enable this front rail to go right through and beyond the side panels. The front panel is placed on the front cross bar and butts up against the side panels. This is screwed similar to the side panels.

Through the front end a $\frac{7}{16}$-inch bolt is put through the panel-rail, cross bar, and sill, making a most secure and strong job, as shown by dotted lines in Fig. 1.

In building jobs with an arch in them, some men prefer to hang it up, that is, put the gear under before cutting it out. They revolve the front wheel around, and mark on the body where it is to be cut through. This is not necessary with a good drawing, so that if these measurements are adhered to the arch can be cut out while the body is still on the trestles. From Fig. 1 we obtain the size and shape on the outside, and from

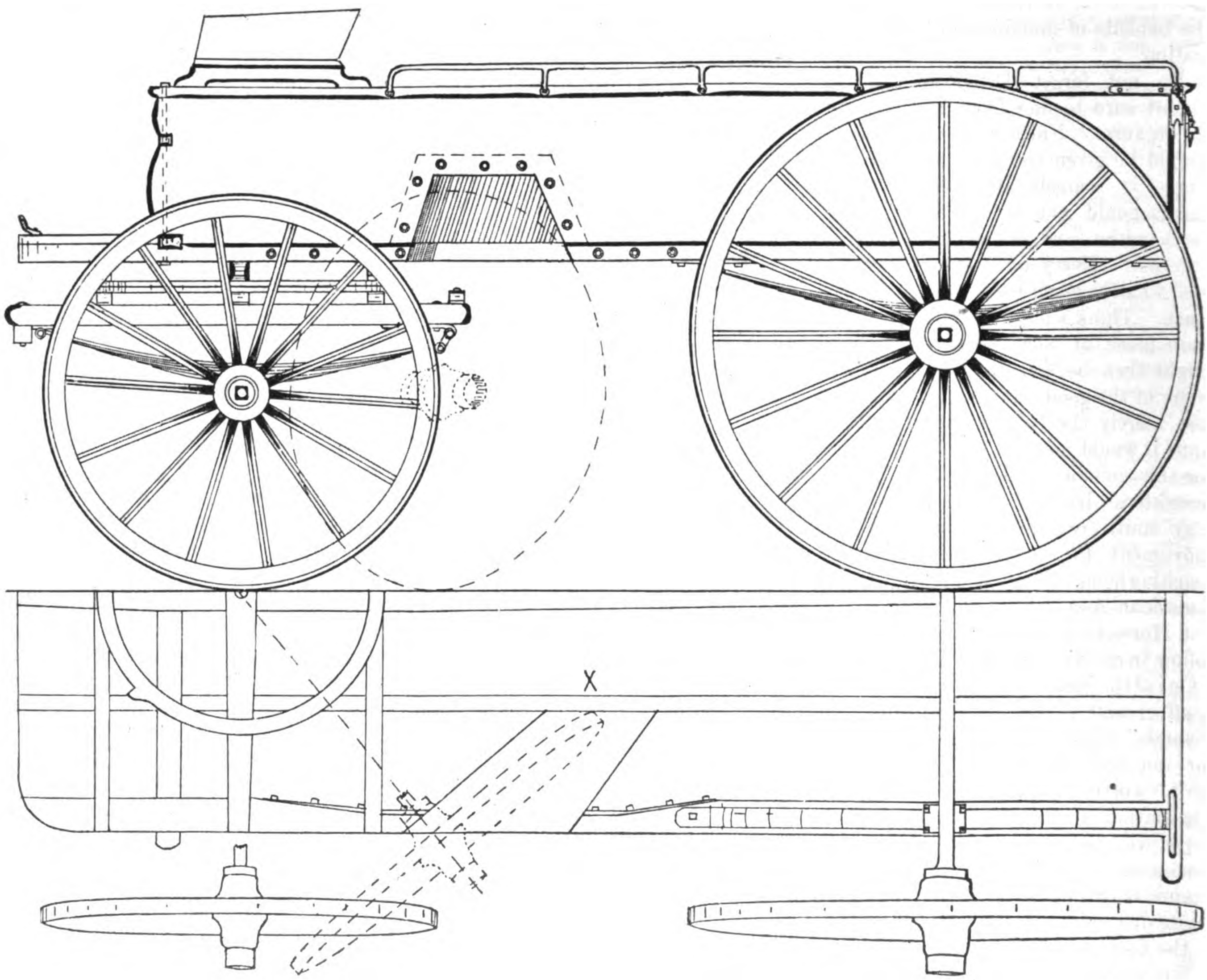

Fig. 1. SIDE ELEVATION AND HALF PLAN OF SIMPLE FARMER'S WAGON. SCALE, 1 INCH EQUALS 18 INCHES.

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the plan view we get the inclination, or the size and shape on the bottom, which is determined by the wheel as it revolves round the king bolt.

The sill is 3½ inches wide; ½ inch is taken up by the chamfer, and one inch

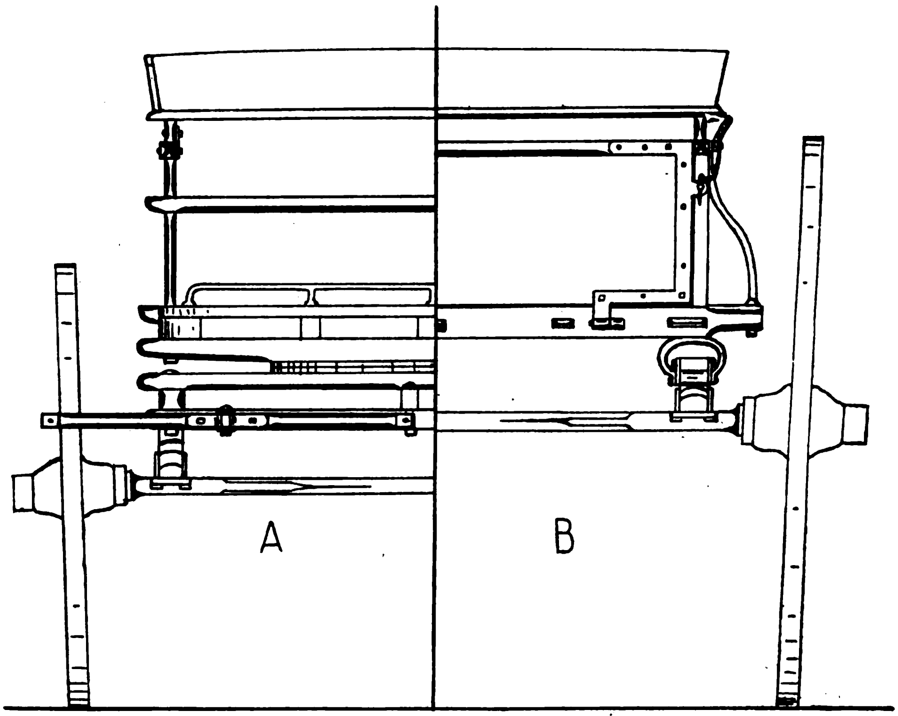

Fig. 2. A, HALF FRONT VIEW. B, HALF REAR VIEW. SCALE, 1 INCH EQUALS 18 INCHES.

by the panel which leaves 2 inches from the inside of the panel. Get some hard wood, 2¼ by 1 inch and fit it on to the sill and against the panel, as shown by dotted lines round the arch in Fig. 1. There remains then 1 inch on the width of sill, which is cut off even with the hard wood framing in the shape shown in the plan, Fig. 1. A good stiff rocker plate is then made, 2¼ by ½ inches, and bolted to the panel and sill. The arch panels are next put in, and then the bottom boards.

In the bottom plan, Fig. 1, there will be noticed a lug on the top part of the fifth wheel. This is to prevent the wheel striking and eventually cutting through the stringer at X by coming in contact with stop Y, Fig. 3, which is welded on to bottom half of fifth wheel.

In Fig. 3 will be noticed one of the simplest of gears; every piece is straight —even the single-trees are cut out of the plank with a square ferrule on each end, and chamfered. There is nothing in this job, with the exception of springs, wheels and axles, but what any country blacksmith could make; and not only make, but easily and cheaply repair, for there are no bent or curved pieces to break, which to replace are a source of trouble to the small repair man, when he has to cut all his pieces out of the plank by hand.

Fig. 4 represents a sectional view of the back bar, showing how the sill is tenoned into it. The plate, which is screwed on top, prevents the wood from wearing with the constant putting in and taking out of heavy materials.

The drawings are all to scale, one inch, on all except Fig. 4, representing 18

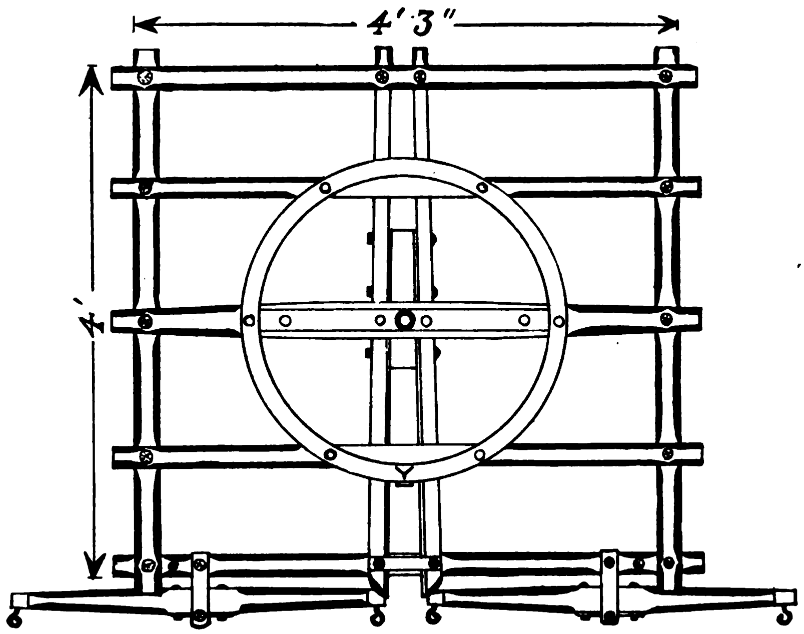

Fig. 3. PLAN OF GEAR. SCALE, 1 INCH EQUALS 18 INCHES.

inches; on Fig. 4 one inch represents one foot.

The following dimensions will give the principal data needed, and other dimensions can be scaled off the drawings:

Body, from outside back to front bar, 9 ft.

Toeboard, 14 x 1 inch.

Body, width 4 ft. 3 in.; height, 18½ inches.

Sill, 3½ x 1⅞ inches.

Center stringer, 4 x 1⅞ inches.

Taper to each end from fifth wheel.

Back bar, 2⅝ x 1⅝ inches.

Front bar, 2⅝ x 1¾ inches.

Rails, 1½ x 1⅛ inches.

Wheels, Sarven:

Front, 3 feet 6 inches. Spokes, 2⅛ inches. Tires, 2 x ⅜.

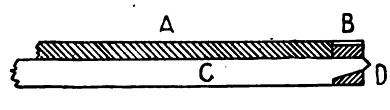

Fig. 4. A, BOTTOM BOARD; B, ⅛-INCH PLATE; C, SILL; D, BACK BAR. SCALE, 1 INCH EQUALS 1 FOOT.

Hind, 4 feet. Spokes, 2¼ inches. Tires, 2 x ⅜.

Axles:

Front, 1½ Concord, round centers.

Hind, 1¾ Concord, round centers.

Springs:

Front, 42 x 2¼ x 6 inches.

Hind, 48 x 2½ x 8 inches.

Fifth wheel, 2 feet 6 inches diameter; 1¾ x ½ inch.

Kingbolt, ⅞ inch round.

Pole, 10 feet 4 inches and 3 x 2½ inches.

Upon completion the following scheme for painting is suggested:

Body; black, striped with vermilion. Gear; tan, striped black and yellow; one half inch black stripe with a fine line of yellow each side.

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Such a farm wagon can be easily and cheaply built at a good profit by any wagon maker from the directions given.

An Interesting Oregon Shop.

CHARLES WALTER.

The accompanying engraving shows my shop, at Glencoe, the main building being 24 by 60 feet, two stories high, with a one-story addition, 18 by 30 feet. In the shop I have a 42 -inch bellows, a Hay-Budden 150-pound anvil, a Western Chief No. 14 drill, (as good a tool as money can buy), and a shear of my own make, cutting up to $\frac{5}{8}$ by 2 inches, $\frac{1}{2}$ by 3, or $\frac{3}{4}$-inch round. I have a vise on the corner of my forge, and find it very handy for hot rasping as well as upsetting. My emery stand carries two 12-inch wheels. A pump draws water out of a 20-foot well and forces it 44 feet to the 600-gallon tank shown above the shop. I keep the pump going always while drilling and sawing, and in this way have plenty of water for my house (to the left of the shop), for my lawn in summer, and for my horse, cow and customers' horses. A 70-foot hose is ready in case of fire.

My rip saw and planer I made myself. The latter will plane six inches wide, and a 16-inch rip saw will saw lumber and small oak logs up to six inches. I have a Silver 20-inch band saw (made by the Silver Manufacturing Co., Salem, Ohio), and a spoke-tenoning machine which I made out of an old drill. Upstairs I have a wood turning lathe.

To drive my shop I have a $2\frac{1}{2}$ horse-power Weber Jr. engine, with an auto-sparker, which makes a good combination. The engine will start in less than five seconds by giving it from one to three turns. My line shaft is $1\frac{5}{16}$ inches by 30 feet. I have had this engine and these machines just one year, during which time I have used but 100 gallons of gasoline and besides have had all kinds of fun out of it. I would never go back to the old "horse killing" way. If there is any smith who has anything to do besides horseshoeing, I would say to him, buy a similar power outfit and be happy. Do not be afraid of this size of engine; it is plenty large enough for two or three men in the shop. I have no power hammer, but I think they are all right and will put one in soon.

Among my other tools are two blacksmith's and one woodworker's vise, a 4-inch Stoddard tire upsetter, two sets of screw plates, a Little Giant hub-boring machine, which sets the boxes nice and true, a Kinsby Tire Bender that will bend $\frac{3}{4}$ by 3-inch tires, and a Henderson Cold Tire Setter, largest size, in which I have shrunk 4-inch tires without turning the wheel. The wagons in this section have nearly all 3-inch tires and this tool gives the best of satisfaction on strong solid wheels. My shoeing rack is of my own make, and has held at least one mean horse that weighed 1770 pounds.

I also keep all kinds of hand tools, together with a good supply of stock, such as tired wheels, axles, wood stock, hard wood lumber and the like. The upper part of the shop is used for a store room and paint shop. A pair of 6 by 8 trap doors allows me to draw up an entire rig at once.

My business is principally repair work and shoeing. As to a cash or credit basis, I trust nearly everybody and have not lost $20 in the last nine years. In conclusion, I would say to brother smiths, take some good trade paper like THE AMERICAN BLACKSMITH and do the right thing in a business-like way, and you will prosper.

EXTERIOR VIEW OF MR. CHARLES WALTER'S SHOP.

A Model Shoeing and Repairing Shop in Iowa.

W. H. JOHNSTON.

In my shop, which is 20 by 50 feet, I have a $2\frac{1}{2}$ H. P. Weber Jr. gasoline engine that I have used for two years, and it is a dandy. I have one emery stand that carries two 12-inch wheels, one Champion disc sharpener, one 10-inch cross-cut saw, one 16-inch rip saw, one 10-inch planer and grooving saw attached, one power drill, one mortising machine, one Champion forge with blower attachment, one Peter Wright anvil, one Hay-Budden anvil, clip horn, an 80-pound bench vise, one woodworker's vise, one Greenriver mandrel with 16-inch base, one Eureka tire bender, bending tires up to 5 inches wide, one Little Giant swage block, large size, a full set of top swages up to 12 inches, one Little Giant screw plate with 12 different size dies and two sets of taps, a very nice set, indeed. They can't be beaten for cutting a nice thread. One set of Little Giant pipe dies, one tool grinder, one Mole tire shrinker No. 3, one Easy iron shear, one trip hammer of "any ones" make. It works finely and I will give the description to any brother in the craft, if he wants me to, so that he can make one. I have recently built the trip hammer. The photograph of my shop doesn't show it, as I had the photograph taken last summer. I have a full set of bench tools, both wood and iron working.

I think that a good variety of labor-saving tools is a nice thing in a shop. A mechanic can use them to pretty good advantage in his daily work, and it makes his work easier and better than he can do by the old method, or as the saying is, "A hand saw, a hatchet and a jack-knife." I have heard men say that it was money wasted to buy all the new and improved tools that come along, but if I had a million dollars I would invest it in labor-saving tools and machinery, so that it would do the work, and I would sit on the bench and take in the cash.

In regard to keeping a shop clean, I make a practice of sweeping my shop out every night and dusting off the machinery when I get through work. I wipe off my engine and put the blanket on it to keep off dirt when not in use I also have a place for every tool to hand and when I get through using them I put them in their proper places. I can go in my shop at night without a

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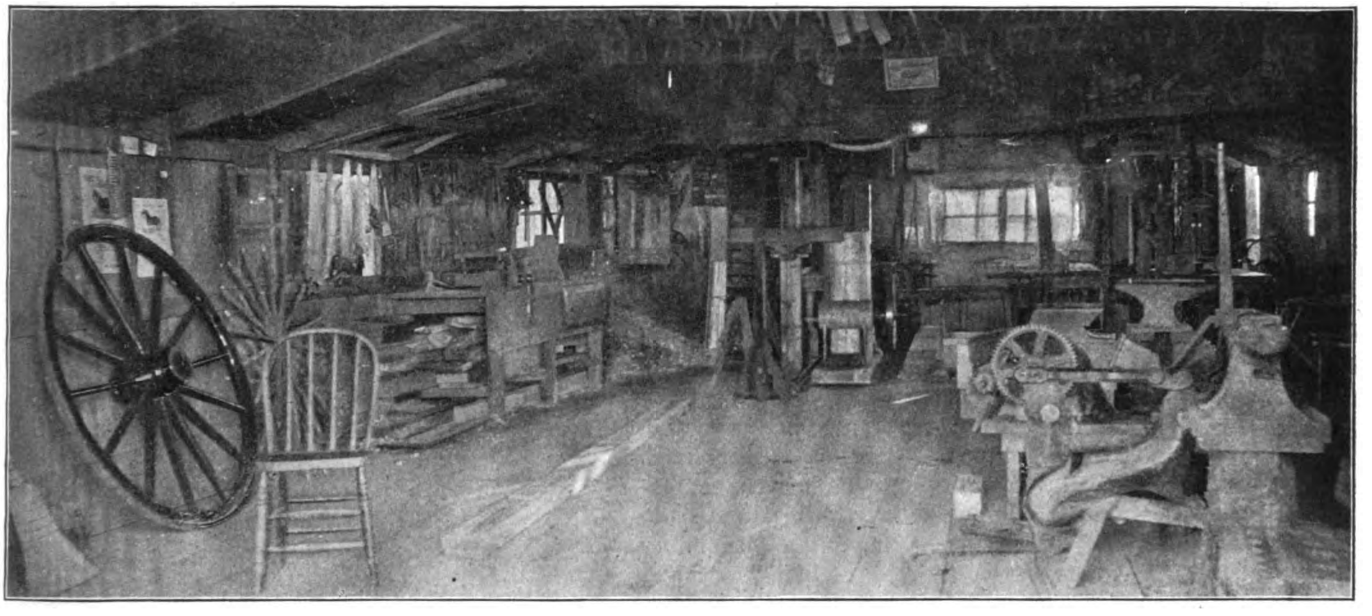
lamp and get any tool that I want, for I know where they were last put. It also pleases my customers to see a clean shop and the tools in their proper place. I was out in Nebraska this fall and I visited some of the shops. There was one in particular where a farmer was doing a job himself. The farmer said to the boss, "Where is your cold chisel." The smith turned around a couple of times and said, "I don't know. I have three of four, but it seems to me when I want one I have to hunt an hour for it." He kicked around on the floor among some old scrap iron and finally found it under his feet. The farmer, as he took it, said, "If you would clean out this scrap iron and sell it, take the money to hire someone to sweep out the shop and keep the tools in their proper places, you would save time in hunting for your tools." I couldn't work in a shop where there is so much dirt. Another thing which I think a very good idea, is to have a few good practical books on the subject and to take a good trade journal. I have been a subscriber to THE AMERICAN BLACKSMITH for the past two years, and I am going to continue as long as I can get it.



INTERIOR ARRANGEMENT OF AN IOWA BLACKSMITH AND REPAIR SHOP.

A Treatise On Horseshoeing.—2.

JOHN W. ADAMS, V. M. D.

The Hoof.

With respect to solidity, the different parts of the hoof vary widely. The middle layer of the wall is harder and more tenacious than the sole, for the latter crumbles away or passes off in larger or smaller flakes on its under surface, while no such spontaneous shortening of the wall occurs. The white line and the frog are soft-horn structures, and differ from hard horn in that their horn cells do not, under natural conditions, become hard and hornlike. They are very elastic, absorb moisture rapidly, and as readily dry out and be come hard, brittle, and easily fissured. Horn of good quality is fine-grained and tough, while bad horn is coarse-grained, and either mellow and friable or hard and brittle. All horn is a poor conductor of heat, and the harder (dryer) the horn, the more slowly does it transmit extremes of temperature.

Physiological Movements of the Hoof.

A hoof while supporting the body weight has a different form, and the structures inclosed within the hoof have a different position than when not bearing weight. Since the amount of weight borne by a foot is continually changing, and the relations of internal pressure are continuously varying, a foot is, from a physiological viewpoint, never at rest. The most marked changes of form of the hoof occur when the foot bears the greatest weight, namely, at the time of the greatest descent of the fetlock. Briefly, these changes of form are: (1) An expansion or widening of the whole back half of the foot from the coronet to the lower edge of the quarters. This expansion varies between one-fiftieth and one twelfth of an inch. (2) A narrowing of the front half of the foot, measured at the coronet. (3) A sinking of the heels and a flattening of the wings of the sole. These changes are more marked in the half of the foot that bears the greater weight.

The changes of form occur in the following order: When the foot is set to the ground the body-weight is transmitted through the bones and sensitive and horny leaves to the wall. The coffin bone and navicular bone sink a little and rotate backward. At the same time the short pastern sinks backward and downward between the lateral cartilages and presses the perforans tendon upon the plantar cushion. This cushion being compressed from above and being unable to expand downward by reason of the resistance of the ground acting against the horny frog, acts like any other elastic mass and expands toward the sides, pushing before it the yielding lateral cartilages and the wall of the quarters. This expansion of the heels is assisted and increased by the simultaneous flattening and lateral expansion of the resilient horny frog, which crowds the bars apart. Of course, when the lateral cartilages are ossified not only is no expansion of the quarters possible, but frog pressure often leads to painful compression of the plantar cushion and to increase of lameness. Frog pressure is therefore contra-indicated in lameness due to sidebones (ossified cartilages). Under the descent of the coffin bone the horny sole sinks a little; that is, the arch of the sole around the point of the frog, and the wings of the sole become somewhat flattened. All these changes of form are most marked in sound unshod hoofs, because in them ground pressure on the frog and sole is pronounced; they are more marked in fore hoofs than in hind hoofs.

The movement of the different structures within the foot and the changes

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of form that occur at every step are indispensable to the health of the hoof, so that these elastic tissues must be kept active by regular exercise, with protection against drying out of the hoof. Long-continued rest in the stable, drying out of the hoof, and shoeing, decrease or alter the physiological movements of the hoof and sometimes lead to foot diseases. Since these movements are complete and spontaneous only in unshod feet, shoeing must be regarded as an evil, albeit a necessary one, and indispensable if we wish to keep horses continuously serviceable on hard artificial roads. However, if in shoeing we bear in mind the structure and functions of the hoof and apply a shoe whose branches have a wide and level bearing surface, so as to interfere as little as may be with the expansion and contraction of the quarters, in so far as this is not hindered by the nails, we need not be apprehensive of trouble, provided the horse has reasonable work and his hoofs proper care.

Growth of the Hoof.

All parts of the hoof grow downward and forward with equal rapidity, the rate of growth being largely dependent upon the amount of blood supplied to the pododerm, or "quick." Abundant and regular exercise, good grooming, moistness and suppleness of the hoof, going barefoot, plenty of good food, and at proper intervals removing the overgrowth of hoof and regulating the bearing surface, by increasing the volume and improving the quality of the blood flowing into the pododerm, favor the rapid growth of horn of good quality; while lack of exercise, dryness of the horn, and excessive length of the hoof hinder growth.

The average rate of growth is about one-third of an inch a month. Hind hoofs grow faster than fore hoofs and unshod ones faster than shod ones. The time required for the horn to grow from the coronet to the ground, though influenced to a slight degree by the precited conditions, varies in proportion to the distance of the coronet from the ground. At the toe, depending on its height, the horn grows down in eleven to thirteen months, at the side wall in six to eight months, and at the heels in three to five months. We can thus estimate with tolerable accuracy the time required for the disappearance of such defects in the hoof as cracks, clefts, etc.

Irregular growth is not infrequent. The almost invariable cause of this is an improper distribution of the body weight over the hoof—that is, an unbalanced foot. Colts running in soft pasture or confined for long periods in the stable are frequently allowed to grow hoofs of excessive length. The long toe becomes "dished"—that is, concave from the coronet to the ground—the long quarters curl forward and inward and often completely cover the frog and lead to contraction of the heels, or the whole hoof bends outward or inward, and a crooked foot, or, even worse, a crooked leg, is the result if the long hoof be allowed to exert its powerful and abnormally directed leverage for but a few months upon young plastic bones and tender and lax articular ligaments. All colts are not foaled with straight legs, but failure to regulate the length and bearing of the hoof may make a straight leg crooked and a crooked leg worse, just as intelligent care during the growing period can greatly improve a congenitally crooked limb. If breeders were more generally cognizant of the power of overgrown and unbalanced hoofs to divert the lower bones of young legs from their proper direction, and, therefore, to cause them to be moved improperly, with loss of speed and often with injury to the limbs, we might hope to see fewer knock-kneed, bow-legged, splay-footed, pigeon-toed, cow-hocked, interfering, and paddling horses.

If in shortening the hoof one side-wall is, from ignorance, left too long or cut down too low with relation to the other, the foot will be unbalanced, and in travelling the long section will touch the ground first and will continue to do so till it has been reduced to its proper level (length) by the increased wear which will take place at this point. While this occurs rapidly in unshod hoofs, the shoe prevents wear of the hoof, though it is itself more rapidly worn away beneath the high (long) side than elsewhere, so that by the time the shoe is worn out the tread of the shoe may be flat. If this mistake be repeated from month to month, the part of the wall left too high will grow more rapidly than the low side whose pododerm is relatively anemic as a result of the greater weight falling into this half of the hoof, and the ultimate result will be a "wry," or crooked foot.

Care of Unshod Hoofs.

The colt should have abundant exercise on dry ground. The hoofs will then wear gradually and it will only be necessary from time to time to regulate any uneven wear with the rasp and to round off the sharp edge about the toe in order to prevent breaking away of the wall.

Colts in the stable can not wear down their hoofs, so that every four to six weeks they should be rasped down and the lower edge of the wall well rounded to prevent chipping. The soles and clefts of the frog should be picked out every few days and the entire hoof washed clean. Plenty of clean straw litter should be provided. Hoofs that are becoming "awry" should have the wall shortened in such a manner as to straighten the foot-axis. This will ultimately produce a good hoof and will improve the position of the limb.

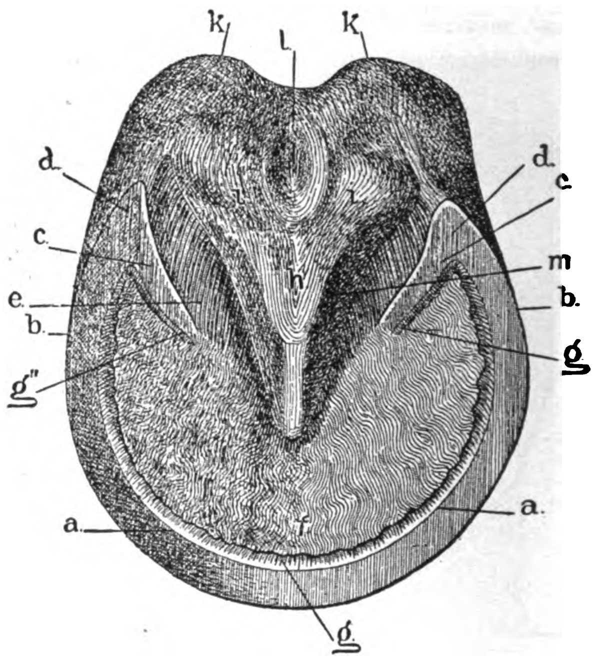

Fig. 1. GROUND SURFACE OF A RIGHT FORE HOOF OF THE REGULAR FORM: *a*, *a*, WALL; *a-a*, THE TOE; *a-b*, THE SIDE WALLS; *b-d*, THE QUARTERS; *c*, *c*, THE BARS; *d*, *d*, THE BUTTRESSES; *e*, LATERAL CLEFT OF THE FROG; *f*, BODY OF THE SOLE; *g*, *g'*, *g''*, LEAFY LAYER (WHITE LINE) OF THE TOE AND BARS; *h*, BODY OF THE FROG; *i*, *i*, BRANCHES OF THE FROG; *k*, *k*, HORNY BULBS OF THE HEELS; *l*, MIDDLE CLEFT OF THE FROG.

Characteristics of a Healthy Hoof.

A healthy hoof (Fig. 1) is equally warm at all parts, and is not tender under pressure with the hands or moderate compression with pincers. The coronet is soft and elastic at all points and does not project beyond the surface of the wall. The wall is straight from coronet to ground, so that a straight-edge laid against the wall

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from coronet to ground parallel to the direction of the horn tubes will touch at every point. The wall should be covered with the outer varnish-like layer (periople) and should show no cracks or clefts. Every hoof shows "ring-formation," but the rings should not be strongly marked and should always run parallel to the coronary band. Strongly marked ring-formation over the entire wall is an evidence of a weak hoof, but when limited to a part of the wall is evidence of previous local inflammation. The bulbs of the heels should be full, rounded, and of equal height. The sole (Fig. 1) should be well hollowed out, the white line solid, the frog well developed, the middle cleft of the frog broad and shallow, the spaces between the bars and the frog wide and shallow, the bars straight from the buttresses toward the point of the frog, and the buttresses themselves so far apart as not to press against the branches of the frog. A hoof cannot be considered healthy if it presents reddish discolored horn, cracks in the wall, white line, bars or frog, thrush of the frog, contraction or displacement of the heels. The lateral cartilages should yield readily to finger pressure.

Various Forms of Hoofs.

As among a thousand human faces no two are alike, so among an equal number of horses no two have hoofs exactly alike. A little study of different forms soon shows us, however, that the form of every hoof is dependent in great measure on the direction of the two pastern bones as viewed from in front or behind, or from one side; and that all hoofs fall into three classes when we view them from in front and three classes when we observe them in profile. Inasmuch as the form of every foot determines the peculiarities of the shoe that is best adapted to it, no one who is ignorant of, or who disregards the natural form of, a hoof, can hope to understand physiological shoeing.

(*To be continued.*)

The Practical Scientific Treatment of Interfering Horses.—4.

E. W. PERRIN.

Interfering Hind or Fetlock Striking.

Ankle hitting, or fetlock striking, consists in the animal striking the inside of the fetlock with the hoof or shoe of the opposite foot. The concussion resulting from the blow often causes the animal to go on three legs to carry the limb for a few steps, like a lame dog. In some cases the point of contact is between the inside toe of one foot and the coronet of the other, that is, they strike the coronet instead of the fetlock.

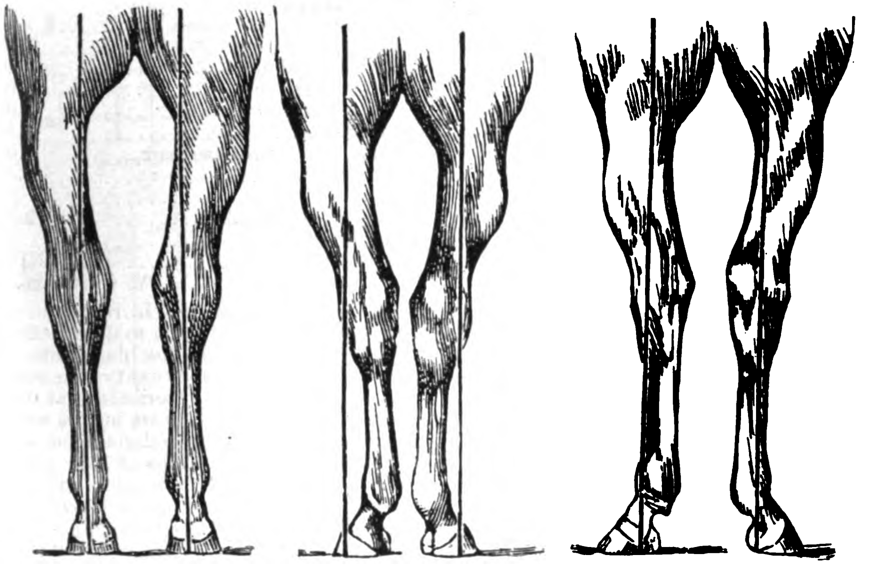

Fig. 9. *a*, REGULAR CONFORMATION; *b*, TOE WIDE AND TOO CLOSE BEHIND; *c*, LEGS BADLY TWISTED.

Fetlock striking behind is very common; all shoers have to contend with it, and every shoer of experience occasionally meets with cases that are very difficult to cure, for, notwithstanding the fact that interfering is so common, it involves scientific principles that are not generally understood by the average horseshoer. Hence the large number of horses wearing boots that would be unnecessary in most cases if the cause of the trouble were clearly understood.

Causes.

The most prolific cause of fetlock striking behind is defective conformation of the limbs, weakness, poor condition, improper hitching, or reckless riding or driving. Sometimes a horse will interfere as a result of a spavin or curb in the hock, or any pain in the foot or limb which interferes with the animal having proper control of the affected limb may cause interfering. Improper shoeing is also a cause.

Treatment.

Two old anvil ringers were talking interfering; one said to the other, "What's the best shoe for interfering?" "Why, that shoe which stops him interfering," was the curt reply. Just so, but the kind of shoe, the method of applying it and preparing the hoof, will vary according to the circumstances of each particular case, so that we cannot intelligently apply the remedy until we have ascertained the cause. If a horse interferes because of being over-worked, don't try to remedy the trouble by shoeing, but protect the injured part with properly fitting boots. Maybe it is a young horse not yet settled down to his work. If the horse be in good condition, and the shoeing apparently correct, then look for defective conformation of the limbs. Fig. 9, A shows the regular conformation; such animals invariably go clear, because the hind feet move straight forward in line with the front ones. You can't make such a horse interfere unless he goes side-ways from improper hitching or loses control of his limbs from being over-driven, etc. Fig. 9, B shows a horse too close behind and toe-wide. Horses of this conformation are very liable to cut their ankles. Fig. 9, C shows a case with legs badly twisted. This form is also very prone to fetlock striking. Now, the mode of preparing the hoof and the shoe to be used will depend on the mode of going and the point of contact in each case. To look at these drawings one would think that such horses would "break-over" at the inside toe, that is, that the inside toe would be the last to leave the ground, but this depends largely on the motion of the body; as you sit behind such horses in the buggy, you'll invariably see the hind quarters roll from side to side. Now look down at the hind feet only, and notwithstanding the fact that the toes are turned out the feet will invariably "break-over" on the outside toe or quarter. In some cases the foot gives a twist at each step just on the point of leaving the ground, and ninety per cent. of such cases are outside wearers, that is, they wear harder on the outside of the shoe than the inside. Now as to the point of contact. The inside of the hoof will generally be marked with a blood spot from the injured fetlock. If, however, you are in doubt as to the part of the hoof with

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which he strikes, chalk the inside of the hoof he strikes with, put some axle grease or black paint on the fetlock, drive the horse on a dry road, and as soon as he hits stop and examine the foot; the black paint will indicate the point of contact. If the horse strikes with the inside toe, then use shoe at D, Fig. 10, fitted close between X and Y. Rasp away a little of the wall at that part. If the point of contact is at the quarter, use shoe of Fig. 10, E. If the point of contact is just at the inside heel hole, as it is in sixty per cent. of the cases, and wearing heavy on the outside of the shoe, then lower the outside of the hoof, and use the shoe of Fig. 10,F. Fit close at the point of contact, but full at the inside toe, and roll the outside quarter between A and B. If your horse is of the conformation in Fig. 9, C, and wearing level, then shoe with a spur on the outside heel of the shoe with a light inside fitted close at the point of contact. In all cases don't use more iron than is compatible with a reasonable amount of wear, because to burden the limbs with extra weight tires the muscles and thus aggravates the trouble.

(To be continued.)

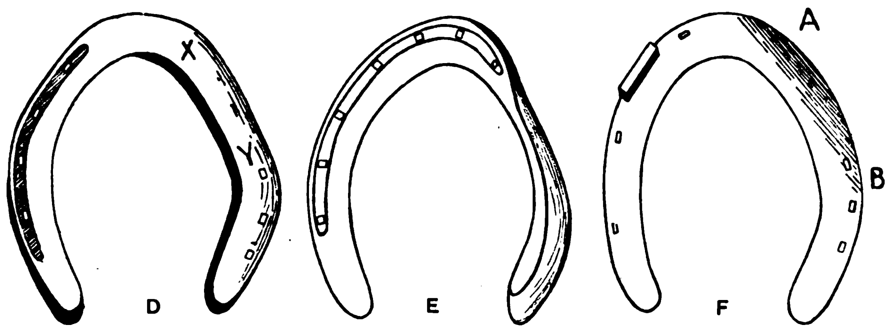


Fig. 10. TYPES OF SHOES TO CORRECT VARIOUS PHASES OF INTERFERING.

Drawing Out a Neverslip Calk.

L. E. RUSH.

The ice on the roads in this neighborhood was so thin and hard that it was next to impossible for a horse to get a hold. The thought of drawing out the Neverslip calk occurred to me and I immediately tried the experiment. It proved successful and I thought perhaps some brother smith could profit by it. I first took a piece of iron about 18 inches long and drilled a hole in the end. Next I cut threads in the hole with my Neverslip tap and I had a fine tool for holding calk while sharpening.

This may be published too late to be of value to any horseshoer this winter, but they may remember it to advantage some other time when a very cold snap makes the roads like glass. It certainly proved a kink of the greatest use to me during the past winter.

QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

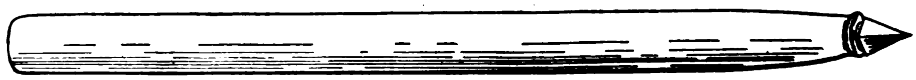
Butcher Knives.—I would like to know the proper way of tempering butcher knives so as not to warp. SAMUEL KREBS.

Dividers and Butcher Knives.—I would like to have some one of the craft tell me the best way to make a pair of dividers or compasses. Also how to temper butcher knives in water, so as not to warp. I have had trouble with them. THOS. LONG.

A Bar Shoe.—Take a Burden snow shoe, weld a toe calk on the toe, make a nice frog pan, drill holes smaller than calk, tap out with taper, and then insert Neverslip calks, which makes a neat shoe, and takes the jar from the heel. Finish as good as you possibly can to draw trade. BYRON WALLACE.

Interfering.—I have a horse that interferes so badly with his hind feet that his ankles are bloody all the time, I have shod him every way that I know of, but he still strikes. I have had him raised on the inside extra high. If some one could give me a pointer on him it will be appreciated. The horse is in good shape and interfered before he ever had a shoe on. BERT FIELDS.

Plan for Taking Out Buggy Bolts.—The following is my plan for taking out bolts from a wagon or buggy wheel, and I think it is a good one. First remove the nuts, then drive the bolts out, or start with the hammer. Next take a sixteen-inch file, split the big end of it 1½ or 2 inches, shaping the end like a claw hammer. Place the fork over the bolt between the bolt head and tire. Striking with hammer, the bolt is easily removed. W. M. TANNER.


TOOL FOR HANDILY DRAWING OUT NEVERSLIP CALKS.

Shoe for Narrow Feet.—Mr. C. W. Metcalf, in the January number, gives a shoe of new design for narrow feet. I will say that I have used the same shoe this winter with very good results. The horse had been shod by a man that said that there was a bone loose in the coffin joint. I saw that the foot was badly contracted, took off the bar shoe, used a shoe like the one mentioned above and the horse is getting better. I believe it can be highly recommended for use on contracted feet. H. NOTESTINE.

A Letter from New Jersey.—I have been a subscriber since your first issue. I think the paper is worth many times the price to any blacksmith if he is not the know-it-all kind. I have a Standard cold tire setter, a Western Chief drill of the largest size, a Green River vise, a set of improved Lightning dies, a No. 400 Champion blower and am sending an order for a 3 H. P. Witte gasoline engine with this mail, so you see I read the ads. as well. I appreciate your efforts to improve your paper; it is with you the same as it is with us, always looking up and trying for something better. So much for this time. G. I. NELSON.

Louisiana Prices.—

Horseshoeing, new shoes	$ 1.50
Shoeing, resetting	1.00
Toe Calks and heels	2.00
Setting buggy tires	3.00
Setting wagon tires	4.00
Setting axles	1.50
Setting 4-inch tires, per pair	5.00
Buggy shafts	1.50
Singletrees	.75
Filling buggy wheels	3.50
Sharpening plows	.25
Painting old buggies	15.00 and up

J. V. CAFFAREL.

A Lien Law Letter.—In regard to the Lien Law, it is a good thing to do something to protect the hard laboring blacksmith. I have been in business for twenty-four years, and I have learnt by experience that there are a great many dead beats in this world. They come into a shop and get some work done and haven't any idea of ever paying for it. They will tell you a good story and put on a good face for the time being, and then you can whistle for your pay. If we had a Lien Law, so that we could put a lien on our work, it would be a very good thing for the blacksmiths. I am in favor of a Lien Law. H. L. OLMSTED.

Flue Welding.—Being obliged to do quite a lot of welding safe ends to boiler tubes, we occasionally experience trouble in not being able even with the best of fire and care to get a good weld. In the best heat they refuse to catch. We chamfer all flues on lathe so as to have a good fit. The larger sizes are worse than the smaller ones. We have resorted to all kinds of remedies, but to no avail. Sometimes changing to another kind of tube will help out to some extent, which would indicate that the grade or quality of the tube had something to do with it, yet we would not claim either that the same is entirely the fault. We have used different welding sands and compounds, but to no avail. We should like very much to hear from others who have had experience in this line. Have been in the business about twelve or fourteen years, but have not found a good remedy yet. It is often a long time between such cases, as they are rare. A discussion of this matter will be followed with great interest by J. M. K.

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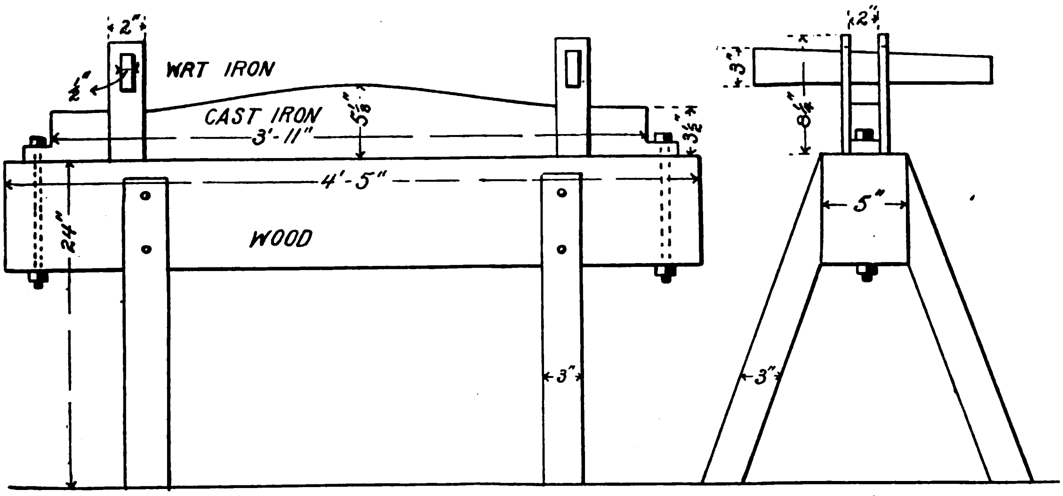
A Paying Side Line.—The recent item in "Queries, Answers, Notes" column by W. C. Powell has interested me very much. I will give my brother craftsmen my experience along the same line. Two years ago I started to carry a line of farm implements. I had saved about $200 and wanted it to make something more than a common 6% interest, so I started with the side line. I first built a lean-to on one side of my shop, 12 by 24, and stocked it as follows: One buggy, mower, rake, disc harrow and a few minor things. In three months I had to put another lean-to on the other side, and put in a wagon and other small implements for farmers, such as plows, etc. Last spring I built a corrugated iron building 25 by 40 and stocked it, but my sales increased so rapidly that in the fall I was compelled to extend it to 25 by 80. I find on going over last year's books that I have done about $9,000 worth of business, on which I received spot cash discounts amounting last year to $175. By allowing it to go until it became due, which would be from sixty days to six months, I would have lost, so brother tradesman, you will see the advantage of paying cash. The line of goods I now carry is wagons, ploughs, harrows, etc., nails, barb wire, smooth wire, forks, shovels, plough repairs for leading ploughs, or in fact anything I do not carry in stock I will procure for my customers in the shortest time possible. Among my sales for last year were 21 wagons, 16 buggies, 30 ploughs, 11 mowing machines, 9 rakes, 16 one-horse cultivators and this year I hope to increase my sales. This in addition to running shop with the help of one man. CHAS. STONEHOUSE.

Axle Tools.—The Gather of Axles.—The following, in reply to Mr. Blanchard and Mr. Foster in the February issue, may be of interest: I enclose draft, giving the exact dimensions of an axle form and gauge for axles, with 1$\frac{3}{8}$-inch drop, and 4 ft. 8-inch track. The sizes of axles shaped over this form vary from $\frac{15}{16}$ inch to 1$\frac{1}{4}$ inches. Of course a man can construct a form to suit his own work, according to shape and size of axles he wishes to use it for. The gauge is a very simple arrangement, made out of a piece of $\frac{7}{8}$ by $\frac{1}{4}$-inch tire steel, and it is not particular whether it be made like draft or not. Some smiths use gauges with the hook on one end only, and a mark for length on the other.

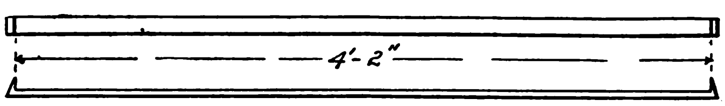
In regard to the smith, who says he differed with me on setting axles so as to give no gather to the wheels, I'll say that I will send an answer to this soon. This is a question on which I am aware that smiths differ considerably, and it will need considerable explanation on some illustrations. In the meantime, and if it would be satisfactory to THE AMERICAN BLACKSMITH and the gentleman referred to, I would like to arrange for a debate with the brother smith on this subject, on the condition that we both write out our views, to be published in the same issue, so that one won't have the advantage of having read the other's position before he writes.

NELS PETERSON.

[NOTE.—A discussion of points at issue like this is always an excellent way of bringing out the best methods and getting down its correct principles. A practical discussion of any statements made in these columns will always be welcome.—*Ed.*]



FORM FOR SHAPING AXLES.



AXLE GAUGE.

Removing Paint.—I would like to know the best way to remove paint from an old vehicle. I have a great deal of this work to do and find the use of pumice stone too slow. Will some brother smith tell me a quicker method? J. V. CAFFAREL.

In Reply.—"The best process of taking off old paint from an old vehicle" is to burn the paint off. I say "best" advisedly, because while even quicker methods are advertised, the burning off, if skilfully performed, leaves the wood in a perfectly sound and normal condition to again paint over. There are a score or more paint and varnish removers on the market recommended to act upon the paint so powerfully that it is only necessary, after applying the remover, to wash it off with a sponge and water.

These removers are composed of very active and penetrating ingredients and their action upon the wood is not always negative, and not infrequently quite the reverse, in which case, of course, the paint structure built over the wood so deleteriously acted upon cannot be guaranteed to long hold in place. Burning the paint from the wood is a quick, effective and trustworthy method of cleaning and preparing the old surface for repainting. Hold the flame on the paint just long enough to soften it up and then with a broad blade putty knife, held at an angle of 45 degrees, lift the softened pigment from the wood. For burning off paint in a small shop use a first class brasier lamp or torch, costing about $5. It should carry an 18-gauge seamless brass tank of 1 quart capacity. Have it made with a heavy burner and constructed on the patented coil system to retain heat to the maximum limit. It should be adjusted to work in any wind perfectly, and to produce heat to about 2,000° F. The lamp weighing 4$\frac{1}{2}$ lbs. and burning 74° gasoline will probably meet our correspondents' requirements fully. Such a lamp, or information concerning all kinds of gasoline lamps, may be obtained from the Turner Brass Works, No. 63 N. Franklin St., Chicago, Ill., whose advertisement appears in the AMERICAN BLACKSMITH. M. C. HILLICK.

A Large Engine Casting.—The base of the largest gas engine of its kind ever manufactured was recently cast at the foundry of the Weber Gas Engine Company in Kansas City. Eight tons of molten iron were necessary to fill the mold.

The engine is a vertical two-cylinder one, having a capacity of 150 horse-power. The fly wheel is 72 inches in diameter. Most gasoline engines range from two and one-half to twenty-five horse-power. This engine is being built for the World's Fair, and the company has received orders for several large ones in addition.

The engine cast will occupy a space of thirty by fifty feet at St. Louis. It will be equipped with a gas producer, also a Weber patent, on its right side, and on its left side will be placed a generator. With charcoal as the only fuel used, gas will be produced, fed to the engine and with the power produced, electricity will be generated. The engine itself will occupy a space only six by ten feet and stand about twelve feet high. It will weigh sixteen tons.

In making a casting many preliminary steps are necessary. Workmen had been busy for a week preparing the mold for the big base cast.

First, a large pit was dug in the sandy loam which comprises the only floor of the foundry. The bottom of this pit was covered for a foot with a lining of coke. The pattern or model was placed in the pit and pipes laid to the surface from all four sides, to be used as an outlet for the escaping gases. The entire was then covered with a mixture of loam and sand. The coke underneath was ignited and the loam and sand on all sides of the model was baked hard. This baking process continued for several days. On three sides, cup-like apertures remained, into which was poured at the proper time the molten metal.

To hold the molten metal for the big casting three large ladles were used. Each had a capacity of from three to five tons. They were swung on cranes or derricks. As fast as a ladle was filled it was hoisted and carried by the crane to a position in front of the cup-like apertures of the impression where the casting was to be made. When all three had been placed in position, the metal was poured into the three ladle apertures, simultaneously.

As the three streams of molted iron

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poured out, the escaping gas ignited, the woodwork caught fire, the entire top of the molding was aflame and the entire foundry was enveloped with steam. The foreman cried "Enough," and the ladles were tipped back, the fires were put out and men with long iron pokers forced the now cooling iron into every portion of the impression.

A Few Words on Organization.—I would like to write a few lines regarding blacksmith organizations. It is a question which I have both studied and consulted my brother craftsmen on. There is one thing which I would like to see the blacksmiths and wagonmakers in every State do, and that is to have their own wholesale

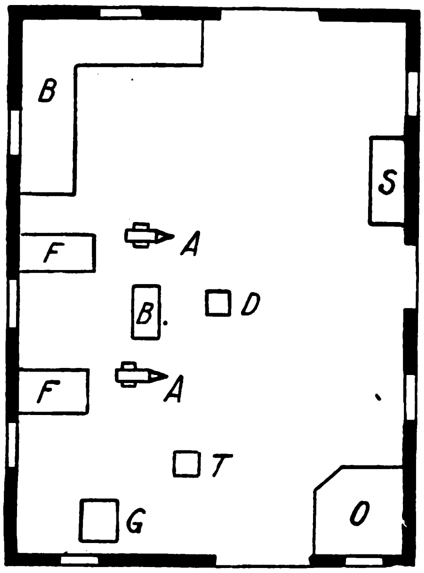

Fig. 1. LAYOUT OF A TWO-FIRE SHOP.

house in some large city or cities and form a regular corporation and each smith have a share or more. This would give them a foundation to start with. There are farmer stores and elevators which are the best paying investment in the land today. In a great many parts of the country blacksmiths have united to increase and protect prices, but in every case, as I believe, we have not commenced at the business end. I trust that the blacksmith, horseshoer, and wagonmakers' associations will take this up and organize a stock company and control our own wholesale houses. Brother blacksmiths, give this a thought. It seems to be a big proposition, but it could be done easily. It is like building a wheel. We must have the hub to commence with, for it is the foundation. At the end of the spokes is where the trouble is found. When it gets old it is there that it commences to fall to pieces. J. H. Butler.

How One Young Smith Made a Start.—Being interested in the blacksmithing and thinking over how I started, I imagined it would be of interest to some beginner to write an article on how I got ahead. I was born in 1883 and commenced work when not quite thirteen years of age. I first became interested in blacksmithing when very small. I used to go to town with my father, and if I could get a chance, would go and watch the men work at the smith shop and would think, that is what I want to do when I am a man. When I was about twelve years old my father had a room in which he did small tinkering jobs for himself. He used an old stove to heat his iron, and had an old flat iron settled into a block to hammer and cut out anything on. My father once told me to make a blade for a broken penknife. I cut out a blade from an old saw and filed it down, and finally it so happened that I got a temper that would carry a good edge. My father, seeing that I wanted to learn, purchased an old bellows that had been thrown away by the user as being no good. We patched and set it up in an old farm house. For my anvil I had an old piece of cast iron out of an old mill. Lucky for me, I welded the first piece of iron. I have the piece today.

Now I began to do my father's work, such as mending chains, single-trees, etc. Then some of the neighbors gave me work to do. My aim was to do it as strongly and neatly as possible, but it was quite a job for me, as I had never worked a day under another smith in my life. After I had worked awhile, I built a new shop 14 by 14 feet, and also made myself a new bellows. Later I built on to this shop and then began to work for the farmers and oystermen. When I was fifteen, I could make a pair of oyster tongs that would pass with the best of oystermen. In the oyster season I would make as high as fifteen dollars a week, this surprising the people. I began to get more work all the time and to hire help in busy seasons. When I was eighteen my father gave me full control of my shop and the following year I had to hire a second helper. In 1902 I built a new shop 25 by 40 feet and two stories high, taking the old shop to store material. From the beginning, whenever I could, I would add new tools and now I have a steel blower and one bellows, but intend to buy another blower as it will pay for itself. I have a Champion tire shrinker, and a set of wood working tools. I have no engine, but I intend to put one in soon

Fig. 1 shows the plan of my shop. My work in the winter is principally horseshoeing; in spring, plow work and new wagons, carts, etc. In summer I do general repairing and painting carriages, and in the fall, repairing, and making oyster and claming tongs. There is some horseshoeing all of the year, but most of it in the winter.

But how had I learned to do all kinds of work, such as building new wagons, horseshoeing, carriage painting and tempering steel? I learned it by the use of books and The American Blacksmith. For example, when I began to repair and build wagons and carts, I did not know any rule for setting axles, but it happened about that time that I got a copy of The American Blacksmith, and sure enough, there was a rule in it to set axles. I have been setting axles by that rule ever since. When I began horseshoeing I knew how to rest the foot and nail the shoe on, but it troubled me to know how I was to shoe the interfering and forging horse, the contracted hoof and the stumbler. When I got acquainted with The American Blacksmith I found out how to do it. With a little practice I could do good shoeing and give satisfaction. When I started to paint carriages, the first one showed it was no easy matter, so I began to read the articles of Mr. M. C. Hillick, and also asked several questions on painting, which were answered through The American Blacksmith. I really think that contributors of The American Blacksmith are the best authorities, for they seem to commence at the root and go up to the top of the tree, not skimming, but telling the cause and then the cure of what they write on.

Perhaps a few words about the business will not be amiss. First I will say, find out all you can about your customers and also the ones that may be your customers. Otherwise when a new customer asks you to extend one credit to him, you may be the loser or if you refuse him you may lose a good customer. Hence, I think it best to know before he comes. Should you extend him credit, try and find out in a sly way how long he wants credit for. I go at him in this manner: "I am glad to extend credit to you and thank you for your work. Can you make it convenient to pay this the first of next month, as I shall have a special use for the money at that time?" Aim to get a promise of when he intends to pay the debt and mark it down on your book. Should he want a new wagon on time, I talk like this: "I would be glad to give you time on the wagon if I could, but owing to the low price and the use I have for the money at this time I shall have to ask for the cash. Now if you could give me a note so I could get the money on it, then I can fix you up." If I wish to refuse him entirely, I talk to him as politely as I can and say something like this. "I would like to give you the time on your work, but my expenses are so great and I work so cheap, that I will have to ask you for the cash, as you see that I have to pay my workmen cash and pay cash for my material." Do not offend him and he will come the next time and bring the cash, whereas if you offend him he will go somewhere else and run down your work, no matter how good it may be.

As an aid to keeping your business straight I find that cards like Fig. 2 will prove good where you have several workmen. When you give a workman a job, let him take the time when he commences and when he stops; also the material. The figure shows one of the cards filled out. When he completes the job let him hand the card in. From it you can figure what the job costs, whereas if you do not know the time you may charge too much or not enough. At the end of the week take all the cards and figure up what you have made that week, what material you have

Jan. 25, '04.

Name......*James Morgan*..............................

Article....... *Wagon* ....

Started .... *9 o'clock*........ Stopped....*11:30*..........

Material........*5 Spokes 1½*...... *1 New Shaft*......

......*2 New Bolts ⅜x2½*........*7 Bolts 2x¼*......

By................. *Irving Hayley* ....

Paid?....*No*..........

Fig. 2. CARD FOR KEEPING TRACK OF WORK.

used and what workman has earned the most for you. The cards are also a record of which jobs are paid, and from them you can give your customer an itemized statement of account. They like it this way, for when a bill runs up fast and you just give the whole amount, your customer may think that there is a mistake in it.

I hope that what I have written may be of some use to the craft. For myself I have just begun to learn and I think it good to get ideas from others. C. D Briddell.

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THE AMERICAN BLACKSMITH

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Seekers After Information.

If there is any question about blacksmithing, horseshoeing or wagon work that you wish to ask, any problem that is bothering you, do not hesitate to see if THE AMERICAN BLACKSMITH can help you. It is our aim to aid the craft in general and our readers in particular, in every way that we can; hence we wish them to feel free to call upon us at all times. If it should so happen that the question cannot be answered from our own practical experience, we will probably be able to get an opinion from some craftsman whose work has been along the line in question. At any rate, there is everything to gain and nothing to lose by sending your questions to THE AMERICAN BLACKSMITH.

The Prize Article Contest on Gas or Gasoline Engines.

Regarding the recent prizes offered for the best articles on the advantages of gas engines for blacksmiths, one of our readers has asked if gasoline engines were included. Inasmuch as the large proportion of such engines in small shops use gasoline, they are of course meant to be included in the topic. The term "gas engine" was used as referring to the whole class of explosive engines as distinguished from steam engines.

So much interest has been shown in the subject that the date of closing the contest has been extended to May 5th. One first prize of ten dollars, two second prizes of five dollars, and three third prizes of yearly subscriptions to THE AMERICAN BLACKSMITH will be awarded to the six best articles on the advantages of gas or gasoline engines for smith shops. The articles should not be more than about 1000 words in length. Those of our readers who desire to write an article in this contest still have time, therefore, in which to send it.

New Shop Tools.

No manufacturing business is ever very successful that does not keep its tools and equipment up to date. The reason for this is a matter of competition. The shop which has tools to do a given job quicker or cheaper than another, can afford to sell their goods cheaper and thus command the trade. One maker succeeds where another fails, or even one country prospers where another is poor, because progressive manufacturers are continually keeping their shops up to date. In large shops, a fund is constantly set aside to take care of depreciation of equipment and to provide new tools, not when the latter are worn out, but when an improved tool can be had.

So also in smaller shops. Blacksmiths and wagon makers should always figure on devoting a portion of their earnings toward improving their means of turning out work rapidly and at the least cost of production. There is no doubt about its paying. We do not advise the purchase of every new tool as soon as it comes out. Rather should the smith investigate. Let him write to the manufacturer for a catalogue and particulars about any tool that seems to offer an improvement on his shop method, or let him ask to see it at his dealers. If satisfied that the implement can do some of his work better, quicker or more cheaply, he can rest assured that it will pay him to buy.

The Railroad Master Blacksmiths' Convention.

On behalf of his Association, President George Lindsay, of the National Railroad Master Blacksmiths, is extending to all members and master blacksmiths a most cordial invitation to attend the next annual meeting of the Association, which will be held in the city of Indianapolis, Ind., August 16, 17 and 18, 1904. This meeting will be of exceptional interest, as a number of prominent railroad officials are expected to be present. The committees who have in charge the various subjects to be brought before this meeting are making every effort to ensure thorough and exhaustive reports on the subjects assigned them. A profitable time is promised all who will attend.

The Blacksmith Apprentice.

Following the inevitable law of supply and demand, the price paid for the services of competent blacksmiths will undoubtedly increase during the next decade. As nearly as can be judged from an extensive correspondence with the craft in various sections, there seems to be a great and growing scarcity of apprentices, which means a future scarcity of smiths, and hence an increase in the price which must be paid to obtain their services. We are far from bewailing this fact in itself, for there are few blacksmiths today whose labor brings them as great a return as it should, comparing them with other mechanics and artisans in other crafts requiring equal skill and effort. We do regret the tendency, however, of young men who are choosing a trade, to look down upon blacksmithing as something beneath them. Let him who is afraid to soil his hands, remember that the grime of any honest toil is a badge of manliness in itself; let him who thinks blacksmithing a grade beneath him bear in mind that the smith is the leading man in many communities: let him who

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believes that once a blacksmith he can never amount to much, recall that from the forge workers' ranks have come some of our foremost thinkers—it is the man and not the trade that counts.

We had not intended to "sermonize," but the topic is important. Every blacksmith takes a pride in his craft, a craft which has existed from the earliest times, and upon which a host of other trades depend. But it is not enough for a smith to take pride simply in his ancient craft. He should use his influence towards its betterment, and in no way can he do it a greater service than by having an eye open as to its future. Strive to convince "likely" young fellows of the opening which blacksmithing offers for good men; induce them to take it up for their livelihood, and encourage them in an endeavor to become good smiths.

A Handsome Ornamental Iron Grille.

The photograph shown herewith is that of an ornamental grille recently made by the Ornamental Iron Works, of Washington, D. C., for the new residence of Mr. James Green, one of Washington's millionaires, on Massachusetts Avenue, between 17th and 18th streets. The grille is eighteen inches wide, seven feet high, and is entirely hand wrought iron work.

It is a splendid specimen of work of this nature well worth reproducing.

Talks to the Jobbing Shop Painter.—13.

The Utility of Varnish Colors.—Yellow Color-and-Varnish.—The Blues.—The Greens.—The Lakes.—The Browns. —Miscellaneous Colors.—Peculiarities and Methods of Handling.

M. C. HILLICK.

In writing these talks from month to month to the jobbing shop painters, a multitude of whom are readers of The American Blacksmith, the difficulty is not in a scarcity of material, but in deciding what is of the most vital concern to the painter—what is essentially a part of his every-day experience, and upon which he must act promptly. Just at the present time, no doubt, he is deep in all the intricate and amazing mysteries of color combinations, color effects and the best methods of handling colors, etc. It is in order, therefore, and quite appropriate to the season, to turn to the utility of varnish colors.

In city shops, and, indeed, in all up-to-date shops, the advantage of using varnish color, where it can be used, in preference to flat color, is clearly recognized and conceded. A color mixed to dry "flat" or "dead"—interchangeable terms in use among a majority of painters—offers a maximum density or opaqueness, whereas the color and varnish—or glazing coats, which virtually

HANDSOME ORNAMENTAL GRILLE OF WROUGHT IRON.

represent color and varnish—offer a minimum density or opaqueness.

When the "flat" or "dead" color coat is varnished, the lustre or brilliancy is upon the surface, but when the color-and-varnish, or the glaze coat is varnished the lustre and brilliancy has a depth and body to it, which arouses admiration. In other words, the varnish-color coat has a depth of lustre and a sharp clearness or brilliancy down into which the observer may look as one would look into a well to find his countenance mirrored on the face of the water. As an experienced carriage painter puts it: You look into the flat color coat as you would look into a stone wall, and into the color-and-varnish coat—the real Simon pure color-and-varnish—as you would look into the mirror. The color-and-varnish has a power for reflection which the flat color does not possess.

Yellow Color-and-Varnish.

Perhaps no color is so susceptible to the effects of varnish, when the varnish is thoroughly united with it, as the big and beauteous family of yellows. Take, for example, Primrose yellow, Fashion's favorite, and originally English. To obtain the smart effect which has given this color an international reputation, bring the foundation up from a pure white priming coat, gradually deepening the surfacing coats until the real Primrose is reached. Then use enough of the color to stoutly stain the varnish in which it is used, and apply the mixture with a bristle or badger hair varnish brush, flowing the color-and-varnish on freely in order to give it a richness of body it will not possess when applied in a thin, brushy film. Such a Primrose yellow will show a measure of brilliancy, a beauty of color tone, which a life-time of the flat color could not equal, or, in fact, approach. The same is true of sulphur yellow, canary yellow, straw color, lemon chrome yellow, cream color —in short, true of all the yellow from the least to the greatest.

The Reds.

Carmine, the queen of the reds, could not long maintain the blush of beauty that has made it famous throughout the world if it were used otherwise than as a color-and-varnish over a ground color almost as rich and fine as itself. In the same category we might mention French red, Manhattan red, Crimson, Maroon, Cherry, Carnation, Claret, Coach painters' 20th Century, and a great company of other dashing reds all depending for their most engaging display of charm upon their use as glazing colors, or as color-and-varnish. Make the foundations fine and dense as to color, free from all defects, and then when the shade of the color that is to be has been duplicated as closely as a flat color will duplicate it, mix just enough of the red in varnish to stain the

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varnish and enrich the ground color, and apply as freely as one would apply the clear varnish.

The Blues.

A dainty and delicate family of pigments are the blues, chief among which, for carriage painting purposes, is the lovely ultramarine blue, furnished in three shades and pretty enough to win a King's ransom. For this color make the ground of flat black. Float the blue in elastic rubbing varnish, using sufficient pigment to furnish a rich blue without dulling the brilliancy of the varnish. If necessary, in order to get the desired density of color without detracting from its brilliancy, apply two coats of the ultramarine glazing, flatting the first coat out with a moist sponge dipped into a little pumice stone flour. Prussian blue, declared by many to be the belle of the blue family, and certainly a magnificent blue when used upon some surface, is seen at its best when used as a color-and-varnish over a ground brought up to approximate it in tone and color. Perhaps the most elegant blue extant is obtained by glazing ultramarine blue over a ground of deep green.

The Greens.

The big and splendid family of greens comprise such favorites as Brewster—a name to conjure with!—Quaker, Bronze, Olive, Merrimac, Newark, Murphy, Milori, Coach painters' green, and many others, most of which are enriched and beautified under the magic flow of varnish, when mixed and applied with it as glaze colors.

The greens, on the whole, require very perfect grounds; and most greens cannot be cross-brushed at the end of the panel without showing a different shade of the same color. This is a marked peculiarity of nearly all greens, and enforces the importance of handling the colors with due regard to this characteristic.

The Lakes.

The lakes are largely used as running parts colors, and comprise such famous colors as Chatemuc, Munich, Carriage part and Carmine lake, and Carmine—also technically a lake, and the loveliest one of the lot—together with English purple, and yellow lake, and American and English crimson lake, all of which are, or should be, used as varnish colors or glazing colors.

The ground colors for all these lakes, and they are a very delicate and sensitive aggregation, and very beautiful withal, should be brought up absolutely without spot or blemish, and to a close match with the particular lake to be used. The lakes are very transparent, and deficient in coloring or covering power, hence the indispensable need of perfecting a ground without flaw, and very close to the shade of the lake. In fact, the true mission of the lake is to simply enrich the ground color upon which it is placed.

In attempting to make the lake cover defects in the ground color, the painter fails in securing what the manufacturer intended it to furnish. When the attempt is made to overcome the transparent property by using the lake heavier in body than is natural to it, the usual brilliancy of the lake is clouded and permanently blurred, and the desired covering power is not secured. It is an utter impossibility to render a strictly transparent color opaque by thickening the consistency of it in the mixing pot. Desirable surface conditions and depth and strength of lustre are alike sacrificed in the trial.

The Browns.

Van Dyke, Pale Amber, Hazel, Portland Amber, Olive, Bismark, Orange, Coffee, Indian and Amber brown are on running parts, most advantageously used as color-and-varnish coats. In all respects they are superior to the same colors used to dry flat. They have richness and finish which the flat coats do not have.

Miscellaneous Colors.

The blacks are used both upon bodies and running parts as color-and-varnish pigments. Black color-and-varnish, in fact is the popular coating-up pigment where black surfaces of fine lustre and texture are sought for. Indeed, if the black color-and-varnish were not used and the black were brought up in flat color, followed with clear varnish coats, the color when finished would be decidedly green rather than purely black. Black color and varnish should be furnished with a ground free from defects and should be used to give the ground a rich, deep, dense, and intense black color. And so we might continue with the maroon—a color popular in all the country just now as a panel and carriage part color—with London smoke with Bergundy, with Wine color, Copper color, Vienna brown, Chocolate, Cobalt blue, English vermilion, and a vast array of other colors finding use in the carriage paint shop. As varnish colors or glazing colors, they materially help the painter to win success in his business, but as flat or dead coat colors, they handicap him to a disastrous extent.

The Setting of Tires.

Prize Article.

R. O'HEARN.

Place wheel, back up, on anvil, and mark between joint bolt holes with center punch. Don't use file. Mark right wheels with two dots and the left with one. When wheels are done and ready to be put back on job the dots will tell which are right and left, and no time need be lost, nor mistake made in getting them back on their own spindles. Throw away all old tire bolts. There is enough time wasted with one old bolt to pay for a dozen new ones. The bolts out, stand wheel on floor and drive it through by striking back of rim carefully and over the spoke, confining blows to about four spokes, none of said spokes being next to joint of rims. We find a bad spoke. It must come out. How? Place wheel, face up, on wheel bench, screw down, knock off rim, being careful not to break any tenons. Take firm hold of end of spoke and bear down with left hand—if right-handed—and strike face of spoke sharply with hand-hammer. Then take hold of spoke with both hands and work it up and down and out it comes. Glue spoke before putting in hub. Be sure to have tenon short enough not to reach box. Saw off tenon and put back rim. Did you mark face of rim before removing it? No? Well, you should do so when there is no stripe to distinguish face from back. A pencil or chalk mark will do.

Wedge all spokes slightly where they don't need much, but where we have loose tire, all the spokes will need some tightening, some more than others. Don't make your wedges. If you do your work well, you will be kept so busy you won't have time to make wedges when you can buy them for 45 to 55 cents a thousand. Your wheel wedged and joint properly sawed out or filled up, as the case may be, trim off the end of spokes with a gauge chisel. You will thus allow the tire to rest on the rim instead of the spoke end. This done, take an old file in both hands and draw-file the rust and grit off. Your wheel is then ready for the traveler.

Let us see; this is a No. 1 flange, Sarven patent wheel, and gone back slightly. Well, with a full $\frac{1}{4}$-inch steel tire the wheel can be brought to a $\frac{1}{2}$-inch dish with $\frac{1}{8}$-inch open joint and full $\frac{1}{8}$-inch draw, with one spot of heat in tire. Shrink tire in space near joint bolt holes

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opposite joint marked with center punch. If the tire needs a $\frac{1}{4}$ inch give it $\frac{1}{8}$ inch at each side of joint holes; this will take a little longer but will be better work than if shrunk all on one side. If as much as $\frac{1}{4}$ is not needed shrink all in one place.

Place tire on the marked joint holes, putting a burning iron or old $\frac{3}{16}$ inch bit in one of the holes to hold the tire in its proper place until cooled.

Never get a buggy tire so hot that water will be required to keep it from burning the wheel.

A Sarven wheel that has been dished too much may be remedied to some extent by the following methods: Remove tire, and put wheel in press, which will open the joints, into which insert leather sufficient to make up for the amount of rim, which had been sawed out too much. Run and fit tire for scant straw draw, and put on tire. While it is cooling, place wheel on anvil, face up. For extension flange place a piece of $\frac{1}{2}$ inch iron, 2½x2½ or 3x3, on point. A heavy blow with a 10 or 12-pound sledge will have the effect of setting the flange against the spokes. Then tighten rivets well, and the dish will, to a great extent, be taken out and the wheel be none the worse for its previous over-dishing. For the short flange set the flange down with fuller and set-hammer and tighten rivets.

The wheel being bolted off, be sure to have the felloe plates neatly set up to the rim. This is something which some will overlook if the blacksmith doesn't oversee the work.

Wipe off spindles and oil up before putting on wheels. That without extra charge. For washers on axles charge as usual. Try with your S-wrench the cap nuts on pops and goose neck. If you can tighten up without washers do so without charge. Tighten single tree bolt free of charge if it can be done without trouble. All such little attention will clinch your customer as a regular patron. These little things might as well be done while he is getting ready to drive away. Call his attention to anti-rattlers, a new whip socket, a bent back lazy back, worn shaft eyes or bolts, bad back-stop, a storm apron, new spring cushion, and a dozen other things which he probably would not notice until another member of the craft —if you don't—will call them to his notice.

Don't let any man get away from your shop with loose shaft tips. As I said before, do all the little extra stunts, the ones you are not going to charge for, while your customer is looking on.

Here's something like an epigram. A dished wheel is never rim-bound. I have seen some smiths, however, saw into the point of a wheel that already had an inch dish.

Better remove flange rivet before trying to remove defective spoke. This is the best and safest way and will not cause any trouble in the end.

If the foregoing remarks are closely followed, I know the smith will have no trouble in setting tires.

Tyandiramba, an Old Smith of Zululand, South Africa.

Through the courtsey of J. H. Williams & Co., of Brooklyn, N. Y., we are able to present our readers with an interesting picture of an old native South African blacksmith, as he plys his craft in the heart of Sululand wilds. The letter accompanying the photograph is written from Mt. Silinda, Rhodesia, South Africa, under date of Jan. 4, 1904, and we reproduce it in the words of Hr. C. C. Fuller, correspondent of the J. H. Williams Co.

TYANDIRAMBA, AN OLD NATIVE SOUTH AFRICAN BLACKSMITH AND HIS HELPER.

"Herewith I hand you two pictures of "Tyandiramba," the old smith who was head armorer for the great Zulu prince, "Gungunyana," before the Portuguese war, in which the chief was captured by treachery and his people subdued. Tyandiramba (Chanderamba is about the way it is pronounced), is not a Zulu or even a "Shangan," but he was elevated to a position of dignity by Gungunyana, in spite of his "Mandow" blood, and was given the right to wear the Zulu badge of honor—the "ring" on his head. I am sorry to say the old man took off his ring only a few weeks before I got down to take the pictures.

You may be interested in hearing something of my experiences in securing the pictures. Leaving here after dinner, December 18th, I rode my wheel and walked ten miles south to the store of Mr. John Ballantyne, a Scotch trader from whom we buy a considerable part of our supplies. This is the end of any road to the south other than the narrow native paths. I had intended to try to get the pictures that day, but Mr. Ballantyne suggested that he would send a boy over to tell the old man of my coming and to ask him to have everything in shape for the next morning. That night I spent at Mr. Ballantyne's, and I wish you could have listened to the yarns he told of life in Africa, for he has been here twenty-three years, and has seen about all there is to see. He is one of the best Kaffir traders in Africa, and we esteem him highly.

As soon as the dew was off the high grass a little the next morning, I started with my boy and one of Mr. Ballantyne's boys for a guide. It was a beautiful morning, and a pleasant walk across a fine valley, then up a high range of hills and down into another large valley.

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Nearly all of the way we walked through native gardens, and ran into one big "beer drink," where scores of men and women had gathered to drink "utshwala" and dig into the garden of the host. Mr. Ballantyne had said it should be about 2½ or 3 miles, but, said he, "the path is pretty wobbly," and so I found it. After an hour's hard walking, we met a man who told us we were on the wrong path, as the smith had moved, so we turned back and finally found his new kraal. It was with disappointment that I first saw the little grass-thatched shed which served as his shop, nor was the old man present. But we soon found him and he had his bellow (the two skins which the boy operates in the picture) and other tools brought down and put in place. By a little study you will understand it all; the two skins which, working alternately, force a steady current of air through the wooden tuyeres into the clay forge. You will notice that the anvil is a large stone, but instead of using a stone for a hammer, as some natives still do in the far interior, you see he has three iron hammers. He uses English, Portuguese and native, "Amakalanga" iron and some steel. His work is very good, as you can judge somewhat by the fine spear and battle-axe which he has finished. He does both wood and iron work, and is working on another spear. The spear shown in the picture is one of the finest I have seen. He had made it for someone and would not sell it to me, but promised to make me one just like it for two shillings, 50 cents, and only asked 75 cents for the battle-axe. Returning to Mr. Ballantyne's for dinner, we came home that afternoon well pleased with the trip.

I am very sorry the pictures are not better, but you have no idea how hard it is to get fine ones here. In the first place it takes so long to get plates and paper out from the United States or England. Then owing to the damp climate it is almost impossible to keep them or chemicals. When I came to develop the negatives I found that the plates had begun to spoil, but if I had fresh paper, it would be possible to get some fair prints. In order to get better light, I had the sides and part of the top of the hut taken away, but you can see that it interfered with the pictures.

You may be glad to know that in June we brought the engine and one wagon safely into Mt. Silinda, that during the following months the saw mill and other machinery came in by big 14 and 16-ox teams from Umtali, and that after months of hard work we started the saw mill November 19th, just one year from the time we reached here. We have sawed considerable lumber, and have everything in good shape for the rainy season now beginning.

Tools for Axle Setting and Their Use.

Prize Article.

C. YOUNGSTROM.

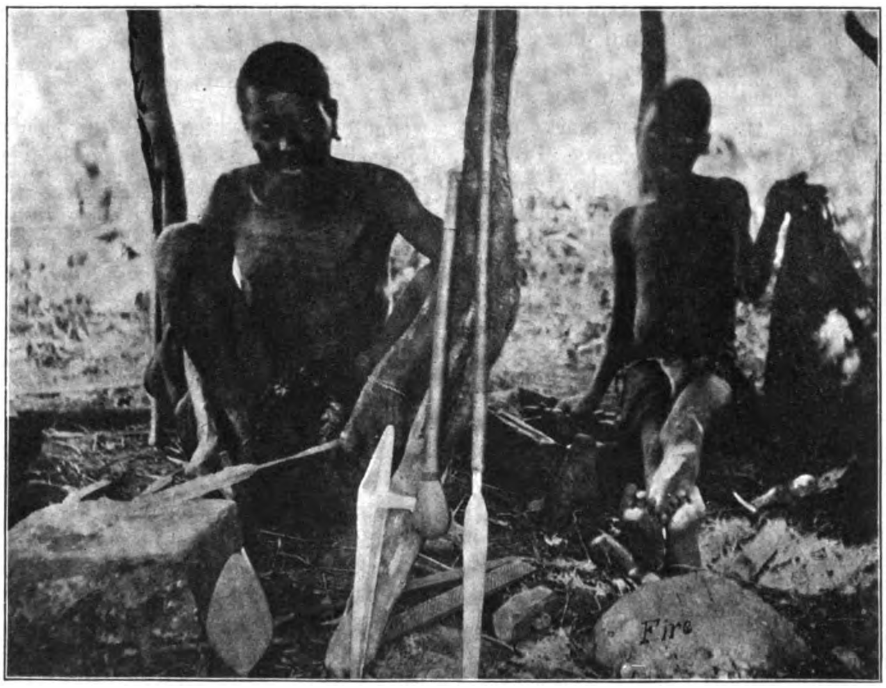
In all carriage building quality of materials is of first consideration, but it cannot be so in a general repair shop where materials are not selected. There comes the consideration first, how to bring the material into the best use.

The foundation for a carriage is the wheels and the axles, and to put them in proper relation to each other is what I will try to explain. Take an axle perfectly straight, put it in the wheel and the wheel will stand true to the centre line of axle, i. e. like a belt pulley to its shaft. Why do we try to disturb that harmony? The reason is this: The spindle of an axle is more or less tapered, so when the wheel revolves it works its way towards the end of spindle. The setting is done to counteract this. One way is to bring the ends of axle down. Another way is to send the ends of axle forward. For buggies and wagons with narrow tires, both ways are used, each in a less degree. In wide wagon tires only the forward setting can be used to advantage.

This in spite of what all "Plumb Spokers" say on the subject. The amount of setting is often overdone, and a little too much is better than a little too little. The happy medium is reached when the wheel keeps up to the collar without friction. I am not prepared to tell where this happy medium is located for it depends on the road, the load and the tapering of the spindle. I will leave to each smith to settle the amount to his own satisfaction, but will show the way to get just that amount of set without using any figures.

I will first give a description of a few tools which I use; they are simple and accurate. The first one, Fig. 1 A, is a testing bar to find out how the wheel stands to axle at the start. Take a rod of ¼ inch round or square iron 9½ feet long, and bend it in centre, staple-fashion, leaving loop big enough to take a ¼-inch bolt. Weld ends together, split open for ½ inch and bend stubs out 45° each. Take another piece of iron $\frac{3}{16}$ x ¾, and 8 inches long, punch one hole ⅜ inch in one end. Next make a little washer ¼ inch thick to go over ¼-inch bolt and inside ⅜-inch hole in the last iron. Leave it there, put in a ¼-inch bolt, put bolt through loop in the first iron, slip on ¼-inch common washer, screw it up and the tool is ready for use.

The next tool is a setting gauge, Fig. 1 B. It consists of a bar ¼x1 inch, 5 feet long, split open at one end about 4 inches and forked as in Fig. 1 B. Even the ends up, double them over and weld



TYANDIRAMBA AND HIS SMITHY, SHOWING FIRE, ANVIL, AND THE WAY HIS HELPER MAKES BLAST.

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to form nuts for ⅜-inch bolts. Make the bolts, one 2 inches, and one 2½ inches, flatten the heads to $\frac{1}{16}$x¾, and cut off square. Next cut off 4 pieces of iron $\frac{3}{16}$x¾x7 inches long and bend like as in Fig. 1 C. Bore two quarter-inch holes in two of them, put on the bar and mark holes in the other two. Bore holes, screw on. Cut threads on the two ⅜-inch bolts, as close to heads as possible. Tap out holes in end of bar, put in the bolts, square up the heads with a file and the gauge is ready. The idea of having the heads of the bolts flattened is this: In the process of setting, the centre of end of axle comes more and more from centre of gauge, and impairs its accuracy; but by the heads being flat its centre is, so to say, expanded to the width of the bolt head, and the gauge can be set to an accuracy to within $\frac{1}{32}$ of an inch.

Now to find out how the wheel stands at the start. Put axle in wheels. Turn axle back side up, fasten a little screw clamp on axle close to the collar at end not to be tested. (See Fig. 1 D). Take testing bar, Fig. 1 A, put forked end against clamp screw, and bring the other end up to where the bottom of wheel is to be. Loosen bolt and make joint close to inner edge of tire. Fasten screw. Bring short end to evenly touch the tire, make a mark across iron at inner edge of tire. Proceed in same manner at other side (top) and note difference. Now to complete the problem by figures already started let us say there is a difference of one inch the larger distance at top of axle. The difference desired, 1½ inch say, will have to be increased by ½ inch. Keep this figure in mind. Turn axle top side up, move clamp in position and find out the difference in front and hind, note difference, and if the longest distance is in front add it to ½ (the gather desired). If longest distance is at back, some of setting in the right direction is started and the difference is to be deducted from ½ inch. This operation done, the next is the setting of gauge. Next lay axle top side up on a board and if bent down in centre, back it up to hang free. Have a piece of straight iron two feet long bent up about ½ inch on one end. Place this bend under axle one inch inside of shoulder, (place where axle is to be bent). Block under the iron so the axle rests on it at bending place and at the end (see Fig. 2 A). Now measure off on iron bar half the diameter of wheel, at which place a post should be set. This post can be set beforehand and the axle put in the proper distance from posts (which invariably is half diameter of wheel from place of bending). The special job here on hand is to increase pitch ½ inch. Now bringing lower part of wheel in ½ inch throws upper part out ½ inch, thus giving the pitch wanted. On post B, Fig. 2, mark off ½ inch from under side of bar. Bring bar down to the mark and there will be an opening between end of axle and the bar. That opening is just the amount of set needed to bring the desired results. But how measure that opening accurately? I do it in this way: I take a slim tapered wedge and insert between axle and bar. Mark the wedge at end of axle. (See Fig. 2 B). To be sure I picked up an old broken wooden rule and made the

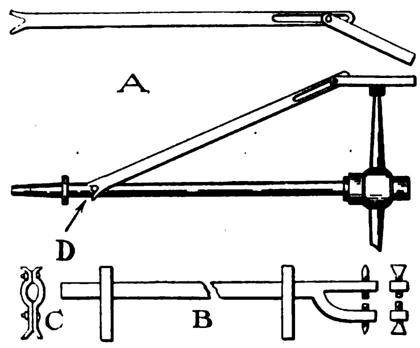

FIG. 1. TESTING BAR AND SETTING GAUGE USED IN AXLE SETTING.

wedge out of it, which gives me plenty of marks to go by. Turn the axle over bottom up and apply the gauge.

For convenience I made a plumb weight to hold the gauge for me—it explains itself. It hooks over back of gauge. The gauge secured, put the wedge where it is marked to be and adjust the screw as near as can be, and the gauge is set for bottom pitch.

To find out the front gather proceed same way as for the bottom. Put front side of axle down, and ascertain the amount. I use the long part of gauge post for bottom side and the short ones for front side. Remember that the amount to be set is only half that of the difference desired in the whole wheel. This with reference to the movement of bar at Fig. 2.

Now the gauge is set and now the only thing left is to set the axles to the gauge. There will not be any difference between the wheels, provided they have some dish and the boxes set true.

These operations apply only to first end of axle, and can be performed in quicker time than it takes to read this. When gauge is once properly set, mark the screws so they can be turned back to place instantly, should they for any reason have to be moved, or in case somebody else should happen to tamper with them.

The tools here described are a blessing to the blacksmith and any smith can make all of them in three hours' time for less than 50 cents. The gauge can also be used for setting an axle cold if the buggy be blocked up in such a way as to leave bottomside and one side free. If both ends of axle are sprung, simply set the gauge right and go to work. If one end of axle is considered fair, adjust the gauge to that end and bring the other end to the same gauge.

Pointers to the Repairman.

Prize Article.

G. A. BISHOFF.

This should be a great prize contest, as it covers a great field of industry, and has in its lines a class of mechanics of which the world can be proud of. For the benefit of those few, who know less than I do on the subject, I will give my methods of conducting business, and repairing buggies and carriages.

Let me say that I have worked in most of the states from the Atlantic to the Pacific, and from Canada to the Gulf. Coming to Gainesville, Texas, I opened a repair shop in an old building, 24 by 30 feet. It seemed to me that the world was cold and the future dark, but I went to work with a will, with a helper the first year or two. Little by little I enlarged, and today I have the largest carriage works in the city, building and all paid for. I employ on an average of 12 men. This is simply intended as a word of encouragement to those about to despair. If you have not succeeded, try some new method. When I opened for business in this city I did not always have work, but I never sat down, summer or winter. I always found something to do to keep the anvil ringing. Between jobs I would make tools until I had plenty, and then I would make odd size shaft clips, shaf[illegible]ns, lap rings and links, work over old axles and fit boxes to them, rebuild an old buggy or an old wagon to sell. One c[illegible]lways find something to do. Besid[illegible] a profit out of the work, you n[illegible] impression on your neighbo[illegible] the public, and they will natu[illegible] you must be all right for you [illegible] busy, and will not forget you[illegible] need of anything in your line. I w[illegible] not do any work without a fair pr[illegible], and under no circumstances would I do a poor piece of work. If I had underpriced a piece of work, I would never slight it, even though I lost. I guarantee all my work and make good all work that proves unsatisfactory, to any reasonable customer. I never do any extra work on a carriage without first getting the owner's permission. I was always afraid he might think I was hungry for a job, and thereby loose his confidence and perhaps his trade. I am always careful to finish all work neatly and then to paint it to correspond with the job so as to conceal any sign that it had been repaired. In this you are sure to please your customer, as everybody likes neat work well finished.

A few words about every-day repair work: I set all axles not bent in the center with an axle set, of which there are several makes. You can find one or more in any good tool catalogue, or if you prefer you can make one at a small expense. They are very simple, and easily made. They are usually sold for about $3.00. With it you can set an axle in about ten minutes without taking it from the buggy. You can't afford to be without one. When setting new axles I set hind axle first, making the wheels at the top three inches wider than at the bottom, and one-half inch wider at the back than at the front of wheels. This will insure a good running axle, one that will not crowd the nut or cut out the washers; on heavy work or low wheels I make the wheels only two inches wider at the top than at the bottom.

When I put one new shaft in an old buggy I am always careful to see that the new shaft has exactly the same bend at the heel, that both are the same length and are square from the crossbar to point of shaft, if you fail to true the shaft the buggy cannot run true will run to causing a dragging of the d cutting of axles.

as been said about welding It is just as easy as many gs, if you go about it the right upset the ends *well* before I f them, groove the scarf to keep them from slipping, and use lump borax to weld. Be very careful not to get the steel too hot, for if you do it is sure to break. After the spring is welded hammer it cold. This will give it all the temper it needs. When putting tires on new buggy wheels I give them one-eighth of an inch draw and always put the weld over a spoke, as there is less strain and it is less liable to break there than at any part of the wheel. In resetting tires on old wheels I give only $\frac{1}{16}$ inch draw, for the wheel will not stand as much draw as when new, and is more liable to dish. When resetting tires I am always careful to saw out the rim and upset the tire on the same side so as to avoid changing holes in rim, which is necessary for good work.

It was a good many years before I discovered an easy way of getting off a broken bow socket. I now use a No. 2 bolt cutter to cut the rivet between the two eyes at the bottom. To get the socket of the bow, split it with a sharp cold chisel and it will fall off. Try it and you will not dread this work any longer.

Seventy-five per cent. of buggy bodies become loose at the joints about the seat. A simple way to make a weak body strong when the joints have become loose and the bed sways from side to side, is to put in a one-piece brace from sill to seat, from seat to opposite sill. On heavy jobs put two bolts in seat frame.

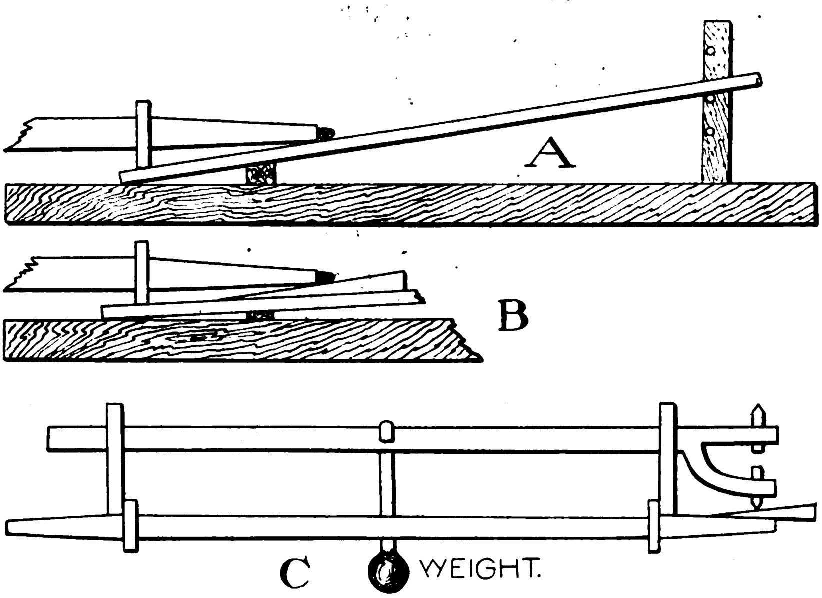

FIG. 2. GAUGE FOR SETTING AXLES AND METHOD OF USING.

Another difficult piece of work is to get the wrinkles out of a carriage fender that has been crushed so as to cause it to wrinkle. If left in this condition it is ruined forever as far as looks are concerned. To take the leather off is very expensive, as it must be sewed on again. I formerly took the leather off; now I only cut the stitches on the outside where the iron is bent, push the leather aside, pull the iron straight, or use a hammer if necessary.

Something else I learned by experience—when I have a bent bow socket to straighten I never strike it with a hammer, for if you do you are sure to dent it. Pull it straight with your hand. If you are not able to do this use two pieces of grooved wood and a screw clamp to straighten it.

When respoking any kind of wheel it is important to have the spokes opposite each other and parallel. If you are careful in this you will not be troubled with bent spokes. It is also important to see that the joints are true when putting on the rims or felloes; this will prevent them from creeping out from under the tire.

When repairing rubber tires it is important to examine the channels, for by the time the rubber tire needs repairing there is sure to be at least $\frac{1}{8}$ inch rust in the channel. This can best be cut out with a cold chisel, and by doing so you will not be troubled by having your tires come off or turn in the channel. When brazing the wires you can prevent burning paint off the rims by using a piece of asbestos under the wires.

In re-covering dashes or fenders much time and trouble can be saved by first sewing two sides and one end, and then putting in the frame. By this method you will prevent wrinkling, which is so much to be feared.

I make a good many cushions and I find by experience that it is much the cheapest to first make a frame of wool to fit the seat. You can then tack on the material and finish it without doing any sewing, thereby saving time and getting a cushion that will hold its shape.

In painting buggies I learned by experience that a varnish that dries quickly and with a hard surface is less liable to spot than a slow drying varnish, which is more delicate and therefore more liable to spot.

How I Made a Trip Hammer.

A. BRUTON.

I took two pieces of wood 8x8 inches and four feet long, put them down eight inches apart, and taking another piece 8x8 by three feet, bolted it between them at the back end for an

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upright. Next I put a piece 8x8 by one foot long between them at the front, and bolted it there as the base for the anvil stand, which I made out of a piece of iron $1\frac{1}{2}$ by $1\frac{1}{2}$ by $2\frac{1}{2}$ feet long. I welded a heavy plate on the bottom end of this and bolted it fast to the base. After boring a hole in the upper end, I squared it into a 1-inch hole. I made an anvil die of tool steel with shank to fit this hole in the stand, after which I drilled a small hole through the stand and shank and drove in an iron pin as a key to hold the die.

Next I made two straps of new wagon tire, bolted to back upright on each side with a $\frac{3}{4}$-inch hole through the ends for a bolt to fasten hammer arm to. This latter I bolted to a tee of the same material, turning the end of the cross tee to fit between the short pieces on the upright, fastening with a $\frac{3}{4}$-inch bolt. The arm I made from the large part of a buggy tongue, and hammer out of a sledge, swelling the eye about as large again. I cut off about one-half the large end and dressed up, using the pein for the face of hammer after dressing this up also to suit the work. I next braced it both ways solidly. I used an old crank shaft of an old mowing machine for my crank shaft and also the pitman rod for driving the hammer. I made a loop or strap out of wagon tire also to fit over the arm extending above and below about ten inches, and put in coil springs there to take off the solid blow from the arms and hammer and also to throw the hammer up as a support to the pitman. This pitman I screwed in the lower end of the loop under the arm and placed a clamp on each side of the loop on the arm, to hold springs and loop in place. By moving the clamp and loop backward and forward I can regulate the stroke.

Next I put a crankshaft in its old boxings about one-third way from back end of the base of hammer, and put a pulley wheel on outside end for belt to run in. The belt tightener, of course, can be fastened to the base or back upright to work with trip, which can be made of anything handy that will stand the pull on the belt tightener. I have mine fastened to a separate post which is right by the hammer, to which I have a countershaft fastened on account of my engine running opposite to the way I wanted to turn my hammer. I put in a short countershaft and then ran a loose belt from it to the hammer. For another thing, it gives a steadier belt by making it shorter, as six or eight feet of belting running loose from the line shaft to the hammer will flop, unless it is wide and heavy.

I have sharpened plows in twenty-two minutes on my hammer and welded $1\frac{1}{4}$-inch axle stubs, after taking first heat with hand hammer. It works fine and cost me about $30.00, all told. My springs are of $\frac{5}{16}$-inch rods (or wire) but $\frac{3}{8}$-inch would be better if not coiled too close for the hammer spring.

This trip hammer has been in almost constant use since it was made, and gives entire satisfaction, as it is a great labor saving device. I would advise all smiths who do work, where such a hammer could be used, to make one. The expense is small and the hammer will soon pay for itself.

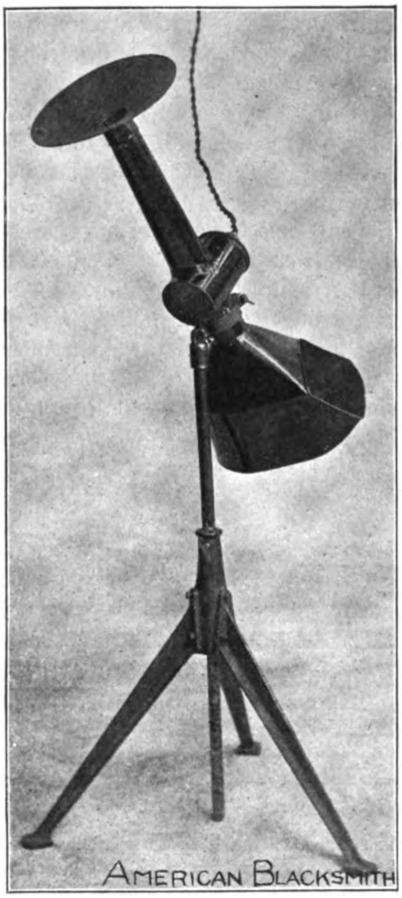

FIG. 1. ELECTRIC GAUGE FOR MEASURING HIGH TEMPERATURES.

A New Electric Gauge for Measuring High Temperature.

In our various industries, accurate means are provided for measuring the different properties of the various materials which enter into the construction of the vast outputs. Lengths are measured with the greatest accuracy by aid of delicate mycrometers, weights by scales of various degrees of delicacy, densities by hydrometers, and the composition of the various materials by chemical analysis, etc., but while the lower temperatures are read by the aid of the mercurial thermometer, in these industries, the higher temperatures seem to have been left to be guessed at, or measured by the observations of skilled operators. The operators estimate these temperatures by the color or degree of incandescence of the materials which are being heated. There are various pyrometers on the market for measuring these temperatures, still in the general case, the old method seems to be resorted to. The reason for this lies probably in the fact that the pyrometers which have been available have lacked either in adaptability to the work, or inconstant reliability as to their indications.

It is well known that the value of the finished product depends in a large measure upon the accuracy with which the heat treatments have been conducted. The cost of machining tools, as well as the quality of the finished tools, depends in a large measure upon the temperature at which the steel has been annealed, and the keenness which can be given to the edge of tools and also the length of time the tool can retain its sharpness, depend altogether upon the temperature at which it is hardened and tempered.

In many steels the range of temperature at which they can be successfully hardened is very small, but in no steel can the best results be attained in a variation exceeding 50° Fahr., whereas, in most steels the variation of one fourth this amount would prove injurious. Observations have shown that the better grade of steel, or the steels which are capable of producing the best tools, are those which can be hardened successfully only within narrow limits of temperatures.

On account of the interest and importance of the correct measurement of temperatures, each new pyrometer that comes out is of interest to the public just in proportion to its possibilities in filling the requirements. Just now the Morse Thermo-Gauge Co. of Trumansburg, N. Y., are bringing out a Thermo-Gauge which will be of considerable interest to the trade. This Thermo-Gauge is based on the comparison of color or degree of incandescence, and is covered by seven United States patents, issued in 1902 and 1903.

While these patents cover a multitude of forms, the Gauge which is generally used is illustrated in Figure 1. In further explanation of the construction of the Gauge, we would add that inside the lamp tube illustrated, is

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provided an incandescent lamp with a large filament in the form of a conical coil. This filament is heated to the different degrees of incandescence corresponding to the different temperatures by an electric current taken from a storage battery. In the circuit of the lamp is included a delicate ammeter and a rheostat with finely divided increments of resistance. With the aid of the rheostat the amount of current passing through the lamp can be regulated to any degree and can be read on the scale of the ammeter. A table accompanies the instrument, which will enable the operator to know the temperature of the filament by the readings from the ammeter.

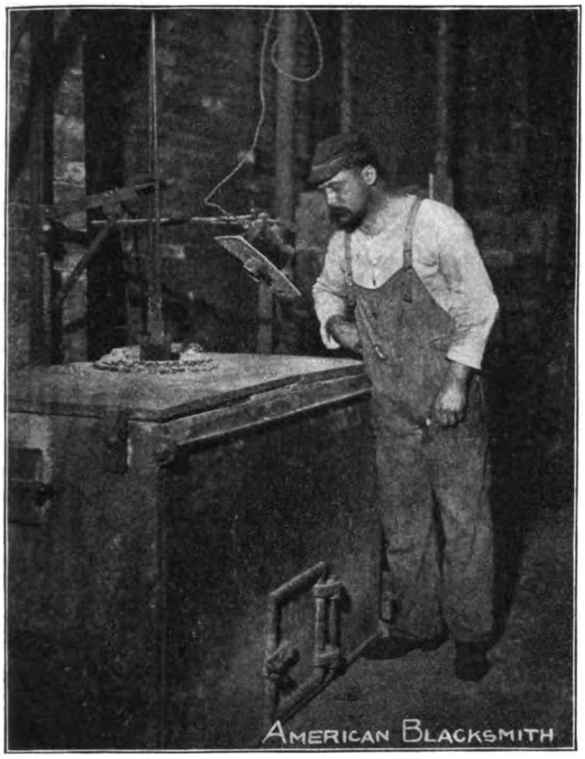

FIG. 2. READING THE ELECTRIC GAUGE.

When this filament is superposed over the substance, whose temperature is to be gaged so that the substance can be viewed through the spirals, it will appear as a more or less bright spiral against said substance, if it is at a higher temperature than the substance. On the other hand if it is at a lower temperature, it will then appear as a more or less dark spiral against it, but when the substance and filament are at the same temperature, then the filament will apparently be obliterated from view and appear to merge into that of the substance. This is because the rays then emitted by the substance whose temperature is to be gauged are identical with the rays emitted by the filament, and therefore the eye detects no difference. This merging effect is a well-defined phenomenon and will enable the operator to read temperatures accurately within 5° Fahr.

If it is desired to measure the temperature of any substance heated to incandescence, the substance is viewed through the lantern tube and the coils of the filament, and the incandescence of the filament is changed by the rheostat until it merges into the substance, when it will be at the same temperature as the substance, and the temperature can be read by the aid of the ammeter and the table accompanying the instrument. If, on the other hand, it is desired to heat a substance to a certain temperature, then the current is regulated by the rheostat until the ammeter indicates the desired temperature, then as the substance is heated, it is observed through the tube and the instant that its temperature is such that the filament of the lamp merges into it, it will be at the desired temperature.

This in general is the principle of the Thermo-Gauge, but by its thorough adaptability to reading temperatures. The Gauge is already in successful use in many of the prominent factories in the country, and has already demonstrated its practicability and importance, among other ways in the hardening of tools.

The Cause and Cure of Thrush.

W. B. ALLEN.

Every farrier knows what thrush is. While all horses are subject to this disease, it is more liable to occur in the heavy draft horses of cities or of wet marshy country localities.

Common causes of thrush: Filthy stables, contracted heels and excessive work on rough roads. Navicular disease is also apt to expose the animal to thrush.

Symptoms: An increase of the moisture in the cleft of the frog and an objectionable odor. This is followed as the disease goes on, by a thin, bad-smelling discharge of considerable amount, which gradually changes to thicker matter, tending to destroy the frog.

Treatment: Cleanliness and a removal of all possible causes should be first looked to. Pare away with care the ragged and diseased parts of the horn. A poultice which is well recommended consists of boiled turnips. Keep this poultice on for a day or so. The smell may be done away with by adding a few drops of carbolic acid or a handful of powdered charcoal to the poultice. Next clean the cleft of the frog and the grooves and fill them with dry calomel. Dress the foot with oakum and a roller bandage. The dressing should be changed every one, two or three days, depending upon how profuse the discharge is. Feet which are subject to thrush should be protected in the stable by means of leather boots.

While thrush is a disease which every horse is capable of contracting, yet this trouble is rarely found in well groomed animals. As stated, in wet and marshy sections this disease is more prevalent than elsewhere. If the above outline of treatment is closely followed thrush can be remedied.

FIG. 3. TAKING FURNACE TEMPERATURES.

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The Blood Horse.

BARRY CORNWALL.

Gamarra is a dainty steed,
Strong, black, and of a noble breed,
Full of fire, and full of bone,
With all his line of fathers known;
Fine his nose, his nostrils thin,
But blown abroad by the pride within!
His mane is like a river flowing,
And his eyes like embers glowing,
In the darkness of the night.
And his pace as swift as light.

Look—how 'round his straining throat
Grace and shifting beauty float;
Sinewy strength is in his reins,
And the red blood gallops through his veins:
Richer, redder, never ran
Through the boasting heart of man.
He can trace his lineage higher
Than the Bourbon dare aspire,—
Douglas, Guzman, or the Guelph,
Or O'Brien's blood itself!

He, who hath no peer, was born,
Here upon a red March morn;
But his famous fathers dead
Were Arabs all, and Arab bred,
And the last of that great line
Trod like one of a race divine!
And yet,—he was but friend to one,
Who fed him at the set of sun,
By some lone fountain fringed with green:
With him, a roving Bedouin,
He lived (none else would he obey
Through all the hot Arabian day),
And died untamed upon the sands
Where Balkh amidst the desert stands.

HEATS SPARKS WELDS

April showers—summer's baptism.

Industry is a bee whose honey is comfort and happiness.

Time's coming for tires to be set. Ready for it?

Don't touch the frog, except to remove such layers as are very loose and form no protection.

Perhaps that old forge or bellows needs repairing. Better get new tools before rush times come. Get the best.

Ride a cock horse—if your hobby has anything to do with your work it will pay you to ride him hard and often.

Great weight of iron is to be avoided in shoeing—especially should this be borne in mind with the approach of warm weather.

How about advertising your shop? It's necessary these days if you want to get ahead. Lots of ways of doing it, too. Think them over.

One month more still remains in which to send in your prize contest article on the advantage of gas or gasoline engine power in the smith shop.

No reason, is there, why smith shops should be dark holes? When you build have plenty of windows, and then don't forget what they are for.

Cheap tools are generally the dearest in the end when you come to figure in the time, money and trouble which their poor quality or need of repairs cost.

Four miles of standard gauge railroad tracks have been laid in the Transportation Building at the World's Fair and still the immense floor space is not exhausted.

When in doubt about how to shoe, observe the horse at a walk or trot. A good deal can be told by the way the animal stands, but much more by the way he goes.

A good time to look over your tools and replace the defective ones is now. Don't forget that the time you waste over that broken drill would soon pay for the purchase of a fine new one.

Reading maketh a full man—a true old saying. The go-ahead smith always has good craft books at his elbow and never lets the subscription to his favorite trade paper run out.

'Tis a good plan to have a regular time for running over accounts to see who hasn't paid up. Otherwise before you know it someone will be so far behind that he can't catch up—then you'll be behind.

Stop to think what side lines you can add with profit. How about wood sawing, feed grinding, disc grinding, horse clipping? There's a host of them. Can't you select one that will pay you? Branch out.

Every blacksmith who has an engine testifies in favor of power in the shop. Nothing would induce them to be without an engine. That's significant. Have you looked into the cost of an engine, its cost of running, what work it would do for you, what trade it would bring? Well worth considering.

Down in the mouth—many smiths think they're doomed to starvation prices forever. Seem to forget "the Lord helps those who help themselves." Be up and doing. Round up the boys in your neighborhood and talk over prices and things with them. There's a way to make a start for better things.

Iron exposed to the action of rain and the atmosphere corrodes quite rapidly. Bolts on bridges of the Thames in London have been found to be eaten away in 25 years from $\frac{7}{8}$ to $\frac{1}{3}$ inch in diameter. Many preservative coatings are used to prevent this action, such as cement, asphaltum graphite, red lead and other substances.

Spruce up the shop. Look over the accumulated odds and ends, discard that which is rubbish and sort that which is of value. Don't be afraid to use paint. A little water was never known to hurt window glass. You've no idea how much better satisfied you'll be with the old shop after a little spring cleaning. Customers appreciate such things, too.

On May first there will be placed on sale at all post offices in the United States a new series of postage stamps commemorating the Louisiana Purchase Exposition. A portrait of Robert R. Livingstone will appear on the one-cent stamp and of Thomas Jefferson on the two-cent stamp. It is interesting to know that 90,000,000 of the former are being engraved, and 225,000,000 of the two-cent stamps.

A thirty-foot knife blade.—The biggest carving knife ever manufactured may be seen at the World's Fair. This monster blade is 30 feet in length and has an edge as sharp as a razor. It is made out of the finest steel, and the handle is a masterpiece of the cutler's art, elaborately carved and beautifully polished. It would take a veritable giant to wield a knife like this. The blade is altogether of American manufacture, and it is expected to show for the first time that American cutlery has now reached a point of perfection where it fears no rivalry. The giant carving knife cost several thousand dollars, and special machinery had to be made.

Tom Tardy's secret is out! We know now why he got a horse. It seems he has always wanted to have a team of his own, and now Tom's dream is realized. We happened along Main street the other day, when, lo and behold, who should appear but Tom and his nag, the one occupying and the other pulling the sorriest looking rig ever eyes were laid on. The fact that it was the busiest time of day, and of a day when there was much shapening to be done, made no difference to Tom. Our worthy friend was much pleased to learn later that we had seen him driving in state, but no amount of questioning would drag from Tom why he was there or whither he was bound. Surely, man is much given to display, and Tom's rig was a show all in itself—but then that's another story.

Do you know just how much each job you do costs you? It is all very well to charge the established price for such and such a piece of work, but do you know accurately what the profit is in each case? It pays to sit down occasionally and figure on prices of work you have done. Figure in just what the material for the job in question costs you laid down in your shop. Figure in your time and also your helper's. Add a proper proportion for coal, rent or taxes, fuel for engine. Get right down to your actual costs and you will then know how low you can figure on the next job of the kind and still have a decent profit left. Very often you want to cut out all profit in your figure to a new desirable customer whose permanent patronage you wish to get in line with, and here again an intelligent knowledge of costs is of much value.

Ruts are bad things. All too many smith's form the habit of expecting only so much trade each year. The man who progresses is he who is in the habit of continually seeking how he may grow. Many ways are open to the smith for an increase of earnings, depending upon locality and ability. With some the first step is an engine, which makes possible, wood sawing, feed grinding, disc sharpening and the like. A power hammer is another move in the same direction. Often a circular saw, planer or band saw can be added with profit. Perhaps there is work for a machine repair shop—a lathe immediately suggests itself. However, an engine is not essential to the smith who would branch out. A tire setter in this neighborhood or a horse clipper in that may be found profitable. Some smiths make a specialty of brazing broken castings; others in their spare moments build new vehicles, rebuild old ones, or buy jobs in the white to paint. Again, to act as agent for farm wagons or implements is another possible source of profit for the man who would get out of his rut. But whatever side line you take up, advertise it far and wide in the locality from which your new trade will come.

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American Association of Blacksmiths and Horseshoers.

If any blacksmith thinks that no benefit can come from a movement to organize the shops in any locality unless every single one agrees to join, he is much mistaken. The greatest success results, of course, when not a single man stands out, but any effort to "get together" for better prices is almost sure to improve conditions, both directly and indirectly. Attention is called to the following letter:

"I feel deeply indebted to you for the better prices which I am getting for my work, which has been a great help. There was not enough sand in some of the blacksmiths of this county to get together and raise the prices, although so many of us have been kicking for a long time about the low prices. You have done a great thing for us in forming the Orleans County Association of Blacksmiths and Wheelwrights and I feel that all the smiths should take your valuable paper." WM. BEEL.

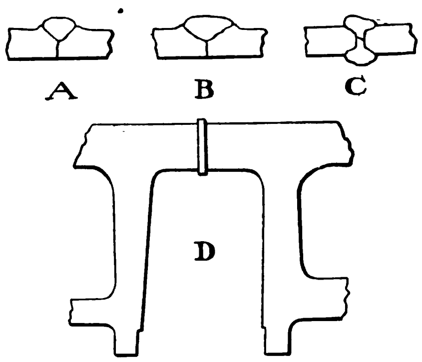
Here is a case in point. Some few smiths in this county obstinately refused to listen to reason, but benefit was derived from the effort made to raise the scale of prices throughout the county. The point we wish to make is this: No man who is thinking of starting a movement for better prices should hesitate because he fears every shop will not join. Very often the ones who are blind enough to want to "stay out" do not control enough trade to make it worth while considering them. A strong, persistent effort in presenting all the many arguments and advantages of organization is almost sure to bring sensible craftsmen around, even if they do not at the very start acknowledge that the best course for them individually lies with the organization.

The American Association of Blacksmiths and Horseshoers, together with its official organ, THE AMERICAN BLACKSMITH, would like to see an organization of blacksmiths, horseshoers and wagon builders in every county in the land, and will be glad to lend every possible assistance towards making a start. There are many reforms and benefits which the craft could secure if they were solidly organized. Any smith can start the ball rolling in his locality. Let him send to us for an outline of plans for taking up the work. Now is an excellent time to make a beginning, as the roads will soon be in prime shape.

Regular meetings are being held and new members taken into the lately-formed New York State associations in Tompkins, Cortland and Cayuga counties. The following officers have been elected in Tompkins County: John Burns, President; Walter D. Helm, Vice-President; Seymour Grover, Secretary, and W. C. Cummings, Treasurer.

Organization of Cherokee County, Iowa.

The blacksmiths of Cherokee County, Iowa, recently organized themselves into an association, the object of which was to formulate and establish a uniform rate of prices, and to discuss matters of interest to the craft in general. The conditions which have prevailed for years in this neighborhood made the opportunity ripe for an association of this kind and the results have been highly satisfactory. This was accomplished with practically no ill-feeling on the part of their customers. All men of the craft in the towns of Marcus, Cleghorn, Meriden, Cherokee, Aurelia, Alta, Storm Lake, Quimby and Washta are members of the association, and as is characteristic of the craft, they are strictly



METHODS OF WELDING LOCOMOTIVE FRAMES.

maintaining prices on their word of honor. The following officers were elected: T. S. Brown, president; J. G. Reigel, vice-president; R. H. Kuhrts, secretary; Ed. Elfrink, treasurer.

The following is the list of prices which were adopted by this association:

Resetting shoes	$ .25
New Shoes	.50
Common bar shoes	.75
Steel plugged shoes, each	.60
Stable horses, resetting	.50
Stable horses, new	1.00
Neverslip shoes, new	.60
Neverslip calks	.05
Sharpening plow lay	.25
Sharpening plow lay and polishing	.50
Pointing, sharpening and polishing	1.00
Wing on lay	.50
Heel on landside	.50
New lay, 14-inch	3.50
New lay, 16-inch	4.00
New lay, 18-inch	4.50
Polishing plow and sharpening lay	1.50
Polishing plow only	1.25
Drawing roller coulter	.50
Grinding roller coulter	.50
Polishing roller coulter	.25
New landside plate	1.50
Drawing road grader blades	2.50
Polishing road grader mould boards	2.50
Axle stubs, single, ¾ to 1¼	2.50
Axle stubs, per set, ¾ to 1⅛	6.00
Axle stubs, per set, 1¼	7.00
Axle stubs, long distance, ¾ to 1¼	8.00
New buggy tires, ¾ to 1⅛, per set	5.00
New buggy tires, 1¼ to 1½, per set	6.00
Setting wagon tires, per set	2.00
Setting wagon tires, (bolted) per set	2.25
Setting wagon tires, (bolted), single	.60
New wagon tires, 1½ to ½, per set	7.00
Sharpening disc harrow, per disc	.20
Sharpening spading disc, 8-foot	5.00
Sharpening spading disc, 10-foot	6.00
Sharpening harrow teeth (when taken out and replaced)	.02
Grinding cultivator shovels	.50
Drawing cultivator shovels	1.00
Trimming cultivator shovels	1.25
Pointing cultivator shovels	2.00
Polishing cultivator shovels	.50

Repairing Locomotive Frames of Cast Steel—1.

A. W. MCCASLIN.

The above subject should interest not only the foreman blacksmith, who, in a manner, is held responsible for the results or behavior of the work passing through his department, and the master mechanic, whose energy in determining the cause of failures frequently pushes the foreman dangerously close to the edge, or even the superintendent of motive power, who is inclined to pronounce the word failure, a corruption, or as being entirely void of meaning in its application to the performance of the motive power, but to all officials of all railroads, who have the best interests of their respective roads in mind; nor should we forget the traveling public, whose safety is, or should be, given paramount consideration from the highest official down to the apprentice boy in the shop. This is termed the steel age, owing to the fact that mild steel, through its superiority over iron for some purposes, has, to a material extent, superseded the latter. Steel is at the present time being quite extensively introduced, and one would think without a voucher as to its reliability, into one of the most expensive as well as fundamental parts of the locomotive. If compression, tensile and torsional strength were the only requisites of a perfect material for locomotive frames, steel would indeed be the ideal metal, but where shocks and vibrations are factors, we approach danger in its use. We know of no other member of the locomotive that is required to withstand, per square inch, that which is expected of the frame. Steel is not a universal metal, and can not be used indiscriminately or regardless of the laws governing metallography or metallurgy, but like men, should be chosen only to fill the positions best fitted for it. No thinking mechanic would accept a new locomotive frame made from crystallized iron, with its tendency to separate from the least shock. Steel is also "crystalline." We

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doubt if there is a superintendent of motive power or a master mechanic on any of our railroads who would accept a new engine frame made from granular iron, with its disposition to fracture or separate, from shock, identical with that of crystallized iron when there is the least flaw or imperfection as to soundness of its surface. Steel is also granular, and every hole drilled into it makes its liability almost a certainty to fracture at that point, if subject to shocks. True steel has greater tensile strength than iron, but certainly at the expense of ductility. The best authorities on steel claim the highest tensile strength and greatest ductility cannot be had together. If it were possible to combine the highest tensile strength of steel, and the ductility of good fibrous iron, the problem of not only a proper, but the best material for frames and many other parts of locomotives, coaches, cars, etc., would be solved, and who could estimate the saving in dollars to railways in general, through the decrease in failures or breakages, frequently termed accidents?

In casting a locomotive steel frame, owing to its length and irregular shape, we believe it necessary to gate or pour the metal at several points; thus, in a manner casting it in sections. Does this metal retain the proper degree of temperature or fluidity, after traveling from four to six feet, as the case may be, to form a perfect union with the same metal at the same temperature from the next or neighboring pour? This would be possible when pouring large volumes of metal, if the pour be constant, but can we have perfect faith in the union of such metal when poured at intervals of four to six feet into a mould with a sectional area of only sixteen to twenty-five square inches, owing to its tendency to coldshut at point of supposed union?

Let us reason. If this metal be poured at the proper temperature to make a perfectly solid casting, retaining its full virtue as to specified strength, ductility, etc., what will be the percentage of these virtues at point of union, effected at a lower temperature occassioned by travel or metal through the mould some distance from the pour? Invariably it is necessary, when casting ingots, to cut from them what is called the piped end, which is constituted largely of the dirt and other impurities in the steel, which settles at top end of ingot. If this is necessary in order to procure a perfect or sound billet from which, through lamination, a solid bar or refined steel can be procured, what are the conditions of this metal in a steel frame with these imperfections and impurities uneliminated and distributed throughout the frame, the effects of which we fear are not always considered ?

If we have been observant we have noted, in the many broken steel castings that come into the shop, a cavity at point of breakage, around which can also be seen the impurities in the steel, which settled at that point. Nor should we be unmindful of the fact that the consequent ill-effects of all imperfections as to unions, as well as impurities in the steel, are greatly augmented by uneven contraction, which annealing does not always entirely relieve.

We know of no degree of temperature that a sectional area of twelve square inches at a much higher temperature will not more speedily meet or drop to than is possible with a sectional area of twenty-four square inches. If the argument be worthy of thought, I would ask: How can a long frame-back with a sectional area of twenty-five square inches cool or contract evenly with the braces or bottom rail with a section area to only one-half that of the back, without leaving a strain somewhere in the frame regardless of the method of annealing?

We are told by some men that castings made from open-hearth steel, containing a specified percentage of carbon, which is one of its life-giving components, do not run regular throughout as to points in carbon. Thus a frame made to specifications or formula, calling for thirty points in carbon, is liable to contain thirty points at one end, with twenty points at the other end and fifteen points in the middle, etc., which would make a frame of an unknown quality at any given point, with possibly its weakest section where greatest stress or abuse is to be met. I have been told by men who have straightened many steel frames under the steam hammer after they were annealed, that they sometimes break in two in the middle, by a blow from the hammer; others will break off near the end through shock or jar, which certainly shows feeble tenacity, but this should not surprise us when we understand that steel ingots sometimes crack in two or three places, even after they are supposed to be cold, which doubtless is due to internal as well as external strains, caused by uneven shrinkage, combined with the left-over impurities in the steel and through lack of reheating and the refining process under the hammer.

(To be continued.)

The Progressive Smith as a Business Man.—7.

Selling.

BILLY BUNTZ.

Some smiths have the idea that they have nothing to sell aside from the manual exertion they put forth in doing a job of work, yet the progressive smith knows it requires knack to handle his customers so as to make the most profit on their jobs; hence, he uses tact and spreads on a little "molasses," the same as the store salesman who endeavors to sell the best or highest-priced goods.

When a horse is brought in, instead of merely asking, "What kind of shoes?" he examines the hoof carefully—not particularly because he expects to find any deformities, but more especially to show the customer that he is giving the animal special attention. He may even have his helper run the horse up and down the street so he can see his gait,

AGENCY New Tires Applied
RUBBER
Repairing Neatly and Promptly Executed
TIRES

remarking "It would be a shame to put cheap shoes on an animal like that!" Everybody likes to have his horse praised. If a customer can be induced by proper "horse talk" to buy the best shoes or special ones or have the hoof shaped by special tools, the smith increases his earnings; at the same time he need not be dishonest—simply *shrewd*.

From his familiarity with horses the smith often makes a good horse dealer, buying, trading or selling horses as an avocation; or he may be agent for miscellaneous supplies, such as tools, machinery, gas engines, harness, blankets, curative remedies, etc. Of course, the handling of such articles depends on the inclination of the smith, his location and the demand for such goods in his locality.

In selling, the shrewd smith is not prone to argue, but rather, he makes such statements of fact as he thinks seductive in inducing his customer to buy what he has to sell. When the customer talks on a certain point, he does likewise, rather than to appear disinterested or to insist upon getting in "side-talk" or mentioning some hobby. Where he knows his customer is in the wrong, instead of "flooring" him flatly, he states the facts in an offhand way as though he were passing the subject up, at the same time agreeing with his customer on a few points and complimenting him on his good judgment. As he talks, he notices the effect it has, and afterwards he *thinks* about it, so he can improve until he becomes an expert seller.

When he is doing a job repairing, he calls attention to the excellent quality of the iron, by showing how nicely it works under the hammer, or how well a sample stood the test of "bending over on itself," or how it stood a hard pull. "That iron," he remarks, "costs more, but the customer gets double benefit." Likewise, the customer comes to know that the charge will be higher, while the smith is afterwards praised for the good material he uses. Where a customer wants something cheap or is inclined to "Jew," he should be given to understand that although the job can be done, it can't be guaranteed.

When warranting a job, the shrewd smith does not say, "I guarantee" this, that or the other, for, even should he be positive it will last ten years, he takes into consideration that some customers would remember to bring the article back in nine years were anything wrong with it and want it renewed. A guarantee should be a general statement, as, what some customers say of jobs that have been done for them, or that the same article, with good care lasted one customer ten years.

When a job is brought back under the pretence that something was defective, the shrewd smith laughs and convinces

Bring in Your Tires!

Can set 'em quickly with my Setter, which compresses the metal cold.

No Burnt or Charred Felloes or Paint. No Shrinkage. No Over-Dishing. IN FACT—A PERFECT FIT.

the customer of negligence by saying, "That wood was given rough service to splinter that way," or, "Of course a wagon-box would warp, standing out this weather." "Can't expect varnish to hold gloss out in the wet." "That shoe was loosened by the car track." "That's no fracture in the iron, it's rough usage; you can break anything if its hit hard enough."

In repairing old wagons or doing work

CLIPPING PARLOR

What Clipping Does for the Horse

Improves his appearance. Renders currying unnecessary. Prevents excessive perspiration or catching cold. Increases his vitality, strength and weight. Makes him cheerful—a better worker. Adds to his worth.

Bring Him In

where it would be impossible to have the repair last long, it is well to say, "Why didn't you bring me something easy? I can fix it as good as anybody, but it can't last." Should the smith deal in wagons, he should try to sell one to his customer, comparing the superior points of the new one with the "rattle-trap" and agreeing to take it in on a sale. He may substantiate any statements by showing manufacturers catalogues.

To aid in making sales, where the shop has a large front window the smith may use the adjoining space for such exhibition purposes as clipping horses or showing his gas engine; or he may box off the lower half of the window or half its width for a show-case in which to exhibit a full line of horseshoes, or wooden hoofs poorly shod, with a placard entitled, "Why Some Horses Limp." Placards, posters, etc., are good advertisers. These can often be obtained of supply firms or manufacturers free of charge. A few sample placards are here shown in miniature. Selling or buying naturally refers to *contracts*, which will be dwelt upon in next issue of The American Blacksmith.

The Carriage Repairman.

BY SOMERVILLE.

The art of "Carriage Repairing" is more or less fascinating, because of the many different things that is required of the repairer; and to be a successful one "the man" must be a first class mechanic, must have a generous supply of patience and good-nature, be neat and tidy about his work; quick and resourceful, also.

I think that the man who has served his time faithfully at his trade, and has had the benefits of the experience of older heads, and has seen the different processes in forging that are needed for a carriage, makes the best man for a carriage repairer. He knows what to do. If a part of a carriage is wanted that he does not have in stock and can't conveniently get, he knows how to make it.

There are many jobs brought to the repair shop that are puzzling and take a lot of time to do. The customer may be in a hurry, he may not want to pay very much for his work. You don't want to lose him and you want a living price and a little more for your work. Or you may be overburdened with work. Everything is going wrong about the shop. Your fire doesn't work, and you have "the blues." Here is where your patience and good-nature comes in. Treat your friends well. Be good-natured and drive away "the blues."

The successful carriage repairer does his work neatly and I may say that it is just as easy to make your work neat and respectable as it is to make it rough.

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Nobody really enjoys seeing a job of work "botched" or thrown from the anvil in a half-hearted way, as if the "smith" considered it a favor to do it at all. Work, to be appreciated, must be done thoroughly, and it is a true

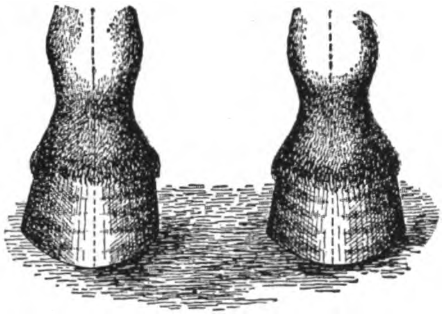

FIG. 2. FORE FEET, REGULAR POSITION.

saying that, "Anything worth doing is worth doing well."

As for stock, buy the best. Poor iron is the dearest thing you can buy in your business; you are never sure of it. You are always better satisfied when you know the work is going to stand, and the difference between good and bad stock is not worth running any risk for.

It is always best to keep ahead of your work; and as far as possible, finish one job before commencing another. Study the best way to handle your work so as to give best results; the man that is quick to see, and is resourceful, accomplishes more work with less labor than the don't-care fellow.

In these days of close competition it is advisable to have all the labor-saving machinery and tools that you can afford, such as punches, upsetters, blowers, etc., cold tire setter if you believe in them, and all your business will stand. A gas or gasoline engine or motor is a grand thing and I think the use of them depends a good deal on the business, and whether or not a "smith" can get his motor power cheap enough to warrant his buying. All those things tend to make the business a success and those within reach of them would do well to have them.

Don't be afraid to charge a good fair price for your work. You have got to do it if you want to be successful. Pay your bills and live decently. Give everybody an equivalent for their money, and when the bill is due, ask for it. How often do we see the man that is owing a "little bill" carrying his work to some one else just because he owes you. Make him pay that "little bill" and see how quick he will come back. Be a good collector if you can. I know that it is the hardest part of the business just now, but you can't get along without money. There are many good bright ideas to be gotten from THE AMERICAN BLACKSMITH that are of lasting value to the repairer; articles that are well-written and that would benefit the man that studies.

Judicious advertising is one of the most necessary things to make any business successful. It may take the form of an ad in the local paper, thereby keeping your name before the public, which I think is the best. There are many ways of advertising and it depends somewhat on the locality as to which would be the best way. Keep abreast of the times and the best way to do that is to take your trade journals and read them carefully, and the knowledge that the best of us can get from them may be applied with profit in our work.

A Treatise On Horseshoeing.—3.

JOHN W. ADAMS, V. M. D.

The Feet. Forms of Feet Viewed from in Front and in Profile.

Whether a horse's feet be observed from in front or from behind, their form corresponds to, or at least resembles, either that of the regular position (Fig. 2), the base wide or toe-wide position (Fig. 3), or the base-narrow or toe narrow position (Fig. 4).

By the direction of the imaginary line passing through the long axes of the two pasterns (Figs. 2, 3, 4) we determine whether or not the hoof and pasterns stand in proper mutual relation.

In the regular standing position (Fig. 2) the foot axis runs straight downward and forward; in the base-wide position (Fig. 3) it runs obliquely downward and outward, and in the base-narrow position (Fig. 4) it runs obliquely downward and inward.

Viewing the foot in profile, we distinguish the regular position (Fig. 5*b*), and designate all forward deviation as acute-angled (long toe and low heel, Fig. 5*a*), and all deviations backward from the regular (steep toe and high heel, Fig. 5*c*) as steep-toed, or stumpy. When the body-weight is evenly distributed over all four limbs, the foot-axis should be straight; the long pastern, the short pastern, and wall at the toe should have the same slant.

A front hoof of the regular standing position.—The outer wall is a little more slanting and somewhat thicker than the inner. The lower border of the outer quarter describes the arc of a smaller circle—that is, is more sharply bent than the inner quarter. The weight falls near the center of the foot and is evenly distributed over the whole bottom of the hoof. The toe forms an angle with the ground of 45° to 50° and is parallel to the direction of the long pastern. The toe points straight ahead, and when the horse is moving forward in a straight line the hoofs are picked up and carried forward in a line parallel to the middle line of the body, and are set down flat. Coming straight toward the observer the hoofs seem to rise and fall perpendicularly.

A hoof of the base-wide position.—This is always awry. The outer wall is more slanting, longer, and thicker than the inner, the outer quarter more curved than the inner, and the outer half of the sole wider than the inner. The weight falls largely into the inner half of the hoof. In motion the hoof is moved in a circle. From its position on the ground it breaks over the inner toe, is carried forward and inward close to the supporting leg, thence forward and outward to the ground, which the hoof meets first with the outer toe. Horses that are toe-wide ("splay-footed"—toes turned outward) show all these peculiarities of hoof-form and hoof-flight to a still more marked degree and are therefore more prone to "interfere" when in motion.

A hoof of the base-narrow position.—This also is awry, but not to so marked a degree as the base-wide hoof. The inner wall is usually a little more slanting than the outer, the inner half of the sole wider than the outer, and the inner quarter more curved than the outer. The outer quarter is often flattened and drawn in at the bottom. The weight falls largely into the outer half of the hoof. In motion the hoof breaks over the outer toe, is carried forward and outward at some distance from the supporting leg, thence forward and inward to the ground, which it generally meets with the outer toe. The

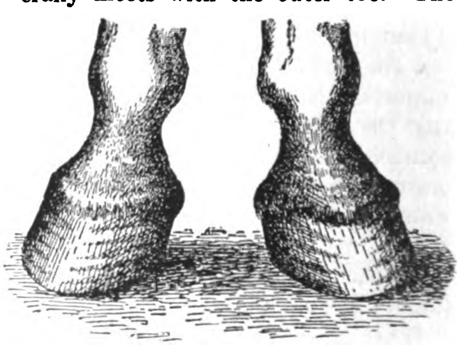

FIG. 3. TOE WIDE POSITION.

foot thus moves in a circle whose convexity is outward, a manner of flight called "paddling." A base-narrow horse whose toes point straight ahead frequently "interferes," while a toe-narrow (pigeon-toed) animal seldom or very infrequently does so.

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Regular hoof.—A regular hoof (fig. 5*b*), viewed from one side, has a straight foot-axis inclined to the horizon at an angle of 45° to 50°. The weight falls near the center of the foot and there is moderate expansion of the quarters.

Acute-angled hoof.—An acute-angled hoof (fig. 5*a*) has a straight foot-axis inclined at an angle less than 45° to the horizon. The weight falls more largely in the back half of the hoof and there is greater length of hoof in contact with the ground and greater expansion of the heels than in the regular hoof.

Upright, or stumpy, hoof.—In the upright, or stumpy, hoof (fig. 5*c*) the foot-axis is straight and more than 55° steep. The hoof is relatively short from toe to heel, the weight falls farther forward, and there is less expansion of the heels than in the regular hoof.

Wide and narrow hoofs.—Finally, there are wide hoofs and narrow hoofs, dependent solely upon race and breeding. The wide hoof is almost circular on the ground surface, the sole but little concave, the frog large, and the quality of the horn coarse. The narrow hoof has a strongly "cupped" sole, a small frog, nearly perpendicular side walls, and fine-grained, tough horn.

Hind hoofs.—Hind hoofs are influenced in shape by different directions of their pasterns much as front feet are. A hind hoof is not round at the toe as a front hoof is, but is more pointed. Its greatest width is two-thirds of the way back from toe to heel, the sole is more concave, the heels relatively wider, and the toe about 10° steeper than in front hoofs.

(To be continued.)

The Practical Scientific Treatment of Interfering Horses.—5.

Cross Firing.

E. W. PERRIN.

Cross firing is a phase of interfering peculiar to fast roadsters, especially pacers, or trotters that "mix"—change their gait. It often happens when a horse is driven to a break. Cross firing consists in the animal striking the inside heel or quarter of one front foot with the inside toe of the opposite hind foot, sometimes causing a severe wound on the coronet, while occasionally the sudden interruption of locomotion resulting from the blow causes the animal to fall violently to the ground.

The passing gaited trotter does not cross fire, because his hind feet straddle the front tones. The line trotter—the horse's whole hind feet follow directly over the track of the front ones—does not cross fire, unless driven to a break or in changing.

Causes.

The discovery of the cause is the all-important factor in the treatment, for if

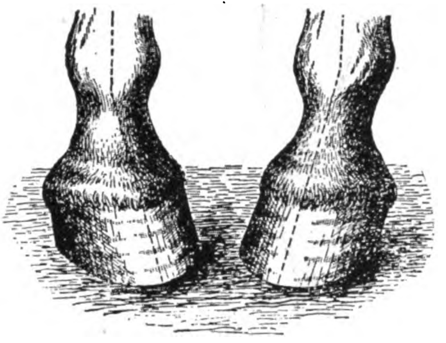

FIG. 4. TOE NARROW POSITION.

you are not sure of the cause of the trouble, then all your remedies are mere haphazard guess work. The proper fitting of the harness and hitching to the sulky have much to do with it. For instance an ill-fitting breast collar may impede the motion of the fore extremity—the shoulders—while you sit behind the horse with a whip urging him on, and may cause the hind quarters to move too fast for the front ones. A bit that hurts the mouth may cause like results. Urging the horse beyond his speed with a whip is a common cause. A horse may improve considerably on his record, for speed, but these improvements are to be achieved by the slow process of careful training. Any soreness in the front legs or feet may sufficiently impede the "pick-up" of the front feet, as to leave them in the way of the hind ones. Lastly, improper shoeing is a cause of cross firing, and under the head of shoeing, I would lay special stress on the preparation of the feet; most pacers are outside wearers behind and go better shod a little heavier behind than in front. However, there are a few exceptions to this rule.

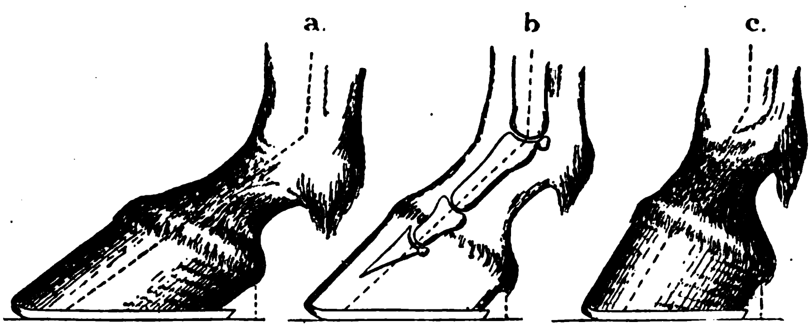

FIG. 5. FORMS OF FEET VIEWED IN PROFILE, SHOWING DIFFERENT POSITIONS.

Treatment.

If you conclude that the shoeing is at fault, first take particular notice of the wear of the front shoes; also observe the angle of the front feet, to see if they conform to the angle of the pastern. Remember that the short upright pastern has an upright foot somewhat high at the heels, and hence if you let the toes of such feet grow abnormally long, you not only put too much tension on the flexor tendons of the leg, but you impede the "pickup" of the front feet which of itself is enough to cause the trouble. If the old shoes show that the "break-over" is at the outside quarter, then roll the shoe at that part.

Now about the hind feet,—it will invariably be found that in horses that cross fire, the inside hoofs are too high. If you find this to be the case, lower the inside of the hoof especially at the toe, as much as it will stand without injury, and use shoe, Fig. 12A. This shoe is designed to give the foot more ground surface to the outside, the extra width on the outside being fitted wide of the foot. If the outside of the foot is wide, then use shoe B, the flange shoe. The weight of the shoes must depend on the horse, and the kind of work for which he is to be used, but in all cases the shoes should be no heavier than is compatible with a reasonable amount of wear. If the front feet are hard and dry, poultice them with warm wet bran for a few days, or stand the horse in a wet clay stall during the day, and remove him to a dry stall with bedding at night. If you are in doubt as to the proper angle of the feet, use the horse a few days without shoes on soft ground until he has worn the ground surface of the hoof to the shape that suits his conformation and mode of going, taking care not to let him wear his feet sore. Then if he goes clear, as he invariably will, provided, of course, that defective shoeing was the cause, shoe him with a light plate all around, the same weight on each foot, bending the plate onto the ground surface of the hoof. If he goes clear with his feet worn in some peculiar shape, don't imagine that you can improve on it by rasping the hoof to some shape suitable to your eye. If he goes clear, that is all sufficient, never mind because one foot is high on the inside while its fellow is high on the out. Practical experience is the best teacher. I have two cases of this character in my practical shoeing today—one goes clear with a front foot

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high on the outside and its fellow high on the inside, while the other goes clear by treating the hind feet in the same manner. Such cases are few and far between

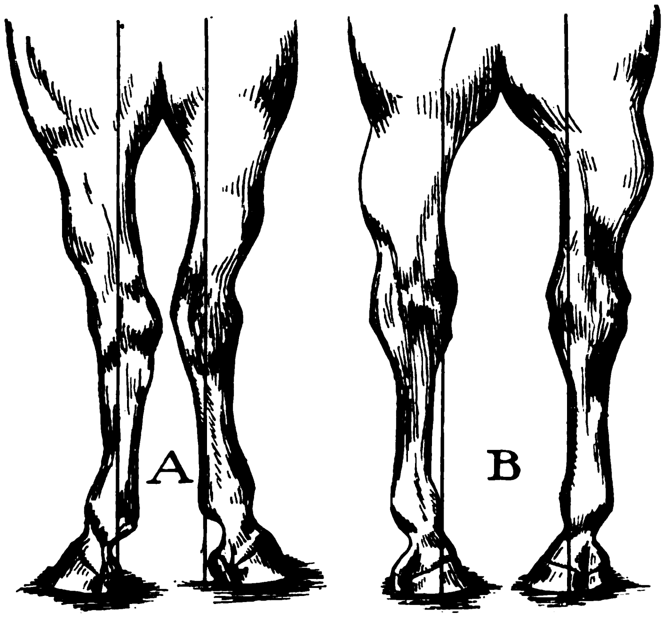


FIG. 11. A, THE COW HOCKED HORSE. B, A CONFORMATION VERY PRONE TO CROSS-FIRE.

and result from some peculiarity of conformation. This defect may be very slight, and very hard even for the experienced eye to detect, but it is there, nevertheless. I have had no trouble with the two cases I speak of since I discovered the real cause of the interfering. Recently, however, one of my men was sick, and I had a stranger in his place and one of these horses came to be shod while I was out of the shop. The new man "leveled up" his feet as he called it, and the next day the horse came back interfering, so that I had to make up the

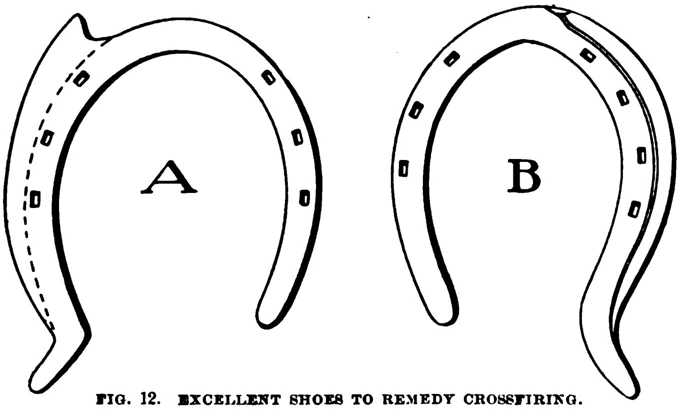


FIG. 12. EXCELLENT SHOES TO REMEDY CROSSFIRING.

amount of hoof rasped away with layers of leather so as to restore nature's level, and then he travelled all right again, thus giving me another proof that the ground surface of the hoof must conform to the limb. Cross-firing is a form of interfering that does not affect slow horses, and much depends on the trainer or driver. Of course, if the driver will persist in pushing his horse above that speed at which he is capable of moving his four limbs in unison with each other, the result is a break, a "mix up," and this is one of the ways that a horse is made to cross-fire. I need hardly say that the horseshoer cannot remedy cross firing when it results from that cause.

In treating interfering, it behooves the shoer to look carefully into all the possible causes. It will sometimes be found to be caused by things that seem to have no connection. But it is certain that every effect must have a cause, and it is the cause which must be sought in every case before a cure can be effected.

(To be continued.)

A Home-made Tuyere Iron.

FRED RICKERT.

I have read about all kinds of tuyere irons, and will here tell about the one which I am now using. I have used all kinds, but think the one which I now have the best, and it cost me but ten cents and ten minutes' work. It is a two-inch gas pipe with elbow in the center. It has three ½-inch holes drilled in the elbow and pieces cut out between the holes as shown in the drawing. My fire will keep clean as long as the other two fires in our shop, and do as much work and heat quicker than my partner's, who has a $3.00 tuyere iron, and when iron or steel will not weld in his fire, it will weld in mine. Recently I welded a wagon tire in my fire which he could not weld, and he is a good man to take a heat.

Prices in McKean County, Pennsylvania.

CHAS. PHALON.

I would like to give some of McKean County prices. They used to be ten and twenty, or twelve and a half and twenty-five cents, but we got together and now have the following prices:

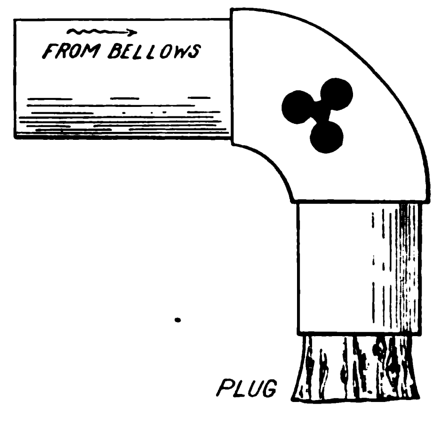
Shoeing	$ .20 and .40
Shoeing, No. 7	.25 and .50
All handwork	.25 and .50
Bar shoes, per pair	1.50 to 2.00
Neck yokes	2.50 to 3.50
Whiffletrees	2.50 to 3.00
Links	.10
Claw hooks	.40
Swivel clevis	1.50 to 2.00
Axles	3.00
Tongues	2.50
Buggy tire setting	.60
Tires, 3 inches and up	1.00
Narrow wagon tire, per set	2.00

QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

Who Makes White Rock Hoof Packing? Can any of our readers tell us?

Will Someone please give me the following information through these columns,—which is the best way to temper buggy springs after they are welded? I do considerable such work. CHAS. E. OEHME.



A HOME-MADE TUYERE IRON.

Hardening Concave Steel—I would like to know the best way to case-harden a concave shell made out of malleable iron, which is very thin, so that it will not crack. Who can tell me? L. M. EMIG.

Blueing Steel—Will some one tell me how to blue steel, like a blue pistol? I can blue it, but it doesn't last long. I especially want to know how to blue bridle bits or spurs and such things. R. B. THOMPSON.

Cold Tire Setters—Will some brother smith kindly inform me through THE AMERICAN BLACKSMITH which is the best kind of a hand-power cold tire setter that will set tires up to 2¼ by ⅝ inches, together with the cost of the same. SUBSCRIBER.

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Oak Graining—I would like to know how to do graining, especially oak graining. Can some one tell? G. E. B.

Whiffletree Staples—Can some brother blacksmith tell me who makes steel drop forged whiffletree staples, with large eye, 3½ or 4 inches in diameter? L. F. CADNE.

Tempering a Gaff—Replying to Mr. White in the February issue, it seems to me I should draw the temper to a fairly good yellow. I have never made any gaffs, but this is how I would temper one if I did.
H. C. ARTER.

A Tinning Query—What I want to know is how to prepare malleable iron castings to tin them, and what proportion of tin and other white metals I should use. Also what kind of vessel for melting the metal in, to dip the castings. I make the Eclipse neck-yoke center and have a call for it tinned as well as japanned. Muriatic acid is used for cleaning the castings with.
S. J. MCDONALD.

A Question on Axes—Will some one tell me regarding the making, hammering and tempering of axes? I would like to see something on this subject, as this work is quite a trade here in New Brunswick. What is the best brand of steel to use and the proper hardness to temper? R. MOORE.

Pulling Spokes—My way of pulling spokes out of a hub, in answer to T. E. Laison, is to make a link out of ½-inch round iron, large enough at the bottom to go over the spoke. Then make a wedge-shaped piece of iron, put it in ring on the top of spoke and drive with hammer. This will draw spoke without breaking it. H. B. PROSE.

Drilling Chilled Cast Iron—In reply to the question asked as to how to drill chilled cast iron, I have found that camphor gum and turpentine is an excellent preparation for drilling hard tempered steel and I have no doubt it will have the same effect on cast iron. I have drilled steel with this preparation that I could not drill with oil.
DONALD A. MCDOUGALL.

Barcus Horse Stocks—In reply to Mr. W. W. Herring's question about the Barcus Horse Stocks would say that I have one and shoe the most vicious kind of mules, some of them weighing 1,400. I do not think there is another set of stocks made that is their equal. They are very easy to work and safe for both man and beast, and I recommend them very highly. JOHN MULL.

Mr. Metcalf's Shoe—In reply to Mr. Metcalf, will say that the shoe which he makes is very good and will spread any foot. I have used them for a long time, but the better you breed a horse the more apt he is to contract. If you spread him too quickly, he is apt to become very lame. It is a hard matter to explain to some men the reason, so the next best thing is to put on a pair of toe tips. This will let the horse's toe grow out and will spread the quarters. A good plan is to let the horse run out in the dew and keep the foot soft. This will be beneficial. GEO. D. ALBERTSON.

Making Punches—Replying to the question of Mr. T. Rowan in the December issue, I would say that blacksmiths' punches should be made out of steel of from 80 to 90 points carbon. In dressing to shape, be careful not to overheat. Draw to a brown yellow. The punch should taper down slightly, with a quicker taper at the extreme end. Where the plates to be punched are of the same thickness, I find a guide plate useful. It is formed of two plates riveted together, wide enough apart to insert the piece to be punched, and having holes formed in them to guide the punch. B. B.

Keep at it—Replying to the request of Mr. J. J. Mullen, who asked for advice in the February issue, I would say by all means stick to the shop. I would charge good prices, and do good work for the price. There is bound to be more or less competition everywhere, and a young man has got to go through more or less of a struggle to establish himself. Don't think of giving up the shop because businesss is poor· Try to get the reputation of being the best mechanic in the neighborhood. To do this, strive to do your work as well as possible. Finish it neatly, and never lower yourself by charging too low a price. Treat your customers well, give them their money's worth, be progressive, and you will find there's no need to think of quitting, as business will increase. W. B. ASH.

Pointing Old Plows—In reply to the inquiry as to how to point old plows, would say that I take and heat the point for two or three inches, cut the share off, leaving the bar. Draw the bar just like a new one. Make your point to taper to fit the bar at the small end and widen to fit the space you cut off the share. Weld on the bar first, then the share and your job is done. P. D. M.

Setting Tires—In answer to John G. on setting tires will say that the way to set them hot (the old way), is to be sure that all the slack is taken out of the wheel, *i. e.*, have the spokes tight in the hub and the rim, being careful in measuring the rim and tire. But the better plan is to get a Brooks Tire Setter and set them cold. Then one can see just the amount of dish as it is drawn. JOHN H.

SHOP OF C. A. HEATH.

Axle Form—In the March issue was published a draft of an axle form which I sent in. Since that time I have noticed the inquiry of Mr. Blanchard. He mentions arched axles, and the thought struck me that since the top side of the axle is always turned to the form, I ought to have mentioned it. For an arched axle, the curvature of the form should be the reverse to one for drop axles, that is, the center should be lower than at the ends.
NELS PETERSON.

A Short Shop Letter—I am very much pleased with THE AMERICAN BLACKSMITH—don't stop it as long as I am in business. I set 500 shoes from Dec. 1st to Dec. 24th, or for shoeing alone $83.63, and since then it has been more icy than ever. Accompanying this is a picture of my shop (which is 18 by 36) taken from the shoeing floor. The shop is operated by a 4-horse power steam engine with the little boiler back of the forge. I have a grind stone, drill, tenoning machine, wood and iron lathe, jig saw, emery stand, a rip and cross-cut saw and jointer all on the same shaft, and a foot-power hammer, all of my own make. I believe in tools. C. A. HEATH.

Tinting Ceilings—Selling Inventions—Will some one please let me know how to paint or tint ceilings, what colors are best and how to mix them? I should also like to know how to dispose of a couple of inventions I have. I have not got them patented, nor do I wish to go to the trouble. The one is a spoke-measuring device. When you know the size of hub and wheel the machine can be set instantly to the length spoke required. The other invention is a trace holder for sword singletrees. If some one will answer these questions I shall be greatly obliged.
G. E. BRIERLY, Arva, Ontario.

A Shoe for Cripples—I have made three different boots, or iron shoes, as they are called, for cripples. Take a steel bar three-sixteenths by one-half inch, and make it in shape of bottom of the shoe with the offset for heel. The posts are to be flattened to cover about the size of heel. These, welded to the heel and toe, should stand up to rest under the heel and ball of the foot, just back of the toes. Put three holes in each plate, fasten on with short screws, the hind plate to extend forward and the front backward. The bottom of the shoe should be made oval, the same as the sole of the shoe. H. B. PROSE.

Gun Springs—For the benefit of a reader of your valuable paper, in regard to tempering a gun spring, or any spring of that nature—Let him make his spring, finish it, then about dark, over a small fire, with a low blast, let him heat it evenly, till it becomes a deep red, then plunge it sidewise into a kettle of water, with the chill heated off. Soft water is the best. Then heat it again over the fire, occasionally holding in a dark place till he sees the red, not as high as the first. Then you have got a temper in a spring that can't be beaten. I have done a good deal of gun-smithing in my days, and this was my way of tempering for a spring. An old tramp taught me this for twenty-five cents. A. S. OTTEY.

Resetting Tires—In answer to John G. with regard to resetting tires, I don't think any one can answer his query. I have had a third of a century's experience and find that the smith has to use judgment in this work. In the first place, wheels vary so much that there can be no fixed rule for setting the tires. A light wheel will not stand as much draw as a heavy wheel, and if a wheel has dish you will have to give it less draw than one that is straight. If a tire is light and badly worn out, it will set closer to the wheel than a thick one, so you can give it more draft. A larger wheel needs more draft or surface than a small one, so that you will see that hardly two wheels would require the same draft to the tire. MONROE HUBBARD.

Tire Setting—In answer to Mr. John G. in regard to tire setting, will state that no rule or set of rules will apply to all wheels. Suppose you have a new wheel, spokes all driven tightly in the hub and felloes well set on the shoulder of spoke tenons and joints in the rim close jointed. With one joint one-eighth inch open to prevent rim binding, give your tire three-eighths inch draw and you will have your tire tight and the proper dish in the wheels, if the spokes have been properly driven. But if you have a very old loose wheel, you must use judgment, according to the firmness or looseness of your wheel. If the rim is loose, wedge up and cut the tenons of the spokes a little below the sufrace of the rim, so the tire won't rest directly on them, as that will surely spring the spokes and dish the wheels. M. A. FOSTER.
Echo Lake, N. J.

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Mixing Paints—In reply to "A Reader" in the February issue who asks for information relative to mixing paints, would say that such information would extend beyond the limits reserved for a single article in THE AMERICAN BLACKSMITH. If he will procure a copy of "Practical Carriage and Wagon Painting," advertised by THE AMERICAN BLACKSMITH, he will find 17 pages devoted to colors, mixing, application, etc. To obtain a good job of wine color painting, light shade—wine color is furnished in three shades—bring up the surface in the usual way, then apply a coat of Indian red, the coat mixed to dry flat, next add enough wine color to varnish to stain thoroughly and apply as a color and varnish coat. A nice wine color will result therefrom. M. C. HILLICK.

Gasoline Engines—I saw in THE AMERICAN BLACKSMITH an inquiry about gasoline engines. I will say that I use an Indian Motocycle. This machine cannot only be used for pleasure on the road, but I bring it into the shop, place it on a stand, which I made myself, and I run a No. 7 Champion drill, a grind stone, and horse clipper, and have plenty of power left. I also intend to get a lathe to run with this motor. I find them very easy to gear for running any kind of machinery. I have these Indian Motocycles for sale and will send catalogue upon application. Full particulars as to how to gear them are given with each purchase. Thus you see you not only have power for the shop, but also a bicycle for pleasure. I have won races with this machine and consider it as good as an ordinary gasoline engine for the same price. J. MARION.

Mixing Paints—I give the following in answer to the question of "A Reader." They are to be mixed in proportion to the shade desired.

Buff—white, yellow ochre and red.

Chesmit—red, black and yellow.

Chocolate—Indian red, vegetable black and pale chrome.

Claret—red, umber and black.

Drab—white lead, umber and Venetian red.

Flesh—white, yellow ochre and vermilion.

French Grey—white lead, Prussian blue tinged with vermilion.

Silver Grey—white lead, Prussian blue, small portion vegetable black.

Gold—white lead, middle chrome, burnt sienna.

Violet—red, blue, white.

Rose—white, Madder lake.

Salmon—white, Venetian red and yellow.

Copper—red, yellow and black.

Peach—white and vermilion.

Plum—white, blue, red.

Cream—white lead, chrome yellow, Venetian red.

Fawn—white lead, ochre, burnt sienna.

Carnation—white lead and red lake.

Dark Brown—Indian red and drop black.

Wine Brown—Indian red, Prussian blue, little chrome yellow.

Olive—yellow, blue, black and white.

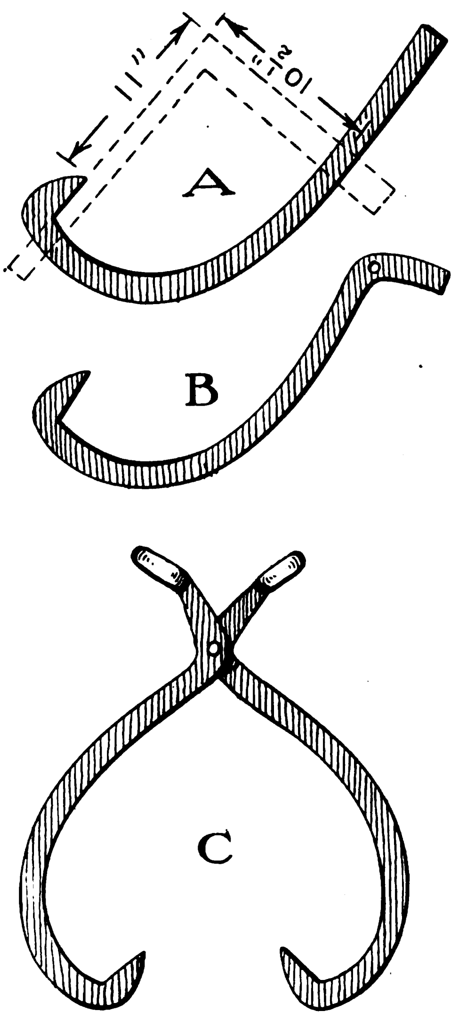
Grass Green—Prussian blue and chrome yellow.

Cheap Green—yellow ochre and vegetable black.

Wine Color—carmine and ultramarine blue. G. E. B.

Hardware Dealers—If there is a jobbing house in this country doing a good business with the country shops, should not the said country shops have some way to get back at the aforesaid jobbing house when the latter, doing a "cash in advance" business, sends the blacksmith a grade of goods so much below what is represented that they are worthless for the particular job for which it was ordered, thereby entailing delay and worry on the part of the smith in the country? He at present has no way to redress, unless he can get it through some paper, where he can warn his brethren against the swindlers.

On last 19th of October, I paid for a set of good wheels, C grade, standard pattern, Sarven patent wheels, tired, in the white. The wheels came covered with a coat of white lead, all the tires loose, three of them burned in the welding, and all of them more crooked at the weld than any tire I ever before saw, although the firm claims to



HOME MADE, SERVICEABLE ICE TONGS.

have facilities for straightening tires after welding. This is claimed in theircatalogue, misleading the smith to believe that the tires will be straightened after welding, although no such thing is done, however. I promptly returned the wheels, and through one excuse or another the wheels did not get back to me until February 10th, lacking just nine days of being four months since the wheels were paid for.

This being my first order with that firm, I of course sent the money with order. It is scarcely necessary to say it will be my last. RICHARD O'HEARN.

Ice Tongs—In answer to the request of Mr. J. F. Semple as to how to make ice tongs, the following is my method, which is satisfactory to every one of my customers. I take 26 inches of mild steel, seven-eighths or one inch wide and three-eighths or seven-sixteenths thick, according to the weight of the tongs which I desire to make, and forge as follows:

First, I turn the head in over edgeways and draw to a flat or chisel point. I then measure 19 inches from the inside of the head and make a center mark where the hole will be, bending the pieces so that they will look as at *A*.

The two pieces, for there must be two jaws, should be shaped so that when you lay a square on them, in line with the inside of the head, it will be just eleven inches to the corner of the square from point of tongs and 10½ inches to center of the bar at the center mark. The greatest bend should be about from four to eight inches from the hole. This will give a better chance to get down on the cake of ice. Next bend back at the mark so that it will look as at *B*.

I then weld the handles and punch or drill the holes. I use a small punch and stretch the hole to about three-eighths or $\frac{7}{16}$ of an inch. The handles I make out of ½ or $\frac{9}{16}$-inch round iron, bending and welding together. The distance between the handles and the hole should not be more than six or seven inches after they are welded on. The handles should bend back a little, as at *C*, so as to give room for a man's fingers without jamming together. PETER H. ST. LOUIS.

Tempering Gun Springs—In answer to J. Summs as to the mode of tempering gun main springs, will say that I have had fifteen years' experience and find that the best spring which I ever made was with a plain oil temper. He speaks of a cherry red heat and dipping in some chemical bath, but I have heard that these same springs break. The way I do it is to select a good piece of spring steel, not cast steel, as that is too hard. A piece of an old cross-cut saw does very well. Clean out your fire, burn your coal to coke and be sure that the sulphur is all out of the coal. Heat the spring to a light red and forge to shape. File or grind it smooth lengthwise with the grain of the steel, taking care that the grain is straight. Don't file or grind across it, as that will score it and cause a break. Have the spring of a gradual taper, perfectly true. Round off the square corners to lessen the danger of fire cracks, and it is ready for the temper.

To temper the spring heat to a dark red, dip in sperm or good lard oil, edgeways. Allow it to cool and then take out with a wire. Hold it over the fire until the oil burns off a number of times or until a small blue flame about an inch high stands, flickers and goes out. Now drop in a dish that has oil enough to cover it, about four tablespoonfuls; set it on the fire, and leave until oil is all out. Turn the spring on the ashes of the forge to cool and you will have a spring that will do its part, if you have done yours. E. C. JOHNSON.

The Gather of Axles—In reply to Mr. Nels Peterson, I will state that we haven't much grounds for an argument, although this is the first time that I ever knew of a factory turning out jobs of any kind of vehicles, without any gather on the axles. Mr. Peterson's explanation of the pitch of spindle, which gives the wheel a plumb spoke, is correct without a doubt, but that is quite different from the gather, if the axle is perfectly straight. The wheels will measure the same in front as at the rear. Now, if the wheel is on a plumb spoke it will play equally between shoulder and nut, while the axle is new, but after it is worn, if you will notice you will observe that the wheels begin to run to the nut, and certainly that will cause friction. Now, if you will take a job that is considerably worn, on which the axles have no gather,

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and measure them, you will find they are wider in front than at the rear. That explains the necessity of gather. Then after the spindle becomes worn, the wheels stand about the same in front as at the rear. I am quite sure here in the War Department, if we did not give the axles any gather, we could not hold our position. I think you can see clearly that a worn job needs gather. I served an apprenticeship in a factory in Burlington, where we built both light and heavy jobs, and all axles were given gather according to the height of wheels. My opinion is, for a three-foot, eight-inch wheel, it should stand one-half inch closer in front than at the rear. M. A. FOSTER.

A Kansas Letter—Not having seen anything printed from our part of Kansas, I will give a few facts about the work in this vicinity. Abilene is a town of about a population of 4,000 and the work consists principally of horseshoeing and carriage work. However, we are prepared to meet anything that comes along. In this section there is a large number of creamery stations, every one of which has attached a so-called blacksmith shop. They do most of the heavy, rough work very cheap and are welcome to it. This has been an open winter and we have enjoyed a very nice run of work. Prices are none the best, but we try to get a reasonable remuneration for our labor The following are a few of our prices:

Tire setting, buggy and wagon wheels, up to 2-inch	$ 2.00
Spokes, single	.25
Spokes, more than six in one wheel,	.20
Felloes	.25
Half-rim for buggy or spring wagon	.75
Shaft, one coat paint	1.25
Shaft, finished, painted	1.75
Buggy and spring wagon poles	2.50
Buggy and spring wagon poles, finished painted	3.00
Wagon tongues, oak	2.75
Wagon tongues, ash	3.00
Wagon axles	3.50
Painting	8.00 to 20.00
Side curtains, 28 oz. drill	2.50
Side curtains, 28 oz. duck	3.00
Bow sockets, single	.75
Horseshoeing—factory shoes plain, per pair	.75
Bar shoes, per pair	1.00
Hand turned shoes, plain	1.00
Hand turned shoes, weights	1.25 to 2.00

We consider that we have one of the best horseshoeing shops west of the Missouri river. H. A. LOTT.

To Make Dividers—I notice the query in March issue of THE AMERICAN BLACKSMITH by Thos. Long with regards to making dividers. About the quickest and perhaps the best way to make a pair of blacksmith's dividers is to take a stump joint. You then have the knuckle already made, cut down with file or on emery wheel, as indicated by dotted lines in figure at *a* and *a'*, as it is difficult to forge close to knuckle without getting it out of shape. Then spread joint till straight, and forge to shape as shown at *b*, *b*. Make a thin flat punch and punch holes equal distances from knuckle, as shown at *c*. Having this done you can weld pieces of steel on, say axle steel, at *d*, and draw to taper the desired length. Then drill a three-sixteenths inch hole through shank at *e*, for rivet, and another hole about one-eighth inch, at *f*. Cut thread through same. This hole should be drilled clear through, as it would be difficult to cut thread without running the tape through the entire thickness; you would also have the advantage of using either side for set screw. Then make the bar *g* about three-eighths inch wide by one-eighth inch thick, and bend it slightly, not necessarily to a true semi-circle, as the joint at *e* allows it to adjust itself to the spread of the compasses. The set-screw *h*, should be made of soft steel, tire steel will do, three-sixteenths inch, with a flat head, for tightening up when setting compass. I made one in this manner about ten years ago, and it is as good today as when new, and it has seen some extremely rough usage, too. NELS PETERSON.

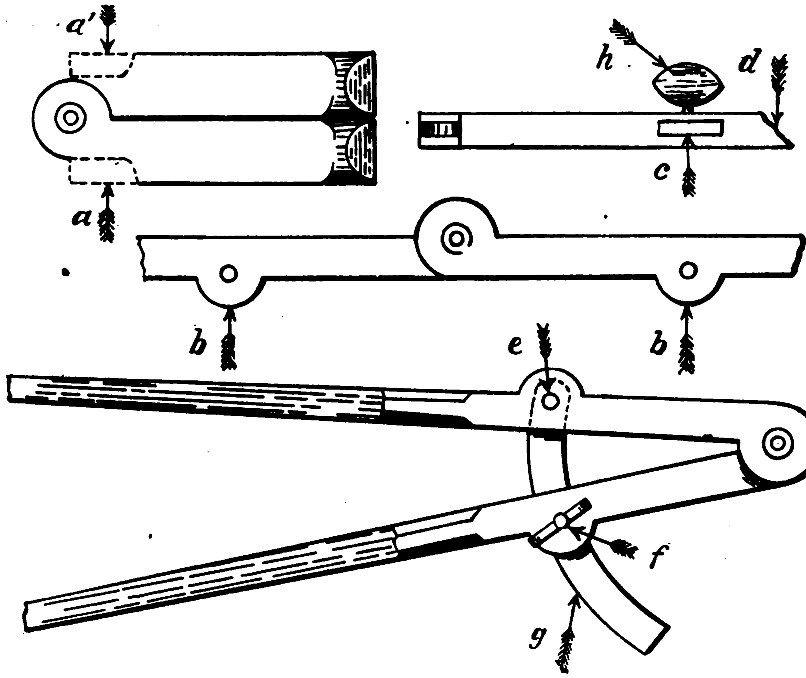
An Interesting Letter from Colorado—I have been a subscriber to THE AMERICAN BLACKSMITH for the last two years and find it a great help to me. I have been at the trade for thirty-two years and have yet much to learn. I have made a study of horseshoeing for over twenty-five years and find that a shoe that will cure one horse will not suit another for the same fault. I think the Essex Rubber Pad is of great benefit out here where you can find corns on horses' feet that have never worn a shoe. Sometimes a bar shoe is of benefit, but more often I find for all troubles, a foot trimmed level and shod with a plain shoe fitted properly to the foot, will prevent or overcome interfering nearly as often as if fitted with these new-fangled shoes which do not fit the foot. Some of our prices are as follows:

Horseshoeing—	
No. 0 to No. 3, per set	$ 1.75
No. 4 up, per set	2.00
Hand turned shoes	2.50
Bar shoes, per pair	1.50
Buggy tires, per set of four	3.00
Wagon tires, each	1.00
Steel plow points, each	.25 to .50
New tires, per set, ⅞ x ½	8.00
New tires, per set, 1½ x ⅝	10.00
New tires, larger than above, extra per set	2.00
Axle stubs, per set	10.00, 12.00 14.00
Single buggy shafts	2.00
Cross bars	1.50 & 1.75
Singletrees	.75 & 1.00
Express shaft	2.50
Wooden axles, each	4.00 to 5.50
Bolster, front, wood, each	3.00
Bolster, hind, wood, each	2.50

I have three men working in my shop besides myself. In January we set 150 tires, and in February up to the 20th, 134. We also do a great deal of rubber tire work, using a Morgan & Wright latest improved machine, which we find a very good machine for the work. If there is a better one, I would like to hear of it.

I am also very much interested in the Lien Law and trust that we may soon have such a law in Colorado. I also hope that the time will soon come when every blacksmith, wheelright, and horseshoer will have to stand an examination and have a diploma in order to start a shop, or even to work in one. Then the craft could get prices for their work on which they could live as they should A. M. MCGEARY.

Tire Query Answered—John G. desires to know how much draw he should give a tire in resetting. This depends on the condition of the wheel, as to whether it is perfectly dry and the hub is sound. Old wheels with soft hubs and a good deal of moisture need more draw to get the wheel in good condition than a dry one. There is no particular rule and the smith has to depend upon his own judgment. We will, however, assume that a wheel is dry and rim-bound. Saw through the rim in one joint, and then in the other to keep the wheel round, and drive the rim down on the spokes with a very light hammer. Saw the rim till it is open about three-thirty-seconds inch, and put in a little wedge to keep open. Measure from this point around the wheel to the other edge of joint, upset the tire to the right of the joint holes on one side, and to the left of the joint holes on the other, thus bringing the bolt holes in the tire to correspond to the holes in the rim. Roll the tire if you have upset a little too much, draw out a little of it, having the tire measure just the same size as the wheel, allowing what heat there is in your two upsets for the draw, which is generally about three-thirty-seconds of an inch or what you sawed out. This is for carriage and buggy wheels. The more you saw out of the rim, the more dish you will have. I have set express wheels that wore out the tire without resetting, using this rule. Most wheels are strained by setting the tire too tight. Don't roll the wheel in a trough to cool tire, as this draws one side too quickly.



METHOD OF MAKING A PAIR OF BLACKSMITH'S DIVIDERS.

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Set it up and let it cool, after which burn out the bolt holes a little and bolt up. When the tire is the same size as the wheel, there is drawn enough for a new wheel. Express and heavy truck wheels need more. Try it. E. C. JOHNSON.

Iron Boot for Cripple—I made an iron boot, or stool as I called it, for a young man, that I think will answer Mr. Semple's purpose. It was adjusted on the sole of

IRON BOOT FOR CRIPPLE.

the shoe with small screws. I took an old handsaw blade and cut out a piece the size and shape of the sole and heel of the shoe, and fitted it to the sole. Taking two pieces of one-quarter inch tool steel, I bent and riveted them to the sole piece as shown. PETER H. ST. LOUIS.

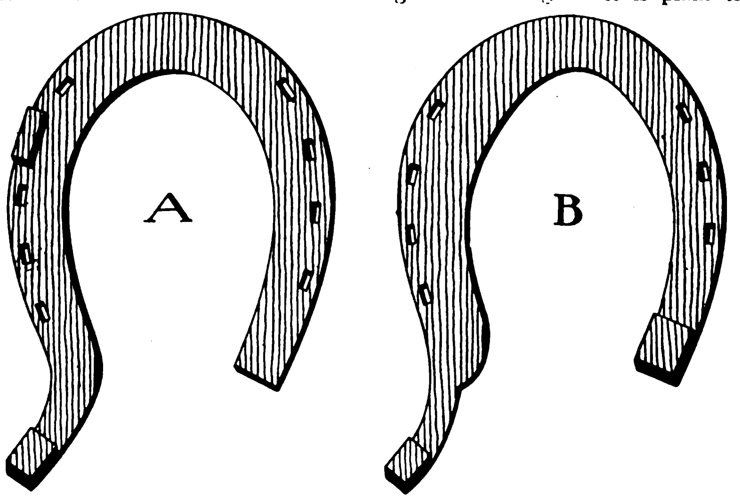
Organizations of Blacksmiths—I have seen much about organized blacksmiths to regulate prices. I make a fair price on everything, guarantee the best work in the shortest time, regardless of the other fellow, and if my price does not suit, the customer can go to the cheap man, which he sometimes does. But as he only causes a breakdown somewhere else, it is money to me, as the customer generally comes back and gives me the job the next time. I believe my way is right. I am running shops in two towns, employing from ten to twelve men. My idea is that if a brother smith will put up a fair price and then do his work right he can hold his trade anywhere. U. No.

With Regard to Prices—I have read M. A. Foster's plan to remedy low prices. He says in his opinion, the plan which would be ahead of any other for the benefit of the craft is to get a law enacted to compel every wheelwright and blacksmith to stand an examination relating to his trade. On passing such an examination, he would be given a diploma, which would entitle him to open a shop. Now, I have read the articles of Mr. Foster and Mr. Peterson and have been very much interested in them, as both are very capable men. But they do not agree on all points, for in the February issue they disagreed as to the setting of axles. Now we will suppose Mr. Foster was to be examined and Mr. Peterson the examiner. What would be the result? Would Mr. Foster have to close his shop?

We live in a small country place situated about six miles from the city of Oswego, N. Y. I began work here in 1870 and have been here ever since. Several times persons have opened a shop and cut prices. We paid no attention to them, and when a customer came to us and said that he could get his work done cheaper at the other shop, my answer always was, "Go and try them. We do our work as cheaply as we can afford, and if they can do it for less, I would go there if I were you." But as Mr. Foster intimates, men who cut prices are not skilled workmen. No one will find it out quicker than the customer. The result is that the price cutter moves to some other locality, and we are still here, the only shop in the place, and have been so for the last fifteen years.

We never cut prices or make private bargains. I think that will ruin a shop quicker than anything. If a man asks me to do his work for less than our price, I say I cannot do it, for if I should do his work for a less price, I would do so for everyone else, for to charge one man one price and another man a different price would ruin my trade and drive me out of business. Let the customer be the examining board. MONROE HUBBARD.

Shoeing for Interfering—With regard to D. W. Cryce's question on interfering, in the October number of THE AMERICAN BLACKSMITH, I will say there are a great many different causes for interfering, and also a great many remedies. My way is first to balance the foot, that is, trim the foot perfectly level, not only on the bottom, but see that the foot is trimmed so that when it is on the floor it is level and in perfect line with the limb. This must be done before you can hope to have success with shoeing any faulty-gaited horse. For instance, if the foot is trimmed with one heel high on one side or the other, it will throw the leg out of line at the knee, about five times the difference in the height of the heels from the floor to top of hoof. After you have trimmed the foot level and have it perfectly in line, fit your shoe perfectly to the foot, and you will have no further trouble. If with an ordinary shoe it does not stop, put on a sideweight shoe, weight on the outside, but I will not recommend a sideweight except in extreme cases. There are many ways of correcting this fault, such as paring the outside of the foot down low and leaving the inside high and many other such preventions, but you can readily see that is throwing your horse out of balance instead of balancing him up. I will also state in case the foot is worn down so you cannot trim it level it must be done by calking the shoe. For instance, if your outside heel is low and you can't trim the inside down to it, turn your outside heel calk high enough to bring the low heel to a level with the high one.



EXCELLENT SHOES TO REMEDY INTERFERING.

With regard to the question of the pacing horse, or what is called cross-firing, it is a habit commonly found in pacers. In shoeing, trim the foot level, being sure the foot is perfectly balanced, then turn the shoe as follows: First, turn an ordinary shoe between the toe nail and the second nail on the outside. Weld on a spur, as shown in drawing at *A*, turn a low calk on the spur and a low calk on the outside heel—no calk on inside heel. Apply this shoe to the hind foot that does the striking. The shoe can be made any weight desired. If this is followed, you will have no trouble in either case. My trade is mostly with track and road horses, and I have all kinds of faulty gaits to correct. This principle of shoeing you will find will work on all kinds of fautly gaits. First level the foot, have it in perfect line with leg and you will have no difficulty in correcting the horse's gait. I have made a study of scientific horseshoeing, and will gladly give any information I can that will be of benefit to a brother smith. I should like to hear from Brother Cryce what success he has, after he has tried these principles of shoeing L. H. PINNELL.

Gather on Axles—I note the criticism in the February issue on my position on the gather of axles by Mr. M. A. Foster, and he asks for an explanation, but there is really nothing to explain, since he admits that the principle is correct on new work, this being the kind my article dealt with. The question is rather to the point, however, and I feel that I ought to answer it, since otherwise, it might appear that it was mere talk and nothing to it.

I wish to state first that my reference was to vehicles of light build. The taper of the spindle on axles for this class of work is very slight and the pitch in the axle which is necessary to obtain a plumb spoke gives the bottom line of the spindle a slanting position to a line drawn through the center of the spoke. It is this slant, together with the pressure of the load from above, that crowds the wheel to the collar, and renders gather unnecessary. But suppose we reverse the position of the axle or turn it bottom side up In this position it is plain that the wheel would slip off when the vehicle was in motion. Let us try an experiment. Fasten an axle in a horizontal position bottom-side up, put on the wheel and set it in motion. While I am not an authority on the law of gravitation, it is apparent from a mechanical point of view that the weight of the wheel would carry it to the collar. This holds true with the axle in the proper position and the weight bearing downward. Another objection to gather is seen on a job standing on the floor,—a glance along the side of the wheels makes the rear axle appear shorter than the front one. To overcome this, some smiths make the rear axle a little the longest, but then what about the track?

I do not comprehend the logic of Mr. Foster's argument. He says when the axle becomes worn and lose in the boxing the wheel drops back and adjusts itself to the spindle. This being true and the wear on the spindle has been even from the collar to the nut, for what reason should the wheels be wider in front than in the rear? Mr. Foster, it is up to you now to explain the above. NELS PETERSON

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THE AMERICAN BLACKSMITH

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Of Interest to Power Users.

The gas or gasoline engine prize article contest closes May 5th. Belated articles, however, mailed so as to reach us Monday, May 9th, will probably be in time. The prize award will be announced and the best articles printed in the June issue. It is intended, therefore, to make that number of special interest to all engine users. If any reader has any questions to ask about engines or power, or any difficulty he would like an explanation of, let him mail his question to the Editor so as to reach Buffalo by May 9th, and we shall endeavor to publish a solution of his difficulty in the June paper.

The Question and Answer Columns.

It is our wish to again call attention to the "Queries, Answers, Notes" department, which occupies the last few reading pages in each issue. The main purpose of this department is to be of service to readers, and afford them an opportunity of asking and answering questions, or of giving opinions upon anything printed in our columns. Criticisms, questions, answers and comments on topics of craft interest will always be gladly received for publication. We desire to have readers feel that THE AMERICAN BLACKSMITH is *their* paper, published at all times for their benefit.

Subscription Contest.
Prize Award.

On April first closed the prize contest for securing the greatest number of new subscribers to THE AMERICAN BLACKSMITH. We are pleased to announce the award of the twenty-five dollar prize to Mr. E. R. Raymer, of Johnstown, Pa., who sent in 73 subscriptions. The contest was a most vigorous one, and an unusually large club was required to take the prize. As in all other similar contests of THE AMERICAN BLACKSMITH, no one drew a blank, the prize being in addition to the regular cash commissions which are offered at all times in return for the trouble of procuring new subscriptions.

Send In a Photograph of Your Shop.

Is your shop conveniently arranged, well equipped or neatly kept? Send a photograph of it to the Editor of THE AMERICAN BLACKSMITH for publication in these columns, if you have a picture or can get one taken. The boys like to see what kind of shop the other "fellow" has and how it is arranged. Such shop photographs are among the most interesting items appearing in these columns. Send interior views if possible, showing as many of the tools and machines as possible, and add also a description of the shop, its equipment and the work that is principally done.

Population Estimates.

The Census Bureau has just issued a bulletin which gives the estimated population of the United States for 1903, exclusive of Alaska and the insular possessions of the United States, as 79,900,389. This is an increase of 3,905,814 since the census of 1900.

According to these estimates, New York is now a city of 3,716,139 inhabitants; Chicago of 1,873,880 inhabitants; Philadelphia has 1,367,716; St. Louis has just passed, and Boston has almost reached the 600,000 mark; Baltimore has 531,313; Cleveland is ahead of Cincinnati, which cities have 414,950 and 332,934 respectively. Buffalo is credited with 381,403; San Francisco with 355,919, and Pittsburg with 345,043. Detroit, Milwaukee and New Orleans have just passed 300,000, and Washington is close to that figure.

In the number of towns and cities having over 10,000 inhabitants, Massachusetts is in the lead, with 47, containing a total of 2,197,706 inhabitants, but this total of urban population of course is not as large as that of New York, Pennsylvania and Illinois. Considered by States, New York leads in population with more than seven and a half millions.

The Outlook in the Steel Trades.

The regular quarterly statement recently issued by the United States Steel Corporation is interesting, as showing the condition and prospects of this most important branch of the country's trade. While the earnings for the quarter ending with March, $11,263,241, were less than for any quarter since the formation of the trust, the indications are that business is regaining its former activity, the unfilled orders at the end of March exceeding by nearly 920,000 tons those on the books at the end of September. The demand for pig iron is steadily increasing, as is that for steel also. In finished iron and steel the outlook is very favorable, though the structural steel market continues quiet under the influence of labor troubles. The railroads still continue to purchase light for pressing needs only. It is safe to say that the iron and steel industries are picking up, leaving little occasion for worry as to the outlook. We usually look for an impending Presidential election to exercise a quieting effect on trade, but the indications seem to point to this being a much less potent factor in trade conditions than it generally is.

Altogether the trade outlook is most

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encouraging. Let us hope that the blacksmiths will enjoy their share in the prosperity.

A Four-fold Iron Entrance Gate.

The accompanying illustration shows an ornamental iron entrance gate which was manufactured by the J. E. Bolles Iron & Wire Works, Detroit, Mich. for the City National Bank, San Antonio, Texas. It will be observed that these gates are made four-fold in order to diminish the space occupied when the gates are open during the day. The frame work and hinges are sufficiently strong to prevent any sagging, and the design is such as to give a pleasing effect. The ornamental leaf work at the center is provided with a neat brass monogram. The closing and locking device was carefully looked after, making the gates, when in place, both ornamental and durable.

Talks to the Jobbing Shop Painter.—14.

M. C. HILLICK.

Graining Walnut, Mahogany, Rosewood.—How the Various Grounds are Prepared.—Graining Colors Used.—Tools Required.—Directions for Doing the Work.—How to Learn the Art of Graining.—Opportunities Offered, etc., etc.

A subscriber of THE AMERICAN BLACKSMITH desires to know how to paint a buggy body the different colors they are painting some now. That is, they are painted dark with red streaks in them. Inasmuch as this is a topic of general interest, it has been deemed proper to incorporate the reply under the above caption. What our correspondent refers to is merely a "fad" fashion which for the past 18 months has prevailed in some sections of the country, and as "fads" go, they may be here today and gone tomorrow. This particular fashion embraces painting the bodies in walnut, mahogany and rosewood, the latter being especially popular in the South.

The imitation of these woods upon carriage bodies calls for expert skill as a grainer, and the average carriage painter would make a poor showing along this line of work without having received any previous instruction and practice. The graining is all done, or should be, in distemper, because smoother surface effects may be obtained, and because, moreover, the woods mentioned may be more accurately imitated in distemper than in oil. Indeed, it would be unsafe to apply oil graining upon a surface brought up and rubbed down on hard brittle roughstuff coats. The surface would have a right to crack and fissure to an ugly depth, an operation it would speedily undergo.

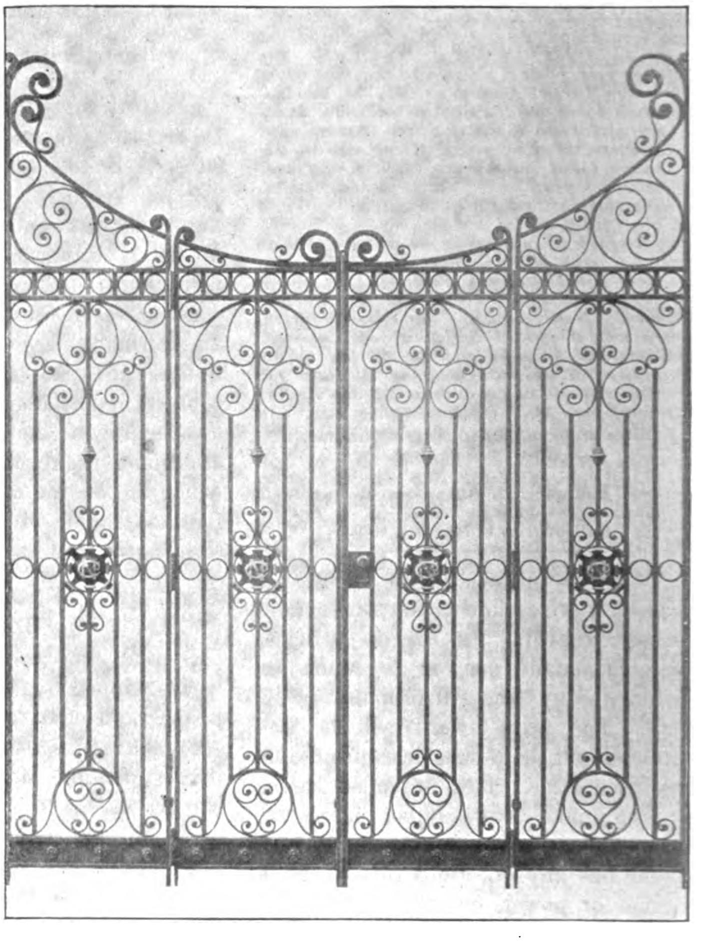
To prepare for the graining, bring the surface up in the usual way—that is to say, apply the regular filling up and roughstuff coats, and rub down with fine rubbing stone.

For rosewood, make the ground black. For mahogany, the ground should be a bright orange to make which, add enough red lead to chrome yellow to deepen the desired shade.

For walnut, a drab-brown is required. To make this brown add equal proportions of finely ground yellow ochre and Venetian red to flake white to produce the shade desired.

The graining color for the walnut should consist of Van Dyke brown, 3 parts; Indian red, 1 part. Wet the ingredients up in stale beer. The ground colors should be mixed to dry flat and thinned with turpentine sufficiently to be applied with a camel's hair brush.

To grain walnut, saturate a soft sponge with the distemper color, then squeeze out the excess of color, and wipe the surface over very quick. Then beat out the color with a mottler, striking the brush softly upon the surface, and aim to bring out all the peculiar under grain and tracings incident to this beautiful wood. Next graze the surface with a mixture of raw linseed oil, pale drying japan and turpentine. This should be applied with a camel's hair brush, and is used to set and hold the color in place. Now take the Van Dyke brown alone and having wet it up in the stale beer to the proper consistency, saturate a clean, soft sponge with the color and wipe over the surface. Once the color is wiped solidly over the surface, draw a piece of chamois skin over the thumb or finger and proceed to wipe out the lights. Then with a piece of hickory shaved thin, 1 x 4 inches, and technically known as a blaze stick, run the stick out the full length of the panel. Now with a blender, a brush especially made for the purpose, blend in the color or wipe it out as it is found necessary to develop the splendid lines and graceful waves and curves natural to the mature walnut. Seek to blend out the prominent grain of the wood in a way to bring forth the brilliant black tracery and soft warm shades of brown always a part of a walnut panel. It will be understood that these various operations must necessarily be completed very quickly, and if the work should prove unsatisfactory, you have only to wet up the color and try over again. This feature is one all-important advantage in favor of distemper graining, and enables the beginner to try and try, until he becomes familiar with the various operations and succeeds in making them at least fairly successful.



A FOUR-FOLD ORNAMENTAL IRON GATE.

After the work with the blender has been concluded, rub the surface over gently with the palm of the hand, applying a light uniform pressure which

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serves to tone down and soften the texture of the graining.

The ground for mahogany is made of chrome yellow and orange red lead, using sufficient red lead to deepen the yellow to a bright orange. The directions covering preparation of the ground for walnut apply also to mahogany. It should always be understood that a defect in the ground cannot be corrected with the graining color or after this color has been applied.

The graining color should consist of burnt sienna, 2 parts; Van Dyke brown, 1 part, wet up in stale beer. The directions for graining walnut apply likewise to mahogany. The blaze stick is, of course, used less freely, the blazes of the wood running shorter and less regularly than in walnut. Otherwise the grain is made very similar to that of walnut.

For rosewood—a very difficult wood to imitate closely—make the ground a dark, reddish, warm brown. The graining color should consist, for this ground, of Van Dyke brown lighted up a bit with burnt sienna. Rosewood has a grain that runs full and regular for a little distance only to end in a snarl of knots and dark, sombre knobs, then disappearing in a stately sweep of rich wood colors. After applying the graining color, mixed in stale beer, with a soft sponge, use the top grainer and a camel's hair pencil to develop the grain and conformations of the wood as desired. Then for an enrichment of the graining color proper, and to give it depth of brilliancy, glaze the surface with madder red, using just enough of the red in thin varnish to stain the red. Some grainers use a dead black ground for rosewood. Then with stale beer wet up dry drop-black and wipe on with a sponge. Then with a top grainer and camel's hair pencil, work in the grain. Then glaze with rose pink and asphaltum and wipe out knots, and lights and shadows, to match the wood.

It will require close study of the peculiar characteristics of rosewood to enable the inexperienced grainer to produce a first-class imitation of the natural wood. To handle distemper colors successfully over large surfaces, the work should be done in a cool, dry room, quite free from draughts of air. In a warm room the color sets up too quickly for easy or successful manipulation, a fact that should always be taken into consideration.

In case it is necessary to work in overgraining, it is well after stippling and working in the fine under-grain, to glaze the surface with a mixture of raw linseed oil, pale coach japan and turpentine, to fasten this part of the graining. Then when this coat is dry, proceed with the necessary over-graining, which consists in bringing out the prominent grain, and the lights and shadows of the design.

There are numerous mechanical devices in use for graining the woods above mentioned, and others, which are recommended to imitate all growths of wood and work in any color and to be successfully handled by the most inexperienced. For information concerning these tools, we would advise our correspondent to write to "Stencil Treasury," 209 E. 59th St., New York.

Perhaps the best way to study the form and color of the grain of any wood to be imitated in graining, is to procure panels of veneer of the woods desired. Obtain at least two panels of each of the woods to be studied, and one of each finished up, leaving the second one unfinished. This will afford the means of a comprehensive study of the various woods in their natural and finished state which is, in fact, the most instructive and practical method of studying them.

The jobbing shop carriage and wagon painter should at least be able to do a fair class of graining, for today many business vehicles of the paneled top style have interiors grained in imitation of different woods. Moreover, a knowledge of the grainer's art will be the means of giving him employment during dull seasons when otherwise he might be idle.

A Few Essential Points in Wagon Building.

Prize Article.

JOHN BRECKINRIDGE.

Wagon building covers a wide and varied field, so I will only attempt to mention what I have found to be the most essential points.

First find out what kind of work is expected of the wagon and the kind of roads it has to travel over. Next make it as light as possible to stand the loads without undue strain, as over-strain on anything soon depletes its lasting qualities. Next use nothing but white oak or hickory, well-seasoned, but not kiln-dried, as that makes it brittle. These are three good points to begin with, which I term the foundation. It matters not how good the other part is, if the framework is poor, it will be a failure clear through. In other words, what good is the upper part of the body if the material in the sills is poor, or the running gear if the coupling pole is bad and the axles common?

I have been building wagons of all kinds for twenty-two years, and am now in a great trucking district. The wagons consist of one horse, three-spring; two horse, four-spring; and two horse, six-spring, and are of a high standard. They make forty miles a day, and have the biggest loads, so you see we have to make them good. In building these wagons, we usually make the body first, which is 10 feet 6 inches long, by 5 feet 6 inches inside. The sills are 1⅞ inches thick by 3½ and 4 inches wide, with four mortised cross bars in the bottom, one at each end, and one over each spring. Sometimes they are plain, and sometimes panelled, the panels being one inch by ¾, chamfered, with solid fillers in corner and flaring sides with five strap irons to each side. Then I made my axle beds, which should be 3¼ inches deep in front under fifth wheels, so in mortising through for the hounds the strength of the bed will not be destroyed. In mortising your front bed piece for the hounds, cut it ¼-inch lower at the back of the bed than in front, so that the hounds will pitch upward in front, which is necessary in order that the tongue will not set too low at the joint. After wearing awhile, the back bed in the center should be 2½ inches deep, and a part where the springs rest should be 3 inches deep, thereby adding strength to the axle where it is most needed. After shaping my axle beds to gauge, I then take up my axles in two parts, right and left, and shape them to the beds. You have to heat them of course.

I then lay them aside and run my tires, with one front wheel and one hind, allowing three times the thickness for the weld. I bend my gage to the wheel, if I have no pattern that height. You can easily make one by taking a soft piece of board about twenty inches long and placing it against the wheel, marking under and above with pencil and cutting down. I do this bending by gage, and find it pays, as it prevents straight or flat places in your tire, which when put on often burns itself into the rim, making a bad looking job. This is my method, and I find it pays to be particular when it gives good results.

Next I proceed to weld, which is not necessary to discuss. After welding tires and putting them on, this gives me the exact dish of my wheel. I can find my length for the axles by laying straight edges across the face of the wheel and measuring to the back of the hub whatever length this is, whether six, seven or eight inches, and doubling it

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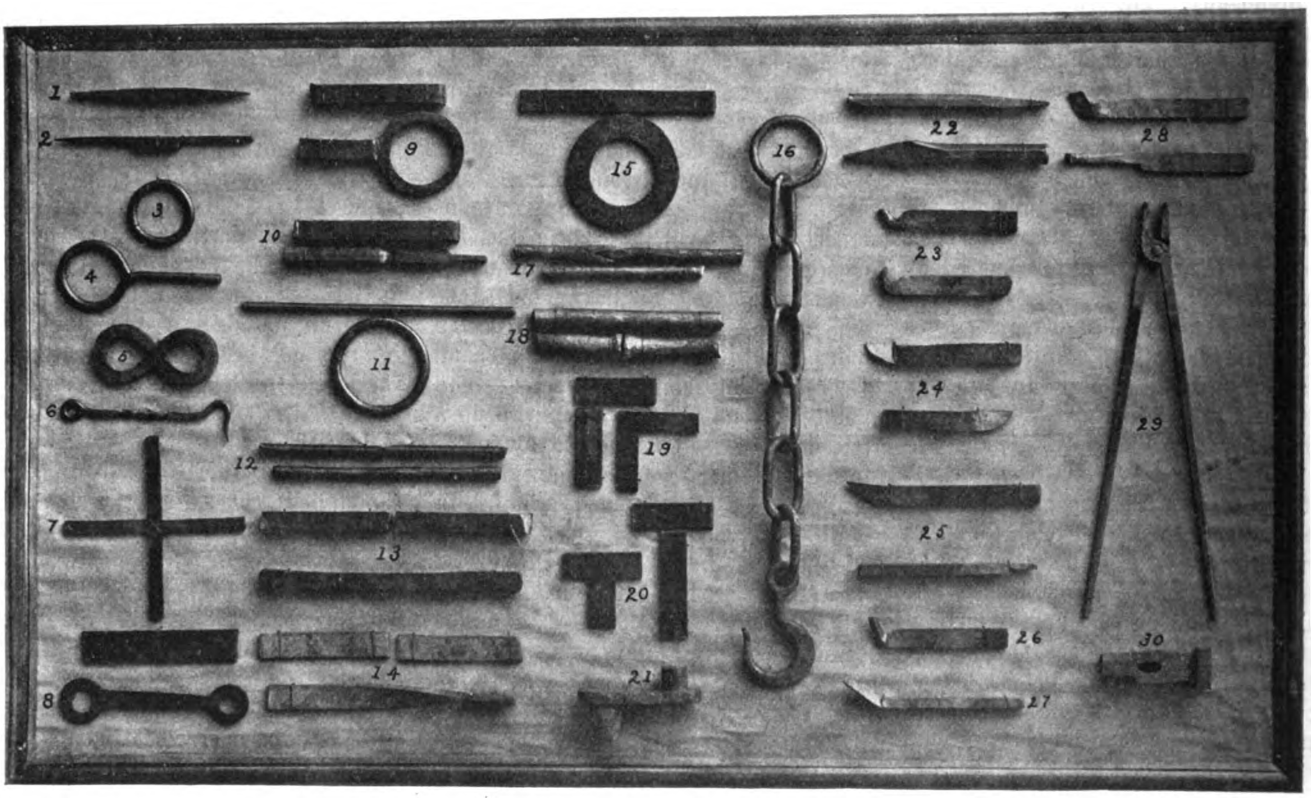
to give both sides twelve, fourteen or sixteen inches, or whatever it might be. Deduct it from your standard tracks. (Mine is 65 inches, and if say we deduct 16 inches from the 65 inches, it gives 49 inches between collars.) Then add one inch for swing, making your axle, say 50 inches between collars. Now give this swing at top, enough so that when your wagon is loaded your wheels will be only $\frac{1}{2}$-inch wider at the top than at bottom. An axle set like this creates little or no friction. An axle set like this will also hold grease six to eight days. Of course you must use good axles. Concord solid collars I find the best. The spring bars are two inches thick by seven or eight inches wide. It is better to be a little heavy so you can let the spring upon them without weakening them. Always let the bolts that fasten the spring bar to the spring go through the sills of the body if possible, then in case one breaks you do not have to lift the body, entailing much time and labor. The doubletree ought to be two inches thick in such wagons, and four inches wide in the center and four feet long. This gives a good length single-tree, which prevents rubbing of the animal. The hounds should take tongues four inches wide at the front and three inches at the back. Our tongues are all 9 feet 6 inches long from point of the hounds. I use 3-feet 4-inch and 4-feet 4-inch wheels for two horses, $1\frac{7}{8}$ spokes, $2\frac{3}{4}$-inch and 3-inch tread, and $\frac{5}{8}$-inch tire for this kind of wagon. The coupler pole should be 5 feet 10 inches or 6 feet long, thereby letting the front wheels turn under the body without rubbing.

In bolting up or putting the work together, always bore the holes the same size as the bolts, or else it will never stay tight. Let a new job work loose all over and it will soon be a wreck as you well know. I have wagons running now for ten years without a bolt getting loose.

Pay attention to the details, and the job as a whole will take care of itself. Good stock, intelligent designing and careful fitting are the essential points. The good smith holds every customer.



SPECIMENS OF FORGING EXERCISES EXECUTED IN THE CLARKSON SCHOOL SHOP.

Forging at the Clarkson School of Technology.

W. S. GRAFFAM, SUPT.

At Potsdam, in the northern part of New York State, within nineteen miles of the St. Lawrence River, and somewhat over one hundred miles from Montreal, is located a technical school which has come to occupy a position in the front rank with those preparing for engineering professions. The Clarkson School of Technology carries on educational work similar to that of other representative technical schools of the country, and is included by the United States Civil Service Commission in the list of approved techincal schools, diploma from which entitles the holder to promotion in the Engineer Department at large. Its graduates from the four years' engineering courses receive the degree of Bachelor of Science from the University of the State of New York, with which the school is affiliated by its charter, granted in 1896. The young men who have gone out from the school in the four classes thus far graduated are doing credit to the professions in which they have engaged, and are coming to occupy positions of trust and responsibility.

The work of the four years comprises instruction in language and literature, the applied and economic sciences, mathematics, engineering and technology. Included in the latter are the courses in workshop instruction; woodworking, wood-turning, and pattern-making, iron and steel forging, moulding and foundry practice, iron work at the bench, machine tool work and mechanical construction in machine shop practice. In all of these classes of work the shop exercise system is employed to familiarize the student with the elements of constructive mechanics. Final project work is required, exercises from the students' own designs or otherwise assigned. The student is daily acquainted with the economies of time and material required, by using the shop order card system of accounting for the same.

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The course in forging is planned to teach the students the fundamental principles of smith work and the heat treatment of iron and steel. It affords that combined training of the mind, the hand and the eye, which is so desirable as the result of well-developed courses of work-shop instruction. This is accomplished by a carefully-graded series of thirty or more forging exercises.

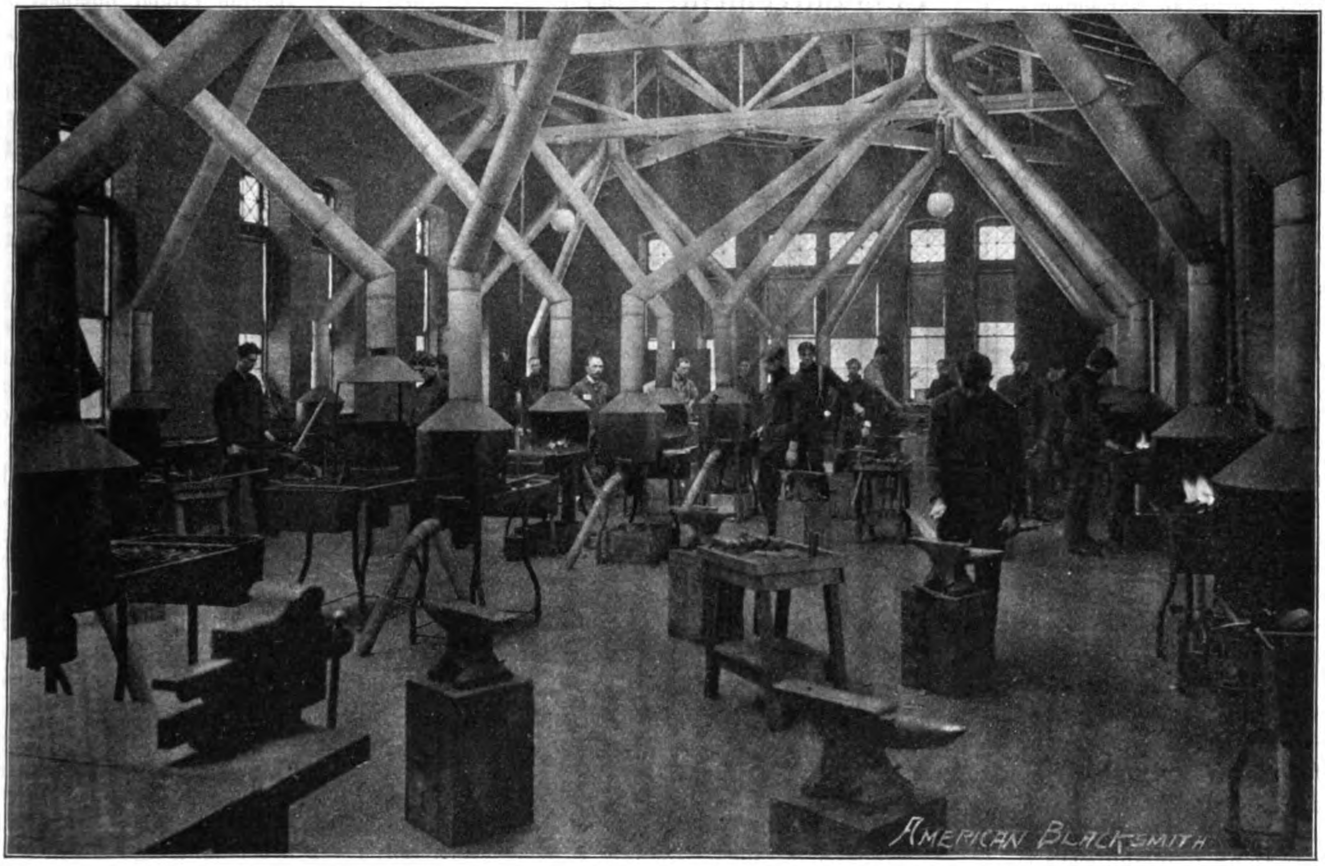
The forge shop of the school is well equipped as follows: Twenty-four forges and anvils, and the necessary small tools; shears for cutting hot or cold metal, blacksmith's drill, bolt-header, vises, swage-block, work benches and a case of draws in which students keep small tools and finished exercises. At one end of the shop is a suitable store room where the iron, steel and other supplies are kept. The shop is well lighted by large over-head skylights.

The exercises are graded in a way to show the students, step by step, the principles and successive processes of the work. The first exercise is to draw out a piece of one-half inch square Norway iron to a flat edge at one end, a square point at the other. The second exercise is similar to the first, but requires swaging over the corner of the anvil. The third introduces bending in forming a ring out of round iron. The fourth is a compound bend to be worked.

Throughout the entire course the student is carefully shown the several processes, illustration and application of the principles of forging. These comprise drawing out and pointing, swaging over corner of the anvil, bending, twisting, splitting, punching, drawing out a ring to larger diameter; forming round, hexagonal, octagonal and rectangular shapes from the square; welding in different ways such as ring, lap, split, chain and butt welds; the making and tempering of tools, including a complete set of cold chisels and lathe tools to be later used in machine shop work. In tool making the student is required to dress over an old, worn out tool of each kind, also to make a new one like it. Aside from the above, many special tools are made by the students and special forgings for repairing old or making new apparatus for the school.

In the accompanying cut the exercises are arranged to show the sequence of the work as numbered, beginning at the upper left hand. In many cases the piece of stock from which the exercise is made is shown with the finished piece. Each exercise is first made and fully explained by the instructor before the class, and the points where the student is liable to have trouble are pointed out. The students are also supplied with blue prints of the exercises and importance is attached to following details and dimensions. During the course in forging, several lectures are given on the manufacture of iron and steel, and the composition and heat treatment of the same, in which students are required to take notes.

In this way the course is practical and educative and the quality of work done has fully justified the methods pursued. Thoroughness is aimed for at all times.



INTERIOR OF FORGE SHOP, CLARKSON SCHOOL OF TECHNOLOGY.

An Axle Gage.—Disc Sharpening

ANDREW COBA.

I have an axle gage which I consider most handy and very easy to use. It is always ready. It has a straight edge long enough to reach from end to end, and four screws in each end and one side. I use one for top gather, and the other for back gather. I take the gage and set my screws to the old axle. Then set the new stubs by that and I have never had a word of complaint. I adjust the screws to fit tight.

I have always had a great deal of trouble with my disc sharpener and could not keep my bits from heating until recently. This spring when I received a disc to sharpen, after using up one bit, I thought of putting water under the disc so that it was in the water about two inches, thus keeping the bits from getting hot. I hope this will be useful.

The Progressive Smith as a Business Man.—8.

The Foundation of a Contract.

BILLY BUNTZ.

By understanding the elements of a contract the progressive smith becomes shrewd, as he is enabled to make agreements so they will favor himself while having his customer fully agree to have a job done and to pay the cash into hand. A smith not shrewd might guarantee a job for a lifetime and even forget to have his customer agree to pay for it.

The principal requisite in making a profitable contract, whether it be a verbal understanding or a written agreement, is to promise little while completely binding the customer to strict terms. Some smiths, being enthusiastic, are prone to guarantee a job to their own detriment, simply because they can do excellent work, or to put the price exceedingly low for fear the customer will back out; whereas, it were better to politely refuse such jobs. As a rule, the higher a job is guaranteed, the more the customer expects or demands, while a low price leads him to think it might perhaps be done still cheaper. The guarantee should be only a general statement, the price plenty high to admit of say 25% or 50% profit when taking into consideration the wear and tear on tools and machinery, rent of shop, etc.

To get some customers in the proper humor for having a job done or entering into a contract requires considerable knack, hence the progressive smith studies his business, his customers, and uses shrewd methods. He does only small jobs on verbal agreements, while those amounting to several dollars or where the obligation cannot be fulfilled for a week or so, he puts in writing. Generally speaking, a written contract *proves itself*, while a verbal understanding is apt to become misconstrued where it covers a big job or considerable time elapses before the work is completed. All folk are not honest, some will lie for gain, others change their mind frequently, while some may agree to the price at the time but afterwards say they misunderstood, or that the job was not as good as promised.

The shrewd smith makes a verbal contract thus:

"Want a *good* job done?" he asks, examining the horse's feet and waiting for his customer to bite.

"Certainly, the best you're capable of."

"A bad pair of feet," he continues, as he plumbs the animal's leg.

"Well, pare the hoof down or level it up."

"That won't allow him to work to advantage or give him much speed. He interferes—has a heavy cross-fire. The way he is now he might trip and break a leg or become stiff-kneed by a sudden wrench."

"Any way to remedy that?"

"Special shoes will help him—maybe in time put him to handling his feet much better. They're the proper thing. Fixed Wilson's horse that way and he says it's doing well. 'Course, costs a little more, but is likely to prevent his stumbling and really pays in the end."

"How much?"

"Five dollars cash for the two hind feet—he's all right in front, otherwise it'd be $10. Take me a couple hours to do it. No doubt it'd help him as much as anything."

Having talked business, he waits for his customer to say "Go ahead." Meanwhile, he might mention the price again, saying that so far as he is concerned he would make about as much on plain shoes, but hates to see a horse go half crippled, like a nigger with his heel worn sidewise.

It will be noted that he has guaranteed nothing, further than to recommend special shoes as *a good thing*, which is only a general statement or one quite different from a guarantee that the horse would thereafter use his feet properly, or if not, to bring him back and the job would be done over again free of charge! The shrewd smith would charge $5 more for a second shoeing and remark about the foolishness of man allowing a horse to become so crippled in the first place—that a bit of prevention would have remedied the trouble in the start, while now it might be necessary to work on him for months, but that it had to be done.

Should the customer agree to the verbal understanding, or say "Go ahead," all of the elements of a well-drawn contract have been complied with, the smith promising to shoe the horse in a special way, and the customer assenting to its being done, the price to be $5 *cash*, from which the customer knows he is to hand it over on completion of the job.

The general explanation gone through in talking to a customer is what would be termed a *secondary* or *modifying* element in a written contract, while the primary elements are: The Parties; The Consideration; The Subject Matter; Mutual Assent; Time. Should any one

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This Agreement, *made this......................day of......................1904, by and between William Anderson, a Blacksmith and Wagonmaker, doing business in Wilton, County of Scott, State of Illinois, party of the first part, and..*
of the same place, party of the second part;

Witnesseth: *That the said party of the first part hereby agrees to build for said second party, one ....wagon of following specifications:*

(A)..

....

....

The party of the second part agrees to having the party of the first part build for him the wagon above described, and to pay therefore the sum of forty (40) *dollars, of which amount ten* (10) *dollars is paid down as part payment to bind the sale, and its receipt is hereby acknowledged by said first party; the said party of second part agreeing to pay the balance of thirty* (30) *dollars upon completion of said wagon.*

The party of the first part further agrees to finish and deliver said wagon to the second party at the smith shop within thirty days from the date hereof, which time the second party accepts as reasonable and fully agrees to.

In Witness Whereof, *said first and second parties to this agreement have set their hands and seals the day and year first above written.*

WITNESSES: *William Anderson* [SEAL]

J. W. Graham. .... [SEAL]

D. E. Ottman.

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of these be left out, while there might be an *agreement*, there would be no contract —nothing which could be enforced by action at law. If no mention was made as to the *time* the work was to be completed, the customer could say that he had lost money by waiting and had bought elsewhere on account of the job not being completed in time for his work. Or, a contract would become void were the consideration not mentioned or the subject-matter left out as to what work was to be done, or the parties' names not mentioned, or the

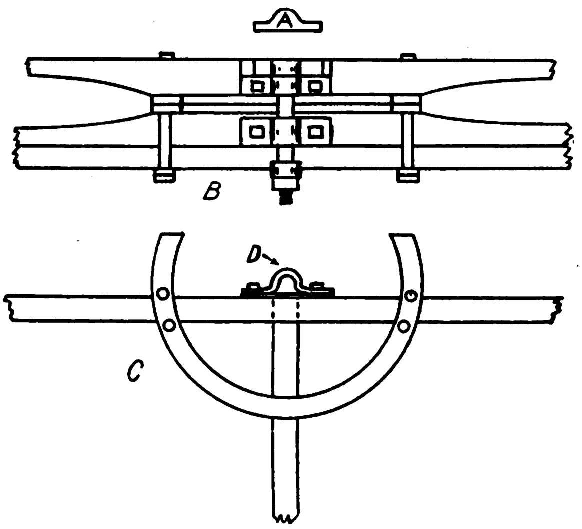

Fig. 1. FRONT ELEVATION AND TOP PLAN VIEW, SHOWING KING BOLT ARRANGEMENT.

agreement not being signed, etc. Where an element is missing it gives the customer a chance to crawl out.

In the verbal contract mentioned, the smith and his customer are the Parties, the consideration being $5 cash, to which the customer Assents, while the Time was stated as "a couple of hours." The Subject-Matter was shoeing *the horse with special shoes*, while the "hot air" given the customer to induce him to have the work done was a *secondary* element, although it modified the contract very little, as the smith did not make an absolute guarantee.

Legally defined, a contract is an agreement between two or more parties, competent to contract, based on a sufficient consideration, each promising to do or not to do some particular thing possible to be done, which thing is not enjoined or prohibited by law. It is unlikely he would ever have occasion to make a contract which would be unlawful or that would lack having a good consideration. Nor it is likely he would ever do business with a crazy person, whom the law considers incapable of making a valid contract, but he should be careful in dealing with a young man, as general laws favor him, while he is a minor. Small jobs may be done for him without assuming much risk, but where the amount is large enough to put the contract in writing the smith should have the boy's father sign with the boy. This is particularly advisable in contracts relating to "The Hire of Smithshop Help," which will be treated in the next number of THE AMERICAN BLACKSMITH.

A sample form of written contract is displayed on preceding page. In the blank space may be inserted the primary and secondary elements necessary to make a complete contract. For instance, the smith may agree to build a particular kind of wagon, describing it in the space marked "A," giving a specification of all the minor parts and mentioning the kind of material—in fact, giving a long description so the customer will see he is getting his money's worth, but promising or guaranteeing only such things as can easily be complied with.

Or he may use a similar form in soliciting trade, as by agreeing to shoe and clip the horses of a certain livery for one year for a specified amount. Where a smith keeps after big jobs of this kind he is likely to land some of them, thereby having an assured income outside of his regular work; and the smith who is shrewd in closing such contracts will make more money out of them than his brother, who allows some attorney to draw the contract and bind him as tigthly as his customer—probably allowing the customer to do all the dictating.

It will be observed that the "wagon" contract contains all the preliminary elements, as well as secondary elements.

Where the smith builds wagons and other things, or wishes to contract with livery or other concerns for shoeing and clipping, he can have some typewritist run off ten or fifteen copies of such form of contract as he wishes to use, so he may be enabled to go after special custom in a business-like way.

(To be continued.)

A Good King Bolt for Wagons.

J. LAWRENCE HILL.

The accompanying illustrations represent a very simple design, not only in constructing, but in repairing, the other feature that commends itself being that it is much stronger than the same size iron when it goes through axle, axle bed and head block.

It is obvious that in boring a hole through these pieces, it destroys much of the strength; therefore any method which successfully overcomes this difficulty, and yet is easy to make, ought to be acceptable to builders of light spring wagons, or even buggies where extra strength is required without additional weight.

In Fig. 1, B, we see the front elevation, showing king bolt in front of bed and axle. A is the shape of king bolt head. Fig. 1, C is a plan of fifth wheel. Fig. 2 is a sectional view, cut through center of king bolt; B, head block; C, axle bed; D, axle; E, king bolt; F, nut; G, stay; H and J, the flat staples seen at D, Fig. 1. Fig. 2, I, is the fifth wheel. It will be noted that back of D, Fig. 1, is a thin iron plate to take wear off king bolt. Now you can see how easy it is to unscrew these few nuts, replace any worn parts, and put it back again without the necessity of undoing spring clips, etc., and raising the body.

This king bolt can be used with a full circle fifth wheel, and when so used, the fifth wheel is a little smaller in diameter than when made as per drawing. It is also equally as well adapted to end or side spring gears, and will be found a most easy working, steady and lasting method of king bolt construction, the most vital part of a vehicle.

During some months of the year many country blacksmiths experience a slack season. It is in just such times when, by a little forethought, a wagon or two can be built without much of a cash outlay, and with this end in view, any and

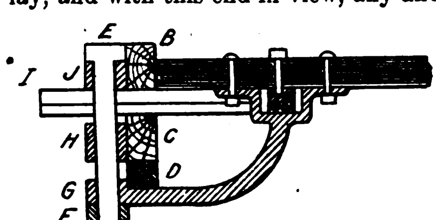

Fig. 2. SECTIONAL VIEW THROUGH KING BOLT.

all parts which can be made should be, instead of being bought, ready made.

The writer knows by experience that there are many men who prefer a handmade vehicle to a factory built one, and yet will not give an order for one, but if from time to time progress is noted on one under construction, interest is aroused, and it is then easier for the builder to dispose of his vehicle. The progressive blacksmith finds it necessary to at times risk a little in the

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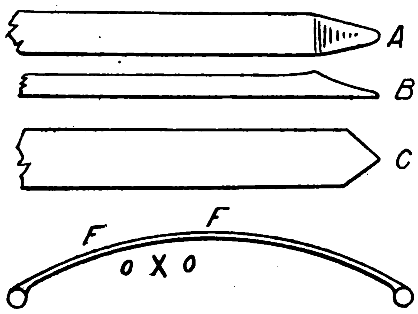
construction of a vehicle or two during the slack season. Very often a start made in this way opens up a profitable wagon-making business.

Hints on the Welding of Springs.

RICHARD O'HEARN.

A weld is not a good one when the repaired spring breaks near the end of the lap. The steel has been overheated, caused probably by putting the spring in the fire with the ends riveted or partly stuck. When a spring is thus put in the fire there are two thicknesses



SPRING WELDING—TEMPERING.

at the end of the lap. It will therefore be seen that the single thickness will suffer somewhat while the double thickness is getting hot.

I wish to say that I consider the best way to weld a spring is to scarf it, as shown at A, (and at B, the side view) staving up from the corners on the anvil, as at C. Take separate heats, weld and finish in one heat. Use some welding compound, of course. If you don't succeed in making a good weld the first heat and finishing the weld at the same time, just take another heat—a light borax heat—to finish with. Keep on trying, however, for the single heat, and you will get there sooner and easier than you think. Don't put in any piece to give the full length and thickness to the finished job. With good coal and ordinary care, there is no waste to speak of in welding a spring, if done with one heat. I have been welding springs for the last twenty-five years in this way, and have had only two springs of my welding break.

As to tempering a spring where you weld it, I would like to ask the question, "What is the use of trying to temper it where you weld it when by the attempt you take the temper out at two places while trying to put it in at one?" D shows the spring. Welding at X takes the temper out of it from O to O. One smith puts the temper back by heating it from O to O, and pouring oil on it. This, however, will leave the spring soft at F and F. A spring cannot be tempered in sections. Where a bath that will temper the whole leaf is not used, the quickest and as good a way as any which I have found is to cold-water hammer the spring into shape (after welded and swaged) and cool in tub as soon thereafter as possible.

The Way to Mortise Bolsters.

BY G. E. B.

The proper way to mortise bolsters is to make the mortises about $\frac{1}{4}$-inch closer together at the bottom than at top, thus causing the stakes to flare out. When the nut is put on the stake, and tightened, it draws the stake to its right place, which is about $\frac{1}{8}$-inch from square. At A is shown a bolster mortised the wrong way, and when the nut is tight it appears as at B. C shows the bolster properly mortised, when driven, and D when the nut is tight.

A Chatty Letter from Canada.

GEORGE NABLO.

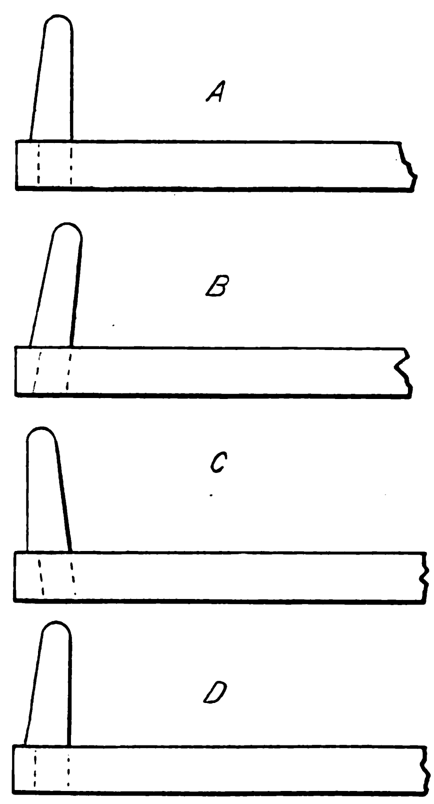
The winter that is now happily over, has been one such as the oldest inhabitants cannot recall, in many ways. Farmers here are accustomed to do fall plowing until nearly Xmas. But Jack Frost came in about the 19th of November and came to stay. In consequence, everywhere plows could be seen firmly imbedded in the snow and ice in the level fields, and weather became colder and colder, then snow came on and in abundance, with storms and zero weather, without a thaw until the latter part of January, when a thunderstorm, with icy rains, turned the snow into ice, flooding fields and highways, which, when freezing weather again set in, made travelling a very dangerous affair without sharp calks on the horses. The consequence was, that the smiths, who all do shoeing, had a very busy time of it all winter. Usually once or twice shoeing sharp is all that was required, but this winter four or five resharpenings were required, so that without the aid of horseshoers, the business on the roads would have been impossible. This winter has demonstrated the importance of the smith and his supremacy in usefulness over that of almost any other vocation. For if they had not been able to keep horses in a travelling condition, business in nearly all lines would have been paralyzed. The prospects for spring and summer work are very promising. The sharpening of cultivators, harrows, etc., is now in demand, and the repairing of vehicles will follow as soon as the roads are good and passable. Close onto that will follow the repairs of mowers and later on of binders, which, if the weather is hot, will be interrupted by tire setting, etc. So the outlook in our line is a very fair one for this locality near the banks of Lake Erie. I would be pleased to hear from others of the craft, how this cold winter has affected their business in various parts of the country, and one could thereby get some idea as to the benefits derived from a hard or a mild winter in the line of general blacksmithing. I hope that all the brothers will be favored with a prosperous year.

An Adjustable Clamp and Rim Wrench.

H. E. KERNEK.

Having been a constant reader of THE AMERICAN BLACKSMITH since its first issue, and having seen therein many useful recipes, also many handy devices from brothers of the craft, will undertake to describe one of the tools in my shop that are entirely of my own make, for perhaps some of them would interest brother smiths.

The tool described herewith has been thoroughly tested, and I can therefore



THE RIGHT AND WRONG WAY TO MORTISE BOLSTERS.

recommend it to any brother smith who desires to make one. I might say that I would not do without it under any condition. The accompanying sketch shows the tool, a combination rim wrench and clamp, which, with its many adjustments, will make a clamp that will take in anything from 10 to 42 inches (including wagon box bottoms)

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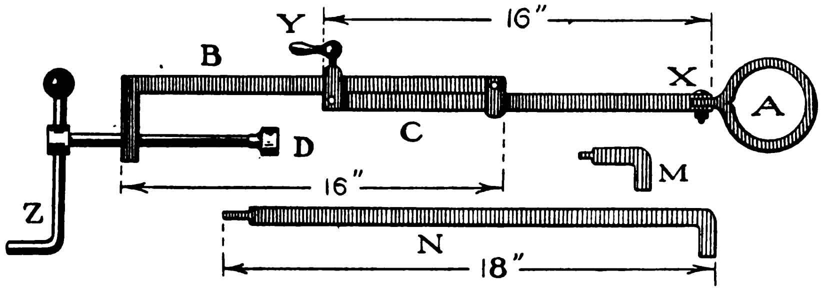
and will make a felloe clamp that will work on any wheel from the smallest to the largest. It is sufficiently strong to draw the rim or felloe. Referring to the sketch, it will readily be seen how it is made, the dimensions also being given. B and C are top and bottom sliding bars, one inch square. M and N are removable clamp bars, one inch square, which can be fastened on the end of C by means of a half-inch bolt at X, instead of the ring A. This ring is to go over the hub, and is ten inches in diameter Also I have a six-inch ring for small hubs, made of ⅝-square stock. Y is the clamp screw. Z is crank-lever made of ⅝-inch iron 12 inches long with a ¾-inch screw. D is a swivel head.



A USEFUL TOOL FOR THE WAGON SHOP.

To Make a Tire Tightener.

D. A. DICKSON.

The accompanying illustration is that of a good and simple tire tightener of my own make. First take a steel bar 3 by ⅜ inches, bend perfectly round and leave four inches open at the joint. Next make two ears and rivet on with three rivets in each. Put holes in the ends to receive a 1½-inch bolt, threaded right and left hand as indicated. Make three corner irons, and rivet one on back to be bolted to table, and one on each side to slide in a groove or clip. Make segments to fit the inside, as shown in cut, five in all, to make a complete circle, with one-inch spaces between joints. Enough of these are to be made so as to fill space between rim and tire of wheel, fitting neatly in the circle. It is now complete. Place on plate large enough to allow outside band to lay on.

To operate, put the wheel in and fit with segments, leaving joint of outside band about three inches open. Slacken screw and take the segments next to wheel and place in fire made of wood or bark, and when fairly hot, place next to tire and screw up tight. Allow the tire to expand a little with heat, and then take out and let cool. Take next wheel of same size, and so on.

Now that winter is over, any ordinary smith that has a little slack time can make one for himself, and have it ready for his spring trade. This tire tightener is for light wheels only. Larger ones can be made accordingly.

Repairing Old Wheels.

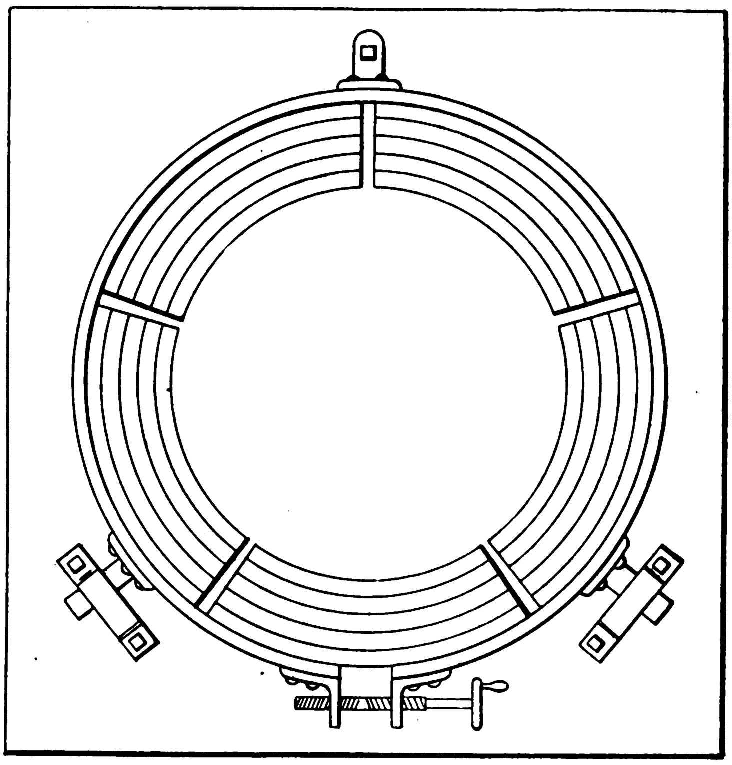
M. A. FOSTER.

I have had considerable experience in repairing wheels, and find it a more difficult matter to repair some old wheels than to put up a new wheel. Take especially an old hub that has been filled two or three times, and is considerably cracked, which will naturally cause some of the mortises to be larger than others; fit each spoke for the mortise you expect to drive it in.

When a few spokes are put in a wheel that is badly dished, the new spokes must be driven to correspond with the old ones, or if not, the wheel will be crooked. In pointing the spokes, point them as low as possible, then run the hollow auger straight with the face of the wheel, not with the spoke, and then the rim will go on snug and level. I have seen many wheelwrights bore the tenons straight with the spokes in place of the face of the wheel, and when the rim was on, it looked like a rail fence. Then finally they would decide that the tire would bring the rim up to its place. So it will, to a certain extent, but after that is done, the tenons are all strained, and if your customer sees the job, before the tire is set, he isn't satisfied with it. It is just as easy to have a wheel true and straight before the tire is set, that is, if you know how. The tire and the wheel will do their part, if we do ours.

I can remember the time when the talk was that a Sarven wheel could not be repaired, and I find it is the easiest wheel to repair that I have. The only secret is to use spokes exactly the same size that were first in the wheel, as these spokes run in sixteenths of inches, and a size smaller or a size larger will make a poor job. Be sure to get the right size spokes, and cut out the rivets through the flange and drive the spokes in glue. Then put in new rivets.

I have taken light buggy wheels, that were badly dished, and put on new rims, where the spokes were solid in the nut and sound, and by driving them on tight as they will bear, without splitting the rims, it will take the dish out of the wheel. But if the rim is driven on loosely it will not take the dish out of the wheel. Cut off the ends of the spokes nearly an eighth of an inch below the rim so the tire won't bend them.


TOP VIEW OF A HEAT TIRE TIGHTENER.

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From Toil to Fame.

There's many a patient toiler
  Who works for a higher life—
Who knows when he'll be the victor,
  And rise from the irksome strife?
No matter how plain his person,
  It houses a lofty soul;
A stout heart beats, and a great brain plans,
  A way to reach the goal.

Perhaps where you hear the rumble
  Of the giant wheels that turn,
Perhaps where you see the glowing
  Of the furnace fires that burn,
There 'mid the din and the tumult,
  In the dust, the grit and the grime,
A kingly man of a crowded world
  Toils on and awaits his time.

Whenever he heats a rivet
  And batters the fiery red,
The clang of the steel is singing
  To him of success ahead;
Although there's a cloud o'er his visage,
  His beaming smile comes through,
And his eye is bright with a future light
  That will help the world anew.

As sure as the earth swings onward
  Along its endless way,
As sure as the sun is shining
  He'll climb to the top some day;
And the world will go to greet him,
  And praise and cheer his name—
He'll reign supreme in a million hearts
  And mount the throne of fame.

—Geo. R. Harrison, in Popular Mechanics.

HEATS SPARKS WELDS

Do it now.

Ready for hot weather?

It pays to pay attention to details.

Coal is an important factor in the smith's work. Is your coal all it ought to be?

Chaos reigns supreme in many shops—take time to put things in order now and then.

Having trouble with the engine? Send us the details of it and we will try to help you out.

Don't hide your trade under a bushel. Advertise yourself, advertise your shop, advertise your business.

Good blacksmiths always keep a supply of coke on hand to use for welding, annealing and hardening heats.

Spring's here, roads are good, time to think about getting together with brother smiths to discuss the question of better prices.

The biggest searchlight in the world is to be seen at the World's Fair. It is of 5,251,000 candle power, weighs four tons and throws a beam of light seven feet in diameter.

When a job comes in that requires a large number of duplicate forgings, get up a tool or former to make them mechanically. Make the head save the hand.

When hardening, remember to heat, not too fast, nor yet too slow, but uniformly, above all things, Much cracking is due to uneven heating.

Sixty little minutes and an hour's gone. A full appreciation of the value of the spare moments, the minutes betwixt and between, will add perhaps a day to each week.

The long-time rates for subscriptions two, three, four or five years in advance have proved very popular with our readers —they appreciate the saving. See the advertising columns.

Dear at any price is the machine that is continually breaking down, a constant expense for repairs and in lost time. It is a good plan to pay a little more and get a good article to start with.

'Tisn't always how hard or how long a man works that determines how much he makes. A man may work a week and profit nothing, because his figures are too low or because he grants credit unwisely.

A little paint judiciously used by the repairman often goes a long way towards making a satisfied customer. It always pays to turn out neat work, if only to strengthen one's reputation as a good mechanic.

Several readers have taken advantage of our offer of advice on horse ills.—See Queries, Answers, Notes at the end of the reading pages. If there are others, let us hear from them. Always glad to help.

Many journals offer substantial reductions in rates to those who subscribe for a term of years in advance. Have you noticed THE AMERICAN BLACKSMITH'S long-time rates—a saving for any number of years up to five.

Your shop—is it well equipped or conveniently arranged? Send in a photograph of its interior, so that brother smiths can have a peep at your work-a-day home. Good photographs, like good stories, are always interesting.

Don't forget that the Queries-Answers-Notes-Department is open to all readers for questions, answers, criticisms or comments on any craft topic. Some brisk controversies are going on there now. Do you agree with what is said? If not, what is your opinion?

Your bill-heads, letter-heads, and other printed matter represent you. Let them at all times be neat and well printed. Those who do business with you from a distance know you from your stationery. In such cases is it all the more needful to have it just exactly right.

Times are changing. Blowers take the place of bellows, the old brick forges give way to steel ones, engines take from the smith much of the former severe manual labor. The movement is in the direction of better tools and more powerful machines, and real, solid progress it is.

Another side line is told of in another column. The smith in question uses his power, in this case a water wheel, to grind apples and make cider for the farmers round about. Who knows of some side lines out of the ordinary, but which other smiths could take up with profit to themselves? Let us hear about them.

A new metal similar to aluminum, but still lighter, has recently been discovered, and called "nodium," after the French engineer Albert Modon, who first separated it. It is manufactured by an electric process, and in color, lustre and structure is almost like steel. The inventor expects numerous uses for the new metal, but principally as castings in place of bronze, German silver, and similar metals now used.

Something-may-turn-up land is where many a smith lives. He goes on working hard in the heat of the forge, but he reaps little. His children are deprived of many advantages which his labor as a mechanic should entitle them to. And as the bills from his jobber come in with painful frequency, he labors on in the hope that something may turn up. Why doesn't he take matters in his own hands and start a movement for better prices and improved conditions in his locality?

Tom Tardy's buggy is surely a sight to behold. The shafts would never be accused of being brothers, the top looks as if it might have sheltered Noah at one time in its history, the wheels are all badly dished, and the whole rig rattles so you can hear it for blocks. Tom stoutly swears he can repair it if he wants to, but "what's the use?" says he. Perhaps after all his buggy is plenty good enough for him, quite in keeping with shop, tools, and owner, so why waste time in repairs? Tom evidently doesn't believe in giving his customers an incentive to have their own rigs fixed up.

A gigantic iron statute of Vulcan, the blacksmith god of the ancient Greeks and Romans, will be an interesting exhibit at the St. Louis Fair. It is being made at Birmingham, Ala., its purpose being to indicate the resources of that district. Fifteen big castings weighing in all 100,000 pounds, compose the figure of the fifty-foot giant, and seven freight cars will be required to convey the monster to St. Louis, where it will be set up in the Mines Building. Its total height is fifty-six feet, length of arm ten feet, weight of hammer 300 pounds and total cost, twenty thousand dollars. After the Fair, the statue will be removed to Birmingham for permanent location.

In Australia, American wagons, buggies and carriages are used, but the greater portion of such vehicles are made in Australia and differ in style and form from those made in the United States. There are heavy, broad, four-wheeled wagons used for transporting heavy material and large loads of grain and skins, but the greater part of the hauling is done on two-wheeled vehicles. Bread wagons, milk wagons, ice wagons, delivery wagons, carts and drays are almost all two-wheeled, drawn by one horse. These are much broader in the box and tread than the American. The lighter vehicles vary in tread from 4 feet 8 inches to 5 feet 2 inches. It is said that vehicles made from Australian wood withstand the severe heat of that climate better than the American, yet manufacturers import great quantities of hubs, spokes and rims, which they work into buggies and sulky carts and carriages. There are no less than 140 shops where vehicles are made, some of them quite extensive, though most of them are of the primitive kind, manufacturing by hand, as was done in the United States fifty years ago, except that ready-made material from the factories of the United States is largely used.

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American Association of Blacksmiths and Horseshoers.

A very lively interest is being taken at this time in the work of the Association in many different localities. A great many smiths have requested appointments as organizers for their respective counties, and with the improved conditions of roads, prospects are bright for many new county organizations at an early date.

No time can be more favorable than the present for taking up the work of organizing. During the coming months meetings can be called without fearing the drawback of bad roads, which often cause poor attendance in winter. Send for our outline of plans for taking up the work. Talk better prices to your neighbors and get them interested. The more that take hold energetically, the quicker will the work of organizing be accomplished. Any body of smiths can get together, whether it be in city, township or county. Where the county is large we recommend that it be taken by halves, especially if there be any natural dividing line running through it.

Blacksmiths and wagon builders should remember that organization is now the order of the day, a necessity of the times. There is no prosperous craft which is not organized more or less completely. Take any of the trades and professions, machinists, carpenters, masons, lawyers, doctors; they all have their organizations and societies for mutual benefit and advancement. Banding together should not and does not restrict competition, but it does away with the evils of ruinous price cutting. Many craftsmen have the idea that if they join an association they must charge exactly the prices agreed upon. Under the plans of THE AMERICAN ASSOCIATION, simply a minimum price schedule is agreed upon by the members of each county branch, and no smith is permitted to do work for *less* than the prices so fixed. He is of course at liberty to get as much higher prices as his skill and reputation will bring him.

Again let us urge the importance of taking up the work without delay. Small beginnings often lead to large results; some of the largest of fraternal orders started with but a mere baker's dozen. There's everything to be gained and nothing lost. Figure how much more a year a slight raise all around will mean. Any reputable, energetic smith in any county can act as our representative.

We regret to say that our New York State Lien Law failed to become a law. The bill, as introduced in the Senate for us by Senator Davis early in the session, passed that body in March, and from there went to the Assembly. In spite of our efforts, it was impossible to get the measure reported out of the Assembly Committee on General Rules, in which Committee it died during the rush of the closing days in the middle of April. We do not intend to relax our efforts, and will endeavor to secure the passage of the bill at the next session. We want to thank the blacksmiths of New York State for the efforts they made with us for the bill. We feel we can count on even stronger support from them next winter.

The following are the officers elected at a late meeting of the Cayuga County (N. Y.) Branch Association: James H. Cole, President; E. M. Babcock, Vice-President; Charles Hutchings, Secretary; Benjamin Hutchings, Treasurer.

Should We Not Protect Ourselves?

J. W. BUETTNER.

In the March number of THE AMERICAN BLACKSMITH, under the heading "American Association of Blacksmiths and Horseshoers," I find one of the many questions which greatly affect the craft's welfare—What about the botch workman? I have read all about the other things, but haven't as yet seen that question brought up for discussion, so I will come out and answer it to the best of my knowledge and experience of thirty-two years.

Now I ask, should not a mechanic be protected from these so-called mechanics that know nothing of the trade? I say, yes! But if we cannot do it by organization we must do it by law. As we have no law to this effect, I say let us band together and bring this before the Senators and Representatives of our different States, asking them to make it a law that every blacksmith and mechanic must go before a board of examiners, appointed by the different States, to pass a rigid examination before said board, and then get a certificate. Those that are not able to pass, let them go back and learn, or else take up some other work, and let them not have the right to botch their work and defraud their customers.

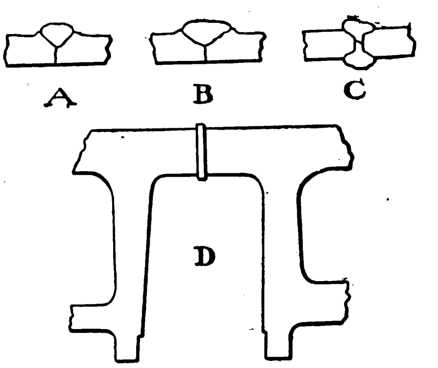
Now, some of my brothers may say that I am very strict and that my plan might interfere with some of our laws, for this is a free country. But I do not think so. Is it right for a man to say he is a blacksmith and then prove that he is not one? What guarantee does a smith give that he is a smith?

Our trade is an honorable one, just as much so as a doctor's or druggist's, who have to pass an examination before they can hang out their sign, and they have a certificate to protect them. But under what protection are we?

Repairing Locomotive Frames of Cast Steel—2.

A. W. McCASLIN.

After the frame is cast, machined and placed in position, what have we of any value or that can be vouched for aside from proper design and dimensions? Placed in service, we await results, which frequently means a loss that some of your gentlemen can compute more easily than I. It is simply the addition of cost of repairs to that of engine out of service through broken frame. Some might ask at this point, will a given number of steel frames show a greater number of breakages than will the same number of good fibrous iron frames, doing same service under same conditions? Will say that I have recently learned that on one of our neighboring railroads, they have, within the last six months, had thirty-five steel frames break on their engines of the consolidated class, and only one wrought iron frame broken in the same length of time. This great



WELDS FOR LOCOMOTIVE FRAMES.

number of failures in the steel frame in such a short period of time, would probably cause one to think some of these breakages due to improper designing of frame. If this be true, who of us would care to take the responsibility of having placed an incompetent man at this very important or we might say, one of the fundamental parts in the construction of locomotives? Has any one ever known such a number of broken steel frames to be paralleled with a like number or breakages in good fibrous iron frames, doing like service, under similar conditions, in the same length of time, even when the steel frames in service have been outnumbered by the iron frame from three hundred to four hundred per cent., including, as this would, those improperly as well as properly designed?

I hear many complaints from foreing smiths on many of our railroads as to the

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great number of breakages in steel frames, which would indicate that wherever the steel frame goes, trouble accompanies it. How shall we repair this broken steel frame? As a blacksmith with thirty-five years' experience in the manipulation of iron and steel, I know but one proper way, that of laying in the side "V" weld, sometimes called the angle weld. In the preparation of parts for this style of weld, the sides of frame at breakage should be driven well back, in order to gather sufficient stock for upper end of wedge piece to properly weld upon. This weld is generally made at an angle of 90 degrees (A), but I think an angle of 110 degrees (B) better, as it requires a longer lap to make a secure weld in steel than it does in iron, and with the obtuse angle, the piece laid in is less liable to slip or drive past its first contract with the walls of aperture in the frame, and will weld by first blow from the hammer, there being less tendency to shear in the weld.

In welding broken steel frames and iron frames as well, the lay-in pieces are usually made of iron, and the fiber should always run with the length of back, limb or brace, according to location of breakage. This style of weld, made with a clean heat, we do not think can be excelled, but it should be remembered that any weld made with dirty or sulphurous fuel, is a counterfeit, and cannot be guaranteed, and I am pleased to be able to supplement this fact by saying that railroad officials, as a rule, do not long retain the foreman or his subordinate who knowingly jeopardizes the best interests of his company by placing in service articles showing faulty workmanship or unreliable material, which gives official recognition to the fact that a sufficiency of the best rather than a super-abundance of the inferior, is true or lasting economy.

We frequently hear of blacksmiths whose ingenuity and reasoning become entangled, and in their efforts to a speedy way out of their dilemma, resort to butt welding the steel frame, and by so doing, entirely disregard the nature of material they are handling, as well as the fact that a slow compression force will not effect a perfect weld, and even undertake to butt weld this frame without removing it from the engine, when their past experience and best judgment would teach that the most secure weld of any style requires a rapid succession of blows.

The method of butt welding the steel frame without removing it from the engine consists of separating it at breakage and inserting a piece of wrought iron which should protrude from one-half inch to one inch on the four sides of frame,(D). A furnace from eight inches to twelve inches square is then built around the broken parts, and air and oil used as fuel. When the broken part arrives at proper welding heat, if it is impossible to use battering ram, which is generally the case, the frame is pulled together at weld with screw rods, or some other equally slow means, and the parts dressed up with light hammers, and the butt welds, for there are two of them, one on either side of iron inserted, are completed, but with this method of welding, only the first installment of expense in the repairs of the frame has been met. A combination of the angle and butt weld would be preferable, (C). Were it possible for this butt weld to remain intact, the frame would break on either side of the weld, through the fact that this steel casting, even after it has been annealed, is in a raw condition, and every square inch of this steel encased in the furnace for the purpose of heating the parts for making the weld, be the furnace six inches or twelve inches long, is brought to the same high heat required to effect the weld, and when this weld is accomplished, this metal of granular or crystalline structure is left in a more open, spongy, as well as over-heated condition, which, through lack of hammering or lamination of any kind, is invalidated for service.

If there were no impurities and defects in the frame, and it should break through the solid, how can be expect good results from a weld with a tensile strength of only sixty to eighty per cent. of the original strength of the material, the lap or angle weld being the only weld that can be guaranteed to approach the initial strength of bar or frame? One might ask what the verdict would be regarding our sanity as to proportions and mechanics in general when we pretend to repair this broken frame by drilling it full of holes and bolting on a patch with a sectional area equal to only one-half that of the broken section.

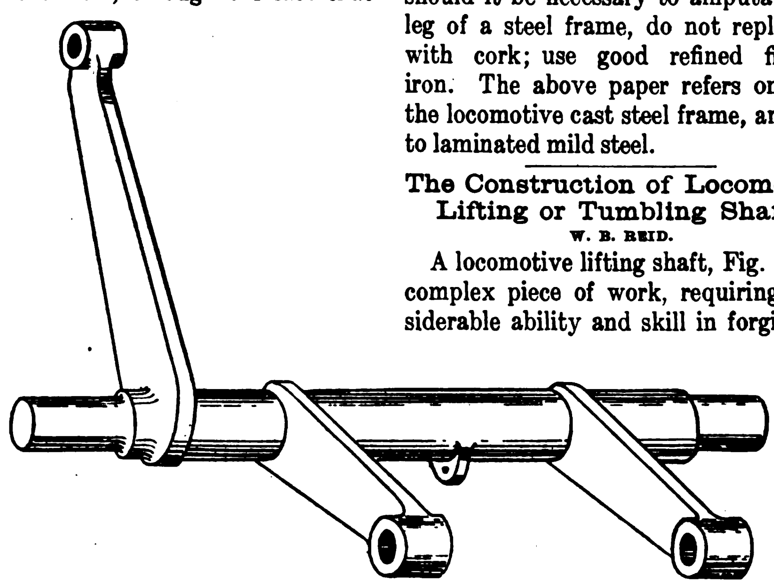
If we must have the steel frames with their present failures, we think the proper place to repair not only them, but the iron frame as well, is in the blacksmith shop under the steam hammer or on the anvil, making the best weld known, the lap or angle weld, paying strict attention to expansion and contraction of all the parts to avoid transmitting an undue strain to the limbs, which also include the braces.

If the disease calls for quinine, we believe in administering quinine, but should it be necessary to amputate the leg of a steel frame, do not replace it with cork; use good refined fibrous iron. The above paper refers only to the locomotive cast steel frame, and not to laminated mild steel.

The Construction of Locomotive Lifting or Tumbling Shafts.

W. B. REID.

A locomotive lifting shaft, Fig. 1, is a complex piece of work, requiring considerable ability and skill in forging it.



FORGING A LOCOMOTIVE LIFTING SHAFT.

In contract shops where they have to be turned out in large numbers, quickly and cheaply, they are often made entirely of bar iron; the shaft from round rolled bars, and the arms from flat bar iron, of suitable sizes. Considering that the work of a lifting shaft is not of a constant and violent nature, a good substantial job can be produced in this way, the workman being competent and conscientious. If he is not so, it matters little what method is followed.

The shaft being cut to suitable length, is held by a heavy pair of tongs, yoked with hand lever for steadying and turning the piece in crane. A bottom swage, large enough for shaft to fit in anvil block, is also necessary.

The first operation is to weld the small lug in the middle of the shaft. A scarf is formed in the shaft with fuller, and the

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lug scarfed to correspond, Fig. 2, A. This is easily welded in place.

From this lug as the center of shaft, locate the position of the first arm to be welded on. Take a good short heat at this point and upset well with a light ram, suspended conveniently at anvil. This will secure a sufficient margin of stock for welding and working purposes. Scarf at this point by cutting out a small piece and enlarging the cavity with fuller, in semi-circular fashion around shaft, as shown at Fig. 2, B. The arm is scarfed to suit, as shown by its front and side views. In scarfing this arm do not cut out any of the stock. A medium sized fuller is driven down in the center as at Fig. 3, A. This augments and forces the stock out at both sides in a fin-shaped scarf. Turning the arm upon its side, this scarf is then extended towards the points with fuller, as shown at B. Re-heating the scarfed arm slightly, and placing it in the scarfed shaft, a few blows of sledge adjusts the parts neatly to each other.

In welding, the arm is driven vigorously into place with a few blows of the

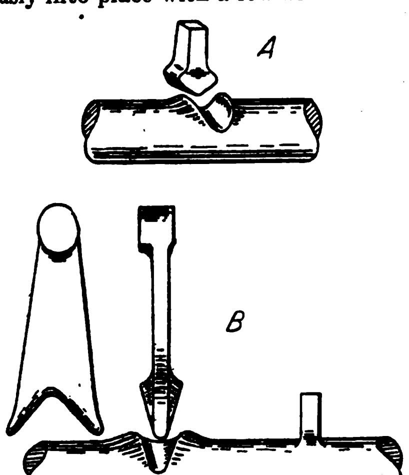


Fig. 2. SCARFING FOR LUG AND ARM.

sledges, then turned upon its sides to weld the points of the scarfs. Two fullers are then quickly applied, simultaneously, to put in the scarfs around shaft, the helpers striking regularly in unision. The fullers are quickly followed by a swage, or a pair of narrow swages (Fig. 3, C), nicely rounded on the edges to preserve the fillet around the base of arm, and at the same time smoothing the round surface of the shaft. This swage should have a slight bend at neck to throw the head of tool back from arm while being struck by helper, as at D, Fig. 3. The fullers, first used in putting in the scarfs, will also prove the better adopted for this work if rounded slightly to the circumference of the shaft. See Fig. 3, E.

The welding of the arm is completed by welding a piece of 1¼-inch or ⅜-inch iron around the back of shaft, catching the points of the scarfs of arms at

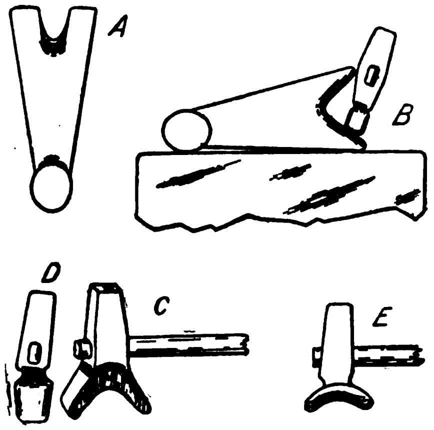


Fig. 3. SCARFING THE ARM. SWAGE AND FULLER.

either sides. This can be done in two heats, and binds and finishes the welded arm in good shape.

(To be continued.)

A Handy Device for Swinging Chucks.

BACKWOODS MACHINIST.

The sketch herewith shows a handy way of taking off and putting on a chuck or face plate of a lathe, and holding it when off. When you want the chuck on, swing the crane around over the lathe bed until hole in chuck comes level with spindle. If not quite level, raise or lower chuck with lever nut. When chuck is partly on, stop lathe, take hook out and swing crane back out of the way. Then start lathe and screw chuck on all the way.

For handling heavy chucks and face plates, this rig is very convenient, much more so than a chain hoist, and it beats three men in lifting a chuck and putting it out of the way where you can get it when wanted. For a 14-inch chuck the crane should be made of 1¼-inch iron. Let the bottom end into a socket or block in the floor. The top fastening is a bracket or brace fastened to the bottom edges of the bed. The hook should be made of ¼-inch iron; this rig will save all kinds of smashed fingers and back-aches caused by lifting the chuck off the floor six or eight times or more a day, also one to two men when a heavy chuck is to be taken off or put on, to say nothing about time, which generally amounts to quite an item in most shops.

To make any shop turn out the greatest profit, the little details must always be looked after. It is surprising how many little leaks can be found if they are carefully looked into, the pay roll, the stock purchases, in wasted materials. In small shops the boss can well devote some time as an inspector.

A Serviceable Tool.

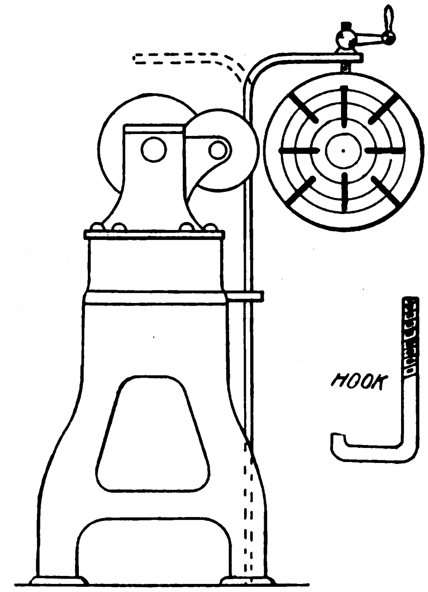
JOHN STITZER.

The following device will be found very easy to make and very handy where there is heavy machinery. The principal part of the tool is a large turn buckle. From one end projects a rod, one end of which is threaded to screw in or out of the turn buckle. The outer end of the rod is shaped with a hook on it. Another similar rod is made to screw into the other end of the buckle, and on the far end of this an eye is formed. Fastened in this eye is a ⅜-inch chain three long with a hook on its end, completing the tool. The various parts may be made of any convenient lengths and the tool will be found quite powerful for moving heavy pieces.

Tongs of Special Merit.

T. B. HULME.

The pair of tongs shown in the accompanying figure were to me of more practical value than any other kind I ever saw, as they will hold anything rigidly with no slipping, either round, square, oval, flat or even a wedge shape. They are simply a straight-lip tongs, with one long lip and one short one. The long lip is left about ½ inch thick at the end and bent in square with a notch cut in the end as shown. A piece



A CHUCK-HANDLING DEVICE.

of iron ¾ inch thick by ½ or ⅝ inch wide, and as long as the lip of the tongs is wide, is welded to the back part and has a notch worked in it to correspond to the front end. The short lip is made exactly like the long one, except that it has no rear piece. It reaches half way

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between the two projections on the long lip, as indicated. This makes a pair of tongs which will give three bearings on any shape of rod.

A Treatise on Horseshoeing.—4.

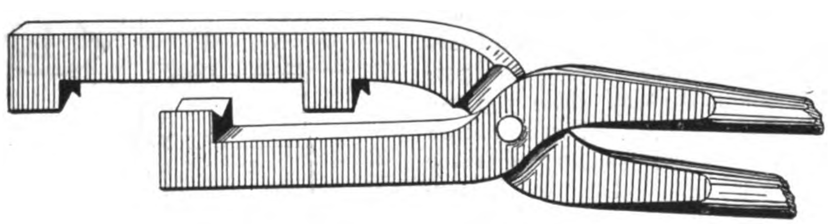
JOHN W. ADAMS, V. M. D.

The Shoe.—Preliminary Examination.

The object of the examination is to ascertain the direction and position of the limbs, the shape, character, and quality of the hoofs, the form, length, position, and wear of the shoe, the number, distribution, and direction of the nails, the manner in which the hoof leaves the ground, its line of flight, the manner in which it is set to the ground, and all other peculiarities, that at the next and subsequent shoeings proper allowances may be made and observed faults corrected. The animal must therefore be observed both at rest and in motion.

At rest, the observer should stand in front and note the slant of the long pasterns. Do they drop perpendicularly, or slant downward and outward (base-wide foot), or downward and inward (base-narrow foot)? Whatever be the direction to the long pastern, an imaginary line passing through its long axis, when prolonged to the ground, should apparently pass through the middle of the toe. But if such line cuts through the inner toe the foot axis is not straight as it should be, but is broken inward at the coronet, an indication that either the outer wall of the hoof is too long (high) or that the inner wall is too short (low). On the contrary, if the centre line of the long pastern falls through the outer toe the foot-axis is broken outward at the coronet, an indication that either the inner wall is too long or the outer wall too short.

The observer should now place himself at one side, two or three paces distant, in order to view the limb and hoof in profile. Note the size of the hoof in relation to the height and weight of the animal, and the obliquity of the hoof. Is the foot-axis straight? that is, does the long pastern have the same slant as the toe? or does the toe of the hoof stand steeper than the long pastern (Fig. 6c)?—in which case the foot-axis is broken forward at the coronet, an indication, usually, that the quarters are either too high or that the toe is too short.



HANDY TONGS FOR ALL AROUND WORK.

If the long pastern stands steeper than the toe (Fig. 6a) the foot-axis is broken backward, in which case the toe is too long or the quarters are too low (short). In Figures 6a and 6c the dotted lines passing from toe to quarters indicate the amount of horn which must be removed in order to straighten the foot axis, as shown in Figure 6b. Note also the length of the shoe.

Next, the feet should be raised and the examiner should note the outline of the foot, the conformation of the sole, form and quality of the frog, form of the shoe, wear of the shoe and the number and distribution of the nails. Does the shoe fully cover the entire lower border of the wall? or is it too narrow or fitted so full on the inside that it has given rise to interfering? or has the shoe been nailed on crooked? or has it become loose and shifted? Is it too short or so wide at the ends of the branches as not to support the buttresses of the hoof? Does the shoe correspond with the form of the hoof? Are the nails distributed so as to interfere as little as possible with the expansion of the quarters? are there too many? are they too large? driven too "fine" or too high? These are questions which the observer should put to himself.

Note carefully the wear of old shoe. It is the unimpeachable evidence of the manner in which the hoof has been set to the ground since the shoe was nailed to it, and gives valuable "pointers" in leveling the hoof. Wear is the effect of friction between the shoe and the ground at the moment of contact. Since the properly leveled hoof is set flat to the ground, the "grounding wear" of a shoe should be uniform at every point, though the toe will always show wear, due to scouring at the moment of "breaking over." Everything which tends to lengthen the stride tends also to make the "grounding wear" more pronounced in the heels of the shoe, while all causes which shorten the stride, as stiffening of the limbs through age, overwork, or disease, bring the grounding wear nearer the toe.

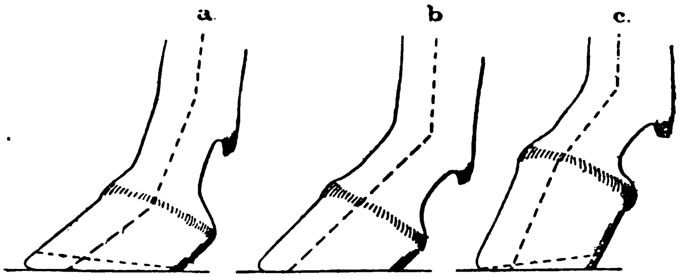


Fig. 6. LIMBS AND HOOFS IN PROFILE: *a*, Side view of foot with the foot-axis broken backward as a result of too long a toe. The amount of horn to be removed from the toe in order to straighten the foot-axis is denoted by a dotted line; *b*, side view of a properly balanced foot, with a straight foot-axis of desirable slant; *c*, side view of stumpy foot with foot-axis broken forward as a result of overgrowth of the quarters. The amount of horn to be removed in order to straighten the foot-axis is shown by a dotted line.

An exception should be noted, however, in founder, in which the grounding wear is most pronounced at the heels.

If one branch of the shoe is found to be worn much thinner than the other, the thinner branch has either been set too near the middle line of the foot (fitted too close), where it has been bearing greater weight while rubbing against the ground, or, what is much more often the case, the section of wall above the thinner branch has been too long (too high), or the opposite section of wall has been too short (too low). "One-sided wear, uneven setting down of the feet, and an unnatural course of the wall are often found together." How much an old shoe can tell us, if we take time and pains to dicipher its scars!

The horse should next be observed at a walk and at a trot or pace, from in front, from behind, and from the side, and the "breaking over," the carriage of the feet, and the manner of setting them to the ground carefully noted and remembered. A horse does not always move just as his standing position would seem to imply. Often there is so great a difference in the form and slant of two fore hoofs or two hind hoofs that we are in doubt as to their normal shape, when a few steps at a trot will usually solve the problem instantly by showing us the line of flight of the hoofs and referring them to the regular, base-wide, or base-narrow form.

No man is competent either to shoe a horse or to direct the work till he has made the precited observations. Almost every foot and limb will be found to vary, so that no shoeing can be intelligently done until an examination has been

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made of the case in hand. Examination of horses in action is not practiced nearly as much as it should be by farriers today.

(To be continued.)

A Few Hints on Interfering.

W. B. ALLEN.

Interfering may be defined as the striking of one leg by the opposite foot as the animal travels. The part most often injured is the inner surface of the fetlock joint, and more generally in hind than in fore legs.

Of the many causes of interfering may be mentioned the following: Defective shoeing, bad roads, too fast work, exhaustion, a swollen leg, high knee action, and too narrow chest or hips. Perhaps the most common cause, however, is faulty conformation when the horse toes in, or when the fetlock joints are close together and the toe is turned out, the leg being so deformed that the ankle and foot turn in or out, and interfering is almost bound to result.

Interfering can be detected usually by the swelling or bruise at the part that is struck. In some cases, however, especially with trotters, little or no visible injury is done, so that interfering is only noticed by an occasional tripping. To make sure in such cases, resort may be had to painting the inside toe and quarter of the striking foot with mud, paint or chalk, and then driving the animal.

Having discovered the offending foot, treatment follows. The first step, of course, is to remove the cause, when this can be done. In cases where the trouble is due to the conformation of the legs, this may not always be possible, and then the only thing to be done is to apply a fetlock or ankle boot and admonish care in driving. When the trouble is from fatigue or exhaustion, the boot is also to be used till recovery.

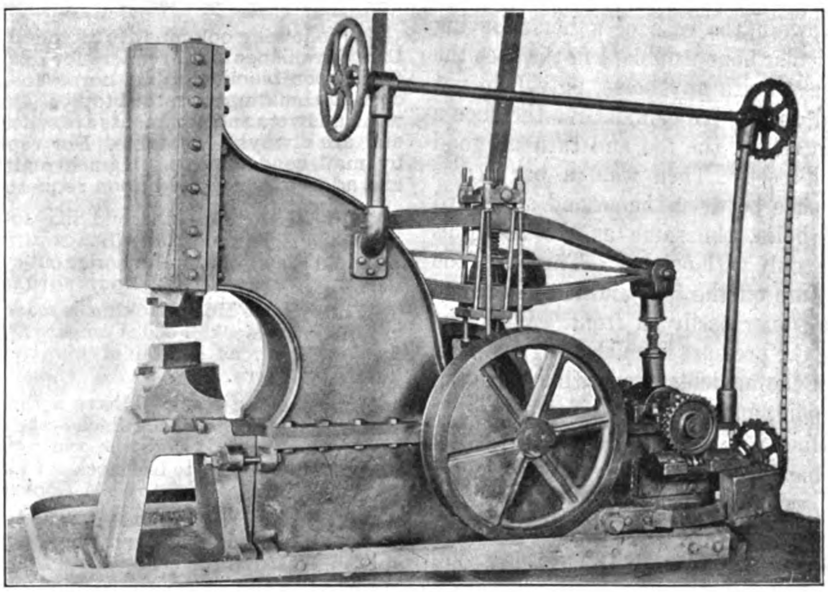
When shoeing to correct interfering, lower the outside heel and quarter on the leg that is struck. The aim is to bring the fetlock joint further away from the center line of the body, and thus allow the offending foot to pass without striking. Care should be observed in this lowering the heel and quarter, because very often a slight change only is necessary to produce the desired result. In shoeing the foot that does the striking, set the shoe well under the hoof at the point where it hits. Reset about every four weeks.

Having removed the cause we may treat the local wound that has been caused. Soreness and swelling, if not of too long standing, can often be reduced by cold water bandages. If the fetlock is calloused from long-continued bruising, apply a Spanish-fly blister at that part, repeating in a couple of weeks if necessary.

Some Indiana Prices.

L. G. CHAMNESS.

Four old shoes, reset	$ .60
Four old shoes, toed	.80
Four shoes, new, toed or plain	1.00
Four new shoes, Neverslip toe calks	1.40
Plow lays	2.00
Plow shares, sharpened	.15
Buggy tires, reset	1.40
Buggy tires, new	3.00 to $4.00
Wagon tires, narrow, set	1.50
Wagon tires, $2\frac{1}{2}$ to $3\frac{1}{2}$	2.00
Buggy and wagon spokes, all sizes	.12$\frac{1}{2}$
Buggy rims, all sizes	3.00
Wagon rims, heavy	5.00



A NEW BELT POWER HAMMER.

A New Power Hammer.

The accompanying engraving shows a hammer recently put upon the market. It weighs 4500 pounds, occupies a floor space of $7\frac{1}{2}$ by $3\frac{1}{2}$ feet, and it is adapted to work iron from $\frac{1}{2}$ to 5 inches thick. Two hundred and seventy-five blows per minute may be struck by it, and the power required for driving is estimated at $2\frac{1}{2}$ or 3 horse-power.

The ram has a long bearing, as shown, and the construction is such that the hammer head gets away from the work quickly after striking. The anvil block is separate from the bed, and the lower die may be adjusted in any direction.

Among the novel features of this hammer is the means of shortening or lengthening the fulcrum quickly by means of the handwheel chain and worm gear. When a large piece of work is put on the anvil, the dies can be thrown open wider, thus securing the maximum stroke and blow on large work.

In the same way a very light blow can be had on small pieces. The elliptic spring helve cushions the ram, permitting a light elastic blow, while running at a fairly high rate of speed. The hammer is made by Austin Bragg, Waterville, Me.

Some Ideas on Horseshoeing.

Interfering—Knee-knocking—Forging—Navicular Disease.

J. B. CLARK.

The following gives some of my experience and ideas on horseshoeing: The first thing which I do when I have a horse to shoe, is to look at the feet as the horse stands on the floor. Pare his feet as nearly level as possible. When a horse interferes, pare the feet level, and if there is any rolling out to do, do it with the shoe. After the feet are level, I give the shoe a square inside toe and fit as closely to the inside as I can. You will find that in nine cases out of ten, horses interfere with the toe about half way back. Straighten the shoe from the toe back to the last nail hole slightly, then cut away a little of the foot on the inside, making the job as smooth as possible. If the case is a bad one, don't clinch your nails on the inside of the foot.

Now a word about knee-knockers. I give my shoe a square outside toe and let the shoe project over about one-half an inch at the outside point of the toe. Having given them a perfectly square toe on outside, I roll the inside of the shoe, so as to make the horse break over

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on the inside of his foot. This plan has given good satisfaction.

Forging is the hardest thing with which I have had to contend. I have, however, had good success with forgers, since I learned this way of shoeing them. I cut the front foot as low as it will stand at the toe. Then I give my shoe a rolling toe with the heels a little thicker. If I am using calks, I weld the toe calk as far back on the web of the shoe as I can with good heavy heels. With the hind foot, I leave the toe as long as possible and set the shoe far forward. If calking the shoe, I weld the calk well toward the front of the shoe, making it a little higher than the heels. You will find this a good plan to follow.

Now in the case of a horse having navicular bone trouble, I fit the shoe the same as with any horse, only I do not weld on any toe calk. Give the shoe a little roll at the toe and turn up good block heels. Then weld a bar across the shoe between the second and third nail holes, the same as the Memphis shoe, only with one bar. This takes the pressure off the frog and lets the horse break over easily in front. When we take the pressure from the frog, we take it off the navicular bone, thus relieving the pain, and the horse will grow better in time.

I have worked at horseshoeing since I was seventeen, and have made the horse's foot a study. I think if some of us would study the foot more, we would find it very interesting. I think there is a great deal of good to be found in the horseshoeing journals.

Special Notice to Subscribers.

If you find a bill in this month's paper it means that your subscription has expired. In that case, won't you kindly treat the bill as you like to have the bills you render treated and respond promptly with your remittance? We always appreciate the prompt renewal of a subscription when it expires. It encourages us to think the paper is liked and to try and give readers a still better issue each month. Therefore, if you find a bill, we would greatly appreciate stamps or a money order in payment, the same day, before it is forgotten.

We want each reader of the AMERICAN BLACKSMITH to feel that it is *his* paper, and to take an interest in its betterment. Since the AMERICAN BLACKSMITH entered the field and set a high standard of blacksmithing journalism, other like papers were forced to improve or go under. The publishers of the AMERICAN BLACKSMITH are not content with merely occupying the foremost position; they desire to make the paper more and more valuable. Readers can help by asking for any kind of articles they want, by giving their experience for the benefit of others, and by promptly renewing their subscriptions.

QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

Cylinder Boring.—I would like to see published in THE AMERICAN BLACKSMITH, a plan and sketch of a tool for boring out cylinders. C. L. HIGGINBOTHAM.

White Rock Hoof Packing is made by the Wilbur Stock Food Company, Milwaukee, Wis., as several of our readers kindly inform us.

Horseshoeing Rack—I have a rack of Hunt, Helm, Ferris & Co., which is the only one in the city. It does the work of six men when it comes to bad stock. I highly recommend it. W. M. COOPER.

A Tempering Question.—I would like to ask through the columns of THE AMERICAN BLACKSMITH the best method for tempering cultivator shovels. A. SCHUETZ.

Drawing a Sleigh Shoe Temper.—I would like to ask of some brother blacksmith how to draw a temper from a case hardened sleigh shoe, so as to bore a hole through it easily. A. H. BLUM.

Sand Belt Query.—Will some brother smith kindly send in a plan and sketch of how I could build a cheap sand belt for polishing all sorts of bent wooden pieces, such as felloes and other carriage and wagon wood work? T. L.

Spokes.—In answer to A. J. Rooks, would say shallow gauge the end of your spokes, thus letting the tire rest on the rim and the latter to settle snugly on the shoulder of the spoke. This, notwithstanding Mr. Dickson to the contrary. R. O'HEARN.

Power Hammers Pay—In reply to Indiana, my experience with power hammers is just like with gas engines—didn't think one would help me much before I put it in, but once having one I wouldn't do without it for a good deal. A power hammer is worth two or three helpers almost, and will do any amount of heavy work. I have a great deal of plow work, and on this just couldn't get along without my hammer. I can strongly recommend the power hammer for smith shops of whatever kind. S. M. LEECH.

The Gas Engine as Power.—In answer to the question "Does the gas engine as power pay?" would say yes and especially in the convenience in handling the work to be done. It is all that is required outside of machinery and the man's fitness for the work. The engine must be a Weber, according to my experience. A. B. ELLSWORTH.

Tire Setting.—John G. doesn't say what kind of tire setting is giving him trouble. A buggy tire with $\frac{1}{8}$ inch draw, hot in one place, and wheel sound and straight on the face, will do well enough. If the wheel is back a little, then a little open joint, $\frac{1}{8}$ inch, and $\frac{1}{4}$ draw cold, or $\frac{3}{16}$ hot in one place. Try this. RICHARD O'HEARN.

The Gas Engine—I wish to say a few words in regard to the gas engine. I think it is used in most shops because it is cleaner, takes less room, and saves expense for fireman, engineer, and fuel. It takes less time to start, is less dangerous, and less expense for repairs. I consider it the best in every way. CHAS. ARNY.

Water Wheel Query.—Will some one tell us how to make a small water wheel to drive a blower for one fire, sixteen-foot head of water? Would a six-inch wheel run it if the floats were made of three-inch band iron? Our water wheel is 17 inches in diameter and will plane 5,000 feet of spruce plank per day. OTIS GEDING.

Pair of Dividers.—In answer to T. H. Long in the February number as to how to make a pair of dividers, would say, take two pieces of small round steel or iron, bring one end to a sharp point and flatten the other end. Rivet them and they are done. If you want a better pair, however, you will probably have to buy them. R. O'HEARN.

Flue Welding.—In answer to J. M. K. with regard to flue welding, I would say, try a mixture of five pounds of borax and one ounce of Venetian red. Apply in fire while heating. This is the best mixture that I have ever seen for applying on the outside and I have had thirty-three years' experience. R. A. S.

Remedy for Knife Warping.—In answer to Samuel Krebbs as to how to prevent knife warping, when tempering, would say lay it on the end of a solid block of wood when drawing the temper, about the time the temper is what you want, and straighten it with the round end of your hammer. Don't be afraid to strike it, for it will then have enough heat in it to keep it from breaking. R. O'HEARN.

Gather—Mr. Foster must stand corrected. A vehicle moving forward or backward or even sideways never brings any appreciable pressure on the front or back of the axle. To do so the spindle would have to leave the bottom or under side of the box. All old spindles will be found to wear on the bottom, wearing to an oval, bordering on flatness. This being so, the rest of your argument is nil. R. O'HEARN.

Interfering.—I noticed in the March issue Mr. Bert Fields' inquiry on interfering. If the horse strikes with the toe, quarter or side of the foot, try a light shoe with the inside heel turned out and the outside heel fitted close. Pare the foot level on the bottom and fit the shoe full with the foot. Do not cut off edges of hoof. Leave plenty of toe. If it has been cut off already, let the shoe project over a little. If the roads will not permit the use of a plate, weld toe calk on inside of heel, ordinary calk on outside heels, putting toe calk a little to the inside of the centre. I have used this shoe successfully on livery horses that are driven hard all the time. R. A. S.

Wheel Work.—In answer to the question asked by Mr. Rooks in the February number, Mr. Dickson says with regard to wheel work that the tenon on the spoke should be left to come flush with the outside of the felloe. I have found in over twenty years' work that if I leave my tenon about $\frac{1}{16}$

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of an inch short and then pin the felloes all tight except one, leaving one open space of ¼ inch, that when you give your tire ¼ inch draw, it will bring the tenon flush with the outside and make a good job, one that can be guaranteed for three years under almost any kind of a load. I think they will agree with me. C. W. METCALF.

Barcus Shoeing Racks—I wish to say in reply to a recent question that the Barcus shoeing rack is the best thing I have ever seen. I do not wish to say anything about the other shoeing racks, but I think the Barcus cannot be beaten. We have one in our shop that cost $65, but $165 would not move it out of our shop and compel us to do without it. We are frequently called upon to shoe Indian ponies, as well as some large horses that are very bad. MAYNARD & HARRIS.

New Machine Wanted.—I want to say through these columns that if some one could get up a machine run by power that would answer the purpose of punch and shears, tire upsetter and tire bender combined, it would be a great seller throughout the Northwest, because it would save so much room. CARL NORDHOUGEN.

A Canadian Letter.—I would not like to do without THE AMERICAN BLACKSMITH. I have worked at all lines of the trade, railroad shop, carriage shop, general jobbing and shoeing, and from the way in which the paper explains the different lines of work I consider each copy worth at least 25 cents to me. A. CAMERON.

Interfering Horses.—I have two rules which I follow. The first is that the foot or line must be straight from shoulder down to the toe and the other is not to drive the horse fast down hill, as he throws the weight all on his ankles and shoulders. To shoe the horse first fit the foot level, and turn the shoe to correspond to the foot. A. B. ELLSWORTH.

Tempering Gun Springs. — Mr. J. Summs, in order to temper your gun spring, heat it to a dark cherry and cool in linseed oil. (This is good enough, although I know a better). Then heat to a red a piece of hoop iron, lay your spring upon it and let both cool together. I will give you twenty-five cents for every one that breaks or weakens if you will give me a quarter for every one that stands,—your work being properly done. R. O'HEARN.

Prices.—A few words of advice which I wish to give on prices are as follows: Do good work and you need not fear that the good price you charge for it will lose you any worthy customer. I charge the highest prices of any smith in this town and I make my charges without any apologies. I credit a few for a week or ten days, but I *know them*. I have not lost $2 in eight years through crediting. R. O'HEARN.

A Shoeing Query.—I would like to ask brother smiths how to shoe a young mare that strikes a full blow with one foot only, causing her to go very lame at once, and continue lame for several days. She is in good condition. I have tried every way that I can think of, but without the desired effect. She travels wide when trotting, but in starting and stopping is very likely to strike one of those terrific blows. Can I shoe to stop it? INQUIRER, CANADA.

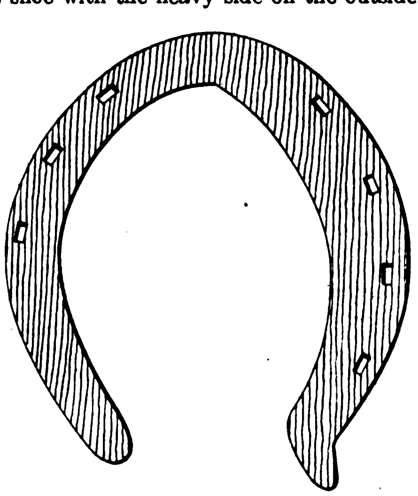
Tempering Knives.—The following is in answer to the inquiries of Messrs. Samuel Krebs and Thomas Long: In tempering so as not to warp the knife or any thin steel, heat to a good plain red. Then take from the fire in a pair of tongs not too heavy, hold by the side of the shank in the tongs and about two or three inches from the oil or water with the edge or back down. See that it is right before you let the point drop. Hang on to the shank of the knife and do not let it go in the bath. Melted lard is the best to temper knives in, as water will crack them if you do not put about two inches of oil on the water. THOS. A. MCKAY.

Wheels—In answer to the question of "No Nothing" in the February issue, would say that I have built and repaired wooden hub wheels, also the Sarven flanged wheel for a good many years. I have found from experience that a good wooden hub, such as white oak or birch, will surpass any flanged hub, for the simple reason that so many do not understand the repairing of the Sarven hubs. We have both kinds in the War Department and would say that the wooden hub gives the best satisfaction, as the rivets work loose in the flange and the iron flange will wear the spoke a great deal faster than a wooden hub. M. A. FOSTER.

Painting Questions.—When I open a keg of white lead and use one half and want to keep the balance for thirty or sixty days, will it do to cover it with water to keep from drying? When you use a torch to burn old paint off, do you have to scrape paint off while hot or do you burn paint all over the gear before you scrape any? KENTUCKY.

In Reply.—Keep the white lead perfectly covered, and change the water frequently. When burning off old paint, remove it while hot, as fast as it is burned. M. C. HILLICK.

To Stop Interfering—In reply to Mr. Cryce, to stop a horse from interfering behind, pare the foot level and fit neatly a shoe with the heavy side on the outside.



A SHOE FOR INTERFERING.

It may require a couple of shoeings to do it. In my experience this would stop any case of the kind. The figure is drawn from a hand-made shoe. JOHN MULL.

A Canadian Letter.—I am sending a dollar for my renewal subscription, as I cannot be without the paper. It is a great help to me. I run a general jobbing shop, do carriage and buggy building, repair wagons and sleighs, do horse shoeing and repair plows and machines for the farmers. We are going to raise our prices soon. What it will be I can not say definitely, probably 20%. ALEX BANNATYNE.

Some Kansas Prices:—The following give our run of prices:—

New shoes, per set of eight	$3.00
Resetting old shoes, each	.20
Sharpening plows	.35
Sharpening lister	.50
Pointing plows	.75
Pointing cultivator shovels, each	.50
New stubs up to 1½ inches, per set	7.00

Soft center plow steel is the only kind of steel we can use for plow work. Blanks for plow shears cost us 18 cents per pound, and we get $3.50 for new lays up to 16-inch Lister lay blanks cost 25 cents per pound and we get $4.50 for putting on new lister lays. LOUIS L. RUHLEN.

Advice On Prices.—Mr. J. J. Mullen, you say you have worked at the business five years. We are not going to suppose that you know more about it than some who have worked at it longer, though you may. But supposing the case as we first put it, it is not reasonable to expect customers to stay or new customers to come, simply because you have put up the price. To command the best prices, unless you have a pull in the community that nothing can stagger, which does not seem to be the case, you must do the best work. Charge like the others until you can do better work. Stick to your shop if you think you can do better as you grow older. If not, get out right off and work for another man or at some other business. That's my opinion. R. O'HEARN.

Shoeing a Horse that Wings—In answer to Mr. Davies with regard to a horse that wings, would say that I have had some experience with that kind and I shoe them as follows: Weld a piece of iron five-sixteenths by one inch at the toe nail on the inside quarter of the foot that he wings and let it extend from the shoe three-quarters of an inch. If he is an extra bad one, let it extend out longer. I have found this successful. ALEX. HENDERSON.

Shoeing Forward Foot—In regard to the forward foot, which I have found to be the most troublesome, would say, do not cut the foot all away or burn the life out of it, as that seems to be the easiest way for some men to level a foot in fitting a shoe. My experience has been to fit the shoe as full as possible and let the shoe follow the wall on both of the quarters. To cover the two bars of a shoe is out of the quesion as the shoe settles down in the quarters and the result is the horse is lamed. I like a shoe heavy on the heels so as not to give. The heel calk should be a little higher than the toe calk and on a flat-footed horse very little filing should be done on the outside. Draw the toe nails first, then the outside and last the heel. GEO. D. ALBERTSON.

Interfering Horses.—In answer to Mr. Bert Fields with regard to his interfering horse, would say that he should pare the inside of the foot ⅛ of an inch lower than the outside. Then take a bar of steel 7/16 by ¾ and about twelve inches long, depending on the size of the foot. Mark off one third with the center punch. This point is the center of the toe. Draw the one-third long enough to fit the inside of the foot and bevel the edge starting at the center of the toe to a feather edge. Now shape the outside of the shoe, drawing a little at the heel. Turn the small heel calk on the outside, throwing it out a little, with no toe or inside calks. Fit the inside even with the hoof, not cutting any away. Fit the outside full, using toe and side clips. I have found this successful in many cases and hope it will prove so with Mr. Fields also. WALTER L. LONG.

Flue Welding—Replying to Mr. J. M. K., in March, just a thought would arise in my mind. First, what facilities has he for cleaning the inside of the flues? It may be that the coal used in firing the boilers is sulphurous, and that sulphur is adhering to the inside of the flue back of the scarf. When it gets hot the fumes going all through the part to be welded would produce such results. As to fluxes, I will say some twenty-five years ago I did work of this character. We would gather clean scales of the iron, around steam hammer or anvil, and mix it with sand. Any flux is good to exclude the air, thereby retaining the heat better. Oil of course is doubtless the best for heating. If this can help the enquirer he is welcome. J. L.

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Barcus Horse Stocks—In answer to W. W. Herring's question in the February issue that he would like to hear from some one who had used the Barcus stocks, I have used them for two years and they are very good. I have been looking up the stock question for twenty years and the Barcus is the one which I consider worthy the name of stocks. When you get an animal in them, he is perfectly secure. The foot you are working on is as secure and solid as if fast in a vise, and you can put it just where you want it. For my part I do not like a set of stocks made up of ropes and blocks, as I find that a rope cannot be fastened in any way but what there is a lot of give to it. H. B. DUNPHEY.

Horse Racks—In reply to Mr. B. Q. Davis, two years ago I bought a Martin rack and find it all they claim for it and a little more. I have shod a horse of 600 pounds and one of 1,700 pounds,—no more trouble with one than the other. The horse cannot move his foot over four inches at the most. It works so well that I have had horses brought for miles to be shod, and all my customers are very well satisfied. I recommend the Martin rack by my own experience. GEO. D. ALBERTSON.

About Engines and Tires.—I am operating a shop 46 by 34 feet, having a 2½-horsepower Weber Junior engine, with which I am very well pleased. This engine runs a trip hammer, emery polishing wheel, one iron and one wood turning lathe, one blower, and one band saw, 26-inch, and a circular saw. The trip hammer and both lathe and band saw are of my own make. Most of the time I run the shop alone and find that by having all these machines can do more work than with a man. The Weber engine is just the one for a shop, and I would advise any blacksmith who needs power in his shop to get a 2½ Weber Junior. He will find it a good helper.

When I am putting new tires on wagons I start the engine, put the belt on the blower, heat the ends of the tire, take it to the trip hammer, and draw it out. Then I punch a hole in each end to rivet it together. It is now ready for bending. I then take and weld it. I heat all my tires in the forge fire. I have found this the easiest way when there is an engine to blow. I believe in having a handy shop, with good tools and machines. J. G. STORN.

A Query from Georgia.—I wish to say that I really cannot do without THE AMERICAN BLACKSMITH. I would rather be without a helper than the journal, for sometimes I strike a job I could do without the helper but could not do without the paper. I wish to ask if there is any shorter way to find the length to cut a bar, say 1¼ inches diameter so as to stave it up and make it 1¾ inches diameter and four inches long. I have the old Sanford Rule. I would like to hear something on the subject.

I am really ashamed of the prices which the blacksmiths in this section work for. However, here are a few:

Setting tires, each	$ .40
Putting in hound	1.00
Wagon tongue	2.00
Cup pole	.75
Bolster, two	.75
Setting axles	.75
Rims	1.00
Horseshoes, four,	.70

You can see by these prices how hard we have to work in order to make both ends meet. J. E. MCLEROY.

Errata.—I note with some pleasure that my prize article has found a place in the April issue of THE AMERICAN BLACKSMITH. There are two points in the illustrations that are not exactly clear, and I will here correct them. On page 126, down in the first column we read. "Have a piece of straight iron two feet long bent up about ½ inch on one end. Place this end under axle one inch inside of shoulder, (See Fig. 2, A). In Fig. 2, A, this bend is absent and cannot therefore be understood. By bringing that bar down, bar and axle move part and axle rests only on that bend. This is necessary to be comprehended to get correct results.

"In Fig. 2, C, where gage is set, the point of screw is way in on spindle. This is wrong. The point of screw should be directly over nut shoulder and the mark on wedge. In the illustration the outside end of gauge is just over place where point of screw should be. In other respects it is all O. K. Should criticism on other points arise, I will not leave them unnoticed if it be brought to my knowledge." C YOUNGSTROM.

A Chatty Shoeing Letter.—I wish to say that I desire to keep up with the times and I know of no better way than to be a regular subscriber to THE AMERICAN BLACKSMITH. I have received a great deal of information from the journal which has been worth dollars to me at a very small cost. If I did not receive THE AMERICAN BLACKSMITH once a month I would feel that I had lost a valuable friend. I am more interterested in the horseshoeing notes than anything, although I do regular jobbing, yet horseshoeing is my delight. Therefore I am always pleased to read any notes upon that subject. Some time ago a brother craftsman wrote that he never knew of a pacer having navicular disease and asked that if any one knew of such to report. I had one at the time, but said nothing, as we had just performed an operation on her and desired to know the result. After giving the mare a reasonable time, I was pleased to find that the operation was very successful and in about three weeks I could drive her and, shortly, she was over her lameness altogether. She was a regular pacer, could strike a 2.25 clip and was eight years old. I sold her afterwards at a good figure.

At the present time I have a double gaited mare that has a mark of 2.25½. She will trot or pace, whichever one wishes, and do it without a hitch, although she is a little the faster trotting. She has been a little tender in one fore foot. I shod her many different ways, but found nothing as satisfactory as the Revere Air Cushion Pad. She is going all right now and I entered her in a race on the ice, where we held our races in the winter.

In shoeing horses, I shod at one time without any assistance thirteen horses in 6½ hours, at another, fourteen in seven hours, and another, sixteen in eight hours. In doing this, I had all the shoes to take off and the feet to dress, also to renew the calks on four sets of old shoes, the rest being new shoes with the toes already welded, but I had the heels to turn. The above was done with satisfaction to my customers. I am pleased to say that I have had better success in horseshoeing since I have been a subscriber to THE AMERICAN BLACKSMITH and can explain more fully any questions asked by customers. A. P. WETMORE.

Knuckled Horses.—I would like to know regarding shoeing knuckled horses or horses about to knuckle, how the shoes are made and all the light which I can possibly get on the subject. GEORGE PINE.

In Reply to the question on shoeing knuckled horses, the following will probably be of interest. In the first place, knuckling is a partial dislocation of the fetlock joint which predisposes the animal to stumbling and to fracture of the pastern. Horses with erect pasterns are very prone to knuckle as they grow older, especially with the hind legs. All kinds of heavy work, and especially hilly localities are apt to excite the same thing. Knuckling may be produced by disease of the suspensory ligaments or of the flexor tendons, whereby they are shortened, and by disease of the fetlock joints.

Shoeing should be done with the idea of relieving the tendons and ligaments. Prepare the feet for the shoe by shortening the toe as much as possible, leaving the heels high, or the feet may be prepared as usual, but the shoe made very thin in front with thick heels or high calks. For the hind feet a long-heeled shoe with calks is recommended. In aggravated cases of knuckling it often happens that relief cannot be secured by shoeing, when the animal becomes useless unless surgical operation is resorted to.

Trip Hammer.—I saw an inquiry in a recent issue as to what kind of hammer would be advisable to instal in a shop. I put in the Easy trip hammer made by Mayer Bros., Mankato, Minn. It weighs 1,000 pounds and strikes 350 times per minute. You can hit very hard or slow and easy, as it is controlled with the foot and easy to handle, and most any kind of work can be done. I have short punches and narrow cut-off chisels and can cut or punch anything I put in. I also put in a gas engine manufactured by the F. M. Watkins Mfg. Company, of Cincinnati, O. a two-horsepower one. It is certainly a fine piece of machinery and starts with all ease, never failing to start at first attempt. Any boy could run it. I drive a fan for two fires and could blow four more; run one press drill, emery wheel, band saw, ventilation fan, and trip hammer and can run them all at once. If you need power you cannot do better than buying one mentioned above, as also a trip hammer made by Mayer Bros. My engine runs for less than ten cents per ten hours on natural gas, 20 cents per 1000. I always have power to spare. The two engines which I had before did not give satisfaction and I would warn the smith who buys an engine to get one well made and to start easily, and the Watkins will do this. The other engines which I had were very hard to get started, taking sometimes as long as thirty minutes. The trip hammer is very easily handled and saves a great deal of hard work. I also use the heavy steel forges with Champion No. 400 Blower. I can blow by hand or power, but do very little by hand. A. M. SPEER.

Tire Setting—In reply to John G. with regard to tire setting, I would like to say I have always had very good success with setting tires, old or new.

First, before removing the tire, mark both tire and rim at one joint on the back of the wheel. Take the tire off and if the wheel is rim bound, run a saw through the joint opposite your mark. If the spokes are loose in the rim, commence at the marked joint and wedge up each spoke (for buggy wheels I use the points of nails), and if the rim is crowded together saw out some more as at first. When you have your rim up all around, if your wheel has dish enough take out a very thin saw kerf, or if you want more dish take out more, but not over one-eighth inch. After measuring the wheel, run the tire before heating to see how much to shrink. Heat the tire on just one side of the joint opposite your mark and upset. True your tire up, cool it off, then run it. If you have to shrink it more, do so on the other side of the joint, and you will have very little trouble about your bolts going back. Give it just about one-sixteenth inch draw after the joint is closed and you will have a good job. On wagon tires it is not necessary to be as careful as with buggy wheels for they will not dish as easily as the lighter wheels. I think if John G. follows these instructions carefully, and does not make any mistake in measuring his wheel and tire, that he will have success. J V. RANDALL.

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An Interesting Letter.—I wish to express my approval of The American Blacksmith, which I have taken since its first number. I think that reading a good trade paper is one of the essential points in keeping up with the times. I am running a general blacksmithing business in a small Nebraska country town. I have a very good outfit for a small place,—Weber 2½ horsepower engine, Mayers Bros. Little Giant Trip Hammer, emery wheel, disc sharpener, feed grinder and drill press, run by power. One of the most convenient tools which I have is a Winner back-geared lever shear. This is in use every day and will cut anything from a shingle nail to a buggy axle and I would miss it about as much as my anvil. In buying a shear, don't get one with the blades inside of the frame. The following is a list of our prices on some common jobs.:

New plow lays, solid cast, 14-inch	$3.00
New plow lays, solid cast, 16-inch	3.50
New lister lays, solid cast, 14-inch	3.00
Sharpening plow lays	.25
Sharpening lister lays	.35
Sharpening cultivator shovels, four to set	.50
Laying cultivator shovels, four to set	1.50
Shoeing, per shoe, new	.50
Shoeing, per shoe, old	.25
Welding mower sickle	.50
Buggy axles, short arm, one-inch	6.00
Setting wagon tires, 1½-inch tread, per set	2.00
Setting buggy tires, per set	2.00
Sawed wagon felloes, per piece	.25
Spokes, 2 inches and 2¼ inches, each	.20
Wagon tongues	2.50
Bolsters	2.00
Axles	3.00

Fred H. Wood.

On Axle Hints, Criticisms.—If C. D. Bridell wants to "turn work off faster," why does he waste time by taking two heats to weld an axle? One heat is all that is necessary on a steel or iron axle of carriage size. Lay the ends together, as at A, for a good weld. If afraid they will slip, scarf like B, when they will fit tight and "never slip."

In connection with the foregoing, wish to say that every experienced smith taking this journal should not let anything go uncriticised unless it be of the very best. I wish to differ with my brother craftsman who says that half of the spokes in a buggy wheel may be turned in order to take out the dish. What will the work look like? I also would like the other smith, who bevels his felloes ⅛ of an inch to keep the dish in the wheel, explain how he fits a tire to such a bevel and how he keeps it on after he fits it, as this is certainly puzzling to me.

Another smith says he stretches a heavy tire which is too tight by fullering it on the edge. I also disagree with this craftsman, and would like to know if any other mechanic of our trade does this? R. O'Hearn.

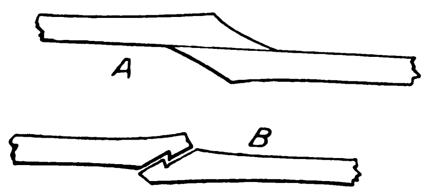
Welding Compound and Crucibles.—The following description of a home-made crucible and tongs to handle the same may be of interest. A band 3 or 4 inches wide by ⅜ or ½ inch thick is rolled up into a round or cylindrical form, about 3 inches in diameter, and then lap welded. Next make a plate or disc of the same diameter, which is welded on the bottom by fusing the rim from one point all around. The tongs are made with long jaws pointing down at right angles with the handles, instead of in line with them. The jaw going inside the crucible is round and the other one square. They are also a useful tongs for welding bands and singletree clips, etc. This crucible is one of the most useful things in my shop for making babbitt or solder, brass, or in fact you can melt any metal in it with care. The tongs are cool when you lift the crucible out of the fire to run. They cannot be detached until ready to run; then they are cold and grip well.

A very good flux for steel welding is made of borax, by first melting it in a crucible like the above. It is well to melt it until it looks like dark syrup in the bottom of the crucible. Then run it out on a dry, clean floor to cool. When cool, powder and mix with filings or fine borings of wrought iron or steel. Put this on the work when well red and your judgment will determine its value. The steel must be on the verge of a good fuse when this is applied. I have the best results from it. It is very convenient and cheap flux; therefore, I would recommend it to the craft for a trial. J. P. Mulrony.

Remarks From Down East.—I have read with interest a good many articles on horseshoeing, interfering, etc., in The American Blacksmith. Regarding scientific horseshoeing, there is no such thing. But practical horseshoing is all right. As there are no two horses gaited alike, neither are there any two horses that need to be shod alike. Therefore science doesn't apply to it, but practice does.

About two thirds of the shoers in the world shoe too heavy at the heel and too high. That is, they take a shoe that's one or two sizes too large for the foot and turn down a great big heel calk and too high, thus raising the frog of the foot an inch or more from the ground and bringing the nail holes too far back in the heel, which will ruin the best foot on earth.

Far better take a shoe a shade small for the foot and draw the heels out and turn down a small low calk, which will leave the nail holes nearer the toe and allow the frog to come nearer the ground. This applies to sound feet. But for contracted feet and corns, which two evils go together, the best remedy is to shoe with tips. But to shoe with tips, the smith has to use a lot of judgment mixed with a lot of experience, as some horses will not do well in tips. In such cases use a shoe with no heel calk and as thin a heel as possible. In some cases bar shoes are necessary for corns. But tips are always best for contraction where there are no corns. A. D. McLane.



SCARFING AXLES FOR WELDING.

Diuresis.—A work horse of mine recently died, after ten days' sickness. He would hold his head down, his ears were cold, but he ate well all the time. He drank lots of water and would urinate every little while. He seemed weak in the hind legs and would stagger when he walked.

In Reply, the disease "Diuresis" consists in an excessive secretion of a clear watery urine with a correspondingly ardent thirst, rapidly advancing emaciation, and great loss of strength and spirit.

Its cause may be the reckless administration of quack horse powders, acrid plants in grass or hay, new oats imperfectly cured, an excess of oats or other very watery food, a full allowance of salt to animals extremely fond of it, or most commonly, grain, hay or bran which has not been properly dried, and which has become musty and permeated by fungi. Thus, hay, straw or oats secured in wet seasons and heating in the rick or stack is especially injurious. This malady is widespread in wet seasons, especially in rainy districts.

As for symptoms, the horse drinks at every opportunity and passes urine on every occasion when stopped, the discharge being pale, watery and inodorous. The flanks become tucked up, the fat disappears, the bones and muscles stand out prominently, the skin becomes tense and hide bound, and the hair erect, scurfy and deficient in lustre. The eye becomes dull and sunken, the spirit are depressed, the animal is weak and sluggish, sweats on the slightest exertion, and can endure little. The subject may survive for months or may die early of exhaustion.

The treatment consists in stopping the eating of the faulty drugs, poisons or food, and supplying sound hay and grain free from all taint of heating or moistness. A liberal supply of boiled flaxseed in the drinking water at once serves to eliminate the poison and to protect the irritated kidneys. Tonics like sulphate or phosphate of iron (2 drams morning and evening) and powdered gentian or Peruvian bark (4 drams), greatly help by bracing the system and hastening repair. To these may be added agents for destroying the fungus and doing away with its poisonous products. In the case of musty food, nothing acts better than large doses of iodide of potassium (2 drams), while in other cases creosote, carbolic acid (1 dram), or oil of turpentine, (4 drams), *properly diluted*, may be resorted to.

Gather or no Gather.—Mr. Nels Peterson has been entertaining us as visitors to his plant in such a way that we must feel very much obliged to him for the lesson we got. That they do not set axles with gather in that plant is none of our business, but his loyalty thus to his company in defending this negligence is another thing. I for one will disagree with him. In his last attempt to prove his idea correct, he turns his work upside down and sees it work to his satisfaction. He sets the axle to give bottom side of spindle a slanting position to a line drawn through centre of spoke and says, "It is this slant, together with the pressure of the load from above, that crowds the wheel to the collar." And if he had stopped here, he would not have been contradicted, but he goes on and says, "and renders gather unnecessary." A good way to settle an argument, is it not? An axle can be given pitch or gather enough to get the wheel up to the collar, but that is not the contention; it is to get it to run up to the collar with least possible draft, *i. e.* to avoid friction as far as possible. Everybody knows if a ring is started in motion over a smooth surface, it will move in a straight line as long as it stands straight up, but as soon as it begins to lean towards one side it will deflect from the straight line and travel in a curved line; the more it inclines the shorter this curve of line. For an example, take a wheel-barrow and you will see that you can make graceful turns simply by raising or lowering one of the handles. Another experiment: Move one bearing on the wheel-barrow slightly backward and you cannot push it in a straight line without holding one handle higher than the other.

Come back to the buggy. The axle is set for pitch, no gather. The wheels are inclined to the outside. With the buggy in motion, the wheels, if they could, would travel in a curved line, but they are kept in place by "slant of spindle and load above." This tendency of the wheels to run away from buggy, but held in check by spindle, causes the tires to creep or slip inwards as the wheels roll on. This creeping produces friction. (In Mr. Peterson's experiment with wheels bottom-side up, this friction was not produced, because it requires two surfaces to come in contact before there can be

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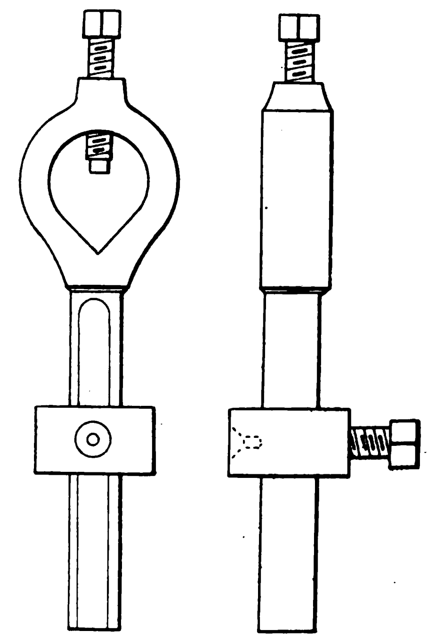
any friction). To overcome friction so produced, the thing to do is to turn the direction of the wheels inwards in front just enough to counteract their tendency to run to the outside. If we go too far, the creeping will be the other way. Yes, we can set gather enough to "*render pitch unnecessary*." The way to get light draft renders both necessary, and by adding the two together it requires less draft than setting only for pitch. If more explanation is necessary I will come again. C. Youngstrom.

Disease of the Eye.—I have a horse from whose eyes has been running for the last two months a water which seems to take off the hair below his eyes. By standing in the stable for a week or more at a time the eyes will nearly cease to run; then if I take him out and drive him the eyes will run again. The horse seems to eat good and feel good in other respects and his eyes seem to be no worse than they were a month ago. My stable is a good box-stall with one window in it at the south. I have tried different remedies recommended to me, which seem to do no good. What would you recommend me to do for the horse?

Lyman F. Terwilliger.

In Reply to the question above, as nearly as can be judged from the facts stated, the trouble seems to lie in an inflammation, more or less severe, of the eyelids. This may be due to a number of varying causes, such as exposure to drafts of cold air, of cold rain or wind storms, to bites, stings or bruises, or in many instances it is the accompanying effect with other diseases. Inasmuch as the horse here described seems to be in good condition and also is improved by remaining in the stable, it is very probably due to the first-named cause, exposure to cold air, rain or snow. In cases of such inflammation the lids are swollen and thickened, more or less, and the inner lining of the lids is a deep red color. The part is hot and painful and a profuse flow of tears and mucous escapes on the side of the face, causing loss of hair. The treatment consists in applying a soothing lotion as the following: Thirty grains of sugar of lead, two teaspoonfuls of laudanum, and one pint of rain water boiled and cooled. It should be applied with a soft cloth kept wet with the lotion and hung over the eye by tying it to the headstall of the bridle on the two sides. If the mucous membrane under the lids shows small red granular elevations, a drop of a solution of two grains of nitrate of silver in an ounce of distilled water should be applied with the soft end of a clean feather on the inside of the lid twice a day. To aid recovery, the patient must have all aggravating causes removed and should be fed from a manger high enough to favor the return of blood from the head. Hard work and a tight collar should be abstained from. His diet should be laxative and non-stimulating (grass, bran mashes, carrots, turnips, beets, potatoes or steamed hay.) If improvement follows, the discharge becomes more tenacious and tends to cause adhesion to the edges of the lids. This gradually decreases in amount and the redness and congested appearance of the eye disappears, but the swelling, thickening and stiffness of the lids may continue for a length of time.

Holding Crank Shafts.—A few months ago there was an inquiry in The American Blacksmith for a way to hold crank shafts in turning. For turning light ones that are used for threshing machines, hay loaders, or any light ones, an adjustable dog made with a sliding collar, as is in the figure, is a good way for repair shops, as they can be instantly adjusted to the different throws of the cranks to be turned. They are much better than to spoil the looks of a dog by drilling centers along the shank and running the risk of spoiling a dog before you get th exact center. A good way to make the dog is to take a piece of $1\frac{1}{8}$ or $1\frac{1}{4}$-inch machinery steel; or an old axle stub makes a good one. Begin about $1\frac{1}{2}$ inches from the end and split for about $2\frac{1}{2}$ inches. Open the split and make it round on the end that the set screw goes in. Leave it V-shaped like a common dog on the shank end. This end should be from 6 to 8 inches long. Now center the piece and turn the set screw end, leaving the shank as large as the stock will allow. File or plane a flat place on shank for the collar set screw to work on, which keeps the collar from turning. This flat place should be on a line with the hole in the dog. The collar should be made of steel, nicely turned. Put set screw in one side of collar and directly opposite put the center hole for the lathe center to work in. For heavier crank shafts, it is better to make arms or castings bored and fitted to the ends of crank shafts. Sometimes it is all right to



SPECIAL DOG FOR TURNING CRANKS.

fasten one end of shaft direct to face plate at the right distance from center of spindle to give the crank the right throw. Turning solid crank pins is at all times a difficult operation on account of the distance the tool has to extend out from the tool post unsupported. Backwoods Machinist.

The Value of Wheels—In reply to "No Nothing" in the February number as to the comparative value of wood and Sarven hubs for wheels, will say that the value of a wheel depends on where it is to be used. If a wheel is desired for use mostly on a paved street and solid stone roads, the wood hub is much better and will last much longer, but if on the other hand you want a wheel for a dirt road then the Sarven wheel will give better satisfaction. At least this has been my experience in twenty-five years running a general jobbing shop for both city and country trade. G. W. Hopkins.

Engine and Pulley Speeds.—Having been a constant reader of The American Blacksmith almost from the beginning, and having noticed a number of questions in regard to machinery in general, I think a few hints in regard to calculating speeds, size of pulleys, etc., might be of value to some smiths and carriage makers who are about to install power and machinery in their shops.

The principal change that has taken place in the shop of a progressive blacksmith in the past three or four years has been in the installation of an engine and purchasing of machinery in order to relieve the smith of much hard labor and at the same time increase his business. When the blacksmith wishes to put in an engine the question might be asked, what size of engine should he buy? Here is where most blacksmith's make a mistake in buying an engine too small, because then it will not give satisfaction and probably cause much trouble. Experience teaches that for work requiring two horse-power you should buy an engine of about four horse-power, because then there will be less danger of overloading and it will run smoothly all day, with very little attention, while the small engine must be constantly watched and a little carelessness will cause the engine to pound at the bearings, giving much trouble and soon being ruined. Another advantage of the 4-horse power engine is that it will allow you to put on other machinery later on and as a general rule more machinery is needed.

In choosing the speed of the line-shaft it is usually best to run it at a speed of about 200 to 250 revolutions per minute, because if run at too high a speed it generally causes a noisy running shop and the bearings must be more carefully watched to prevent heating. If there is much high speed machinery to be driven from the line-shaft it would probably be better to run it at about 300 r. p. m. If run slower, it will mean too large driving pulleys on the line-shaft.

In getting the size of pulley for the line-shaft remember that the diameter of the driving pulley multiplied by its number of revolutions per minute is always equal to the product of the r. p. m. of the driven pulley and its diameter. Suppose the diameter of the engine pulley to be 12 inches and the speed 300 r. p. m. The product then would be $12\times300=3{,}600$. If the line-shaft is to be run at 200 r. p. m. the product of its speed and the diameter of the pulley on it, which help to the engine pulley must equal 3,600, or the diameter of the pulley, would be $3{,}600\div200=18$ inches. The size of pulley on the line-shaft for driving other machinery is found in the same way. That is, we know the size and speed of the pulley on the machine, and we know the speed of the line-shaft, so from them as above we can figure out the size of the pulley we must put on the line-shaft to drive the machine at the required speed.

In finding the size of belt required the main element to be considered is the linear speed of the belt in feet per minute. Suppose the engine to be four horse-power. Then in order to find the size of belt, we calculate the speed of the belt, which would be one $\text{foot}\times3\frac{1}{7}\times300=$ about 940 feet per minute (using same dimensions of pulley and speed as in previous calculations.) Now a belt having a speed of 800 ft. per minute is considered capable of transmitting one horse-power for every inch in width without undue strain on the belt. In order to transmit 4 h. p. with a speed of 940 feet per minute the width would be equal to $800\times4\div940=3.4$ or a $3\frac{1}{2}$ inch belt would be required.

The speed of emery wheels should be such as to give a velocity to the circumference of about 5,000 feet per minute. Suppose we have a wheel 12 inches in diameter; its circumference would measure 12 x 3 1-7 or 37 5-7 inches and in order to have a linear velocity of 5,000 feet per minute the speed in r. p. m. would be equal to $\frac{5000\times12}{37\frac{5}{7}}=$ 1,590.

In general, emery wheels are not run as fast as they should be to get the best results from them. H. Feldhus, Jr.

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Shop Photographs Wanted.

Don't forget to send in a photograph of your shop for reproduction in The American Blacksmith. Interior views are the most interesting, if good, clear ones can be obtained showing the shop arrangement. With the photograph send also a few words about the tools, the amount and kind of work done, any item, in fact, that would make the description of greater interest to brother smiths.

Subscription Contest Announcement.

Last month was published the result of our winter subscription prize contest. We now announce another chance, open to any and all of our readers, to try for three prizes for the greatest number of new subscribers sent in between this time and September 1, 1904. The prizes are in cash, $5, $10 and $15, and in case of a tie for any of the three prizes, an equal division of it will be made.

In addition to the prizes, we offer a liberal cash commission, so that everyone who secures one or more new subscribers for us will receive something in return for the effort, whether he wins a prize or not. Drop us a line and we will give full particulars. This prize contest presents a splendid opportunity for making the spare summer minutes yield a good profit. We help all contestants to the utmost in getting subscribers, though relatively small clubs will probably secure the prizes.

Advertising Opportunities for Smiths.

Attention is called to the announcement on page XIV, giving a special schedule of rates for small advertising spaces. Readers who desire to put before their fellow-craftsmen any tool of their make or invention will be interested in this opportunity for doing widespread advertising at little or no cost. Some of the largest manufacturing plants of this country have been built up from the humblest of beginnings, and it goes without saying that in all such cases it was found as necessary to advertise as it was to have something to sell.

Our Blacksmiths' Directory.

Some time ago we asked subscribers to send in the names and addresses of blacksmiths in their locality, and the response was most hearty. We have decided to ask again, therefore, and this time are offering a neat souvenir in return. All that is necessary is to send 10 or more names of blacksmiths or wagon builders, carefully giving the addresses, and the little souvenir will be forwarded prepaid as a reward. Those who take advantage of this offer will kindly be careful to give the names and addresses correctly. This opportunity is open to any reader.

The Gas Engine Article Contest.

In this issue will be found some of the prize winning articles on the advantages of gas and gasoline engines in the smith shop. The contest was notable for the uniformly high standard of the articles submitted, making choice between them difficult. So much so was this the case that the judges after careful consideration decided to divide the cash prizes, amounting to $20, equally among the four following contestants: F. A. Wheeler, Lyndon, Kansas; William Murphy, Ida Grove, Iowa; Walter McCoy, Conway, Kansas; and Willet Creed, Newton, Illinois. Instead of three prizes of yearly subscriptions to The American Blacksmith, it was found necessary to award six, to the following contestants: B. T. McChesney, Brewster, Minnesota; W. M. Tanner, Du Quoin, Illinois; G. F. Sanders, Port Maitland, Nova Scotia; Wood Brothers, Carrollton, Ky.; T. P. McCanne, Newark, Texas, and W. B. Neethan, Bakewell, Derbyshire, England.

A great many other articles of high merit were sent in, and we regret that prizes could not be given at all. Among those deserving of special mention were contributions by J. Vestal, J. E. Shealy, M. J. Morford, F. L. White, J. S. Schafer, A. Bruton, S. J. Pemberton and R. A. Patterson.

These articles will be published from time to time in our columns as space permits, and are especially recommended to those readers who are thinking of putting in power. Any number of excellent points are brought out.

The Interesting Story of Thomas Newcomen, Blacksmith.*

DWIGHT GODDARD.

Concerning the personal history of this engineer very little is known, and yet the engine which bears his name was the very first use of steam in a successful steam-engine. It was so successful that it held the field almost without dispute for the half century preceding the epoch-making invention of James Watt.

There is no record of his birth, but the house in which he lived was standing, until comparatively recent years, on Lower Street, Dartmouth. It was apparently a house of the better class, and there are numerous indications of his respectable standing and connections. The parish church contains a group of memorials of his near relatives which all bear the mark of comparative wealth, but

*Published through the courtesy of Messrs. Wyman & Gordon, Worcester, Mass.

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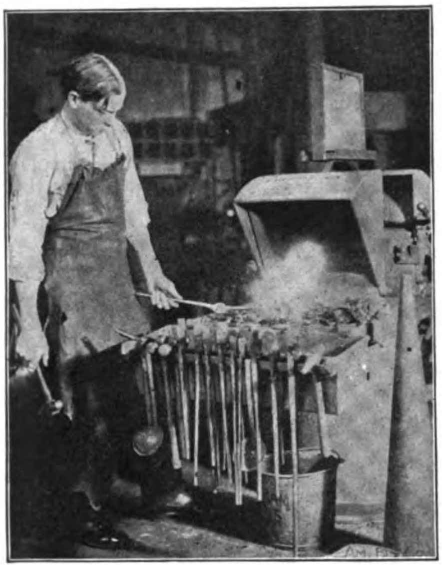
nothing remains to indicate the days of Thomas.

Newcomen was a blacksmith and ironmonger by trade, and as such had a high standing for excellent workmanship. It happened that Captain Savery, the inventor of the vacuum pump, lived



AT THE FORGE. THE RIGHT HEAT.

at Modbury, which was only fifteen miles distant. He made a great many experiments, and in one place it is recorded that he complained of the difficulty he had in getting machinist labor of sufficient skill to do his work. This gives color to one story of the beginning of Newcomen's interest in the use of steam, which is that Savery had him do more or less of his work. At any rate, the experiments of Captain Savery were common knowledge, and must have been known by such a skilled workman as we know Newcomen to have been, and who lived only fifteen miles distant. We also know that Newcomen had drawings of Savery's pump, and set one up in his garden with which to experiment; but Switzer, who was a friend of Savery, says that although Savery received in 1705 the first patent for the use of steam (it is interesting to know that this is also the first recorded patent of any kind), Newcomen was fully as early in his experimental work, and failed in securing priority because of Savery's more intimate relations with the Government. The Newcomen patent was granted in 1707 to three associates, Newcomen, Cawley and Savery. There is no doubt that Newcomen was the real inventor. Cawley was a glazier, who was his assistant, and Savery was included, it is generally accepted, because of his strenuous insistence that any use of the condensation of steam was an infringement of his 1705 patent. The true facts are that Newcomen's invention was radically different from that of Savery or any other single person. Papin invented the cylinder and piston as a means for transforming energy into motion. At first he used the explosive force of gunpowder, and later the use of the expansive force of steam, to raise the piston, and then by removing the fire to cause it to fall again. He made no further use of this principle. Savery discovered that the sudden condensation of steam made a vacuum that he utilized to draw up water. His pumps were actually used to drain mines, but were never satisfactory. They had to be placed within the mine to be drained, not over forty feet from the bottom, and then could be used to force up water an additional height of perhaps 100 feet. Beyond this the process must be repeated. It will be noticed that the water to be forced came into direct contact with the steam, which was contained in a solid vessel.

In addition tremendous pressures were necessary; as high as 1,200 pounds per square inch were secured, and with the materials for construction at hand frequent and disastrous explosions were the result.

Newcomen used Papin's cylinder and piston, and Savery's principle of the condensation of steam to produce a vacuum. But unlike Papin, he used the expansive force of steam to do his work and unlike Savery, he used a cylinder and piston actuated by alternate expansion and condensation of steam to transform heat into mechanical motion.

Thus it is seen that Newcomen, like a good engineer, constructed his machine from the suggestions of his predecessors. At first he made a double cylinder, using the space between for condensing water. This was not very satisfactory. The vacuum was secured very slowly and imperfectly. In 1711 they attempted to erect an engine for draining a mine, but failed. The next year they succeeded in erecting it, but it was slow and ineffective. To operate it, it required two men and a boy. The boy's work was to alternately open and close the valves to the condensing water and to the boiler. One day the engine made two or three motions quickly and powerfully. Newcomen immediately examined the cylinder and found a small hole, through which a small jet from the water that was on top of the piston to make it steam tight, was spurting into the cylinder. He appreciated the significance of the incident at once, dispensed with the outer water jacket and injected the water for condensation, through a small pipe in the bottom of the cylinder. It was a success at once and increased the speed of the engine from eight to fifteen strokes a minute besides getting the advantage of a good vacuum.

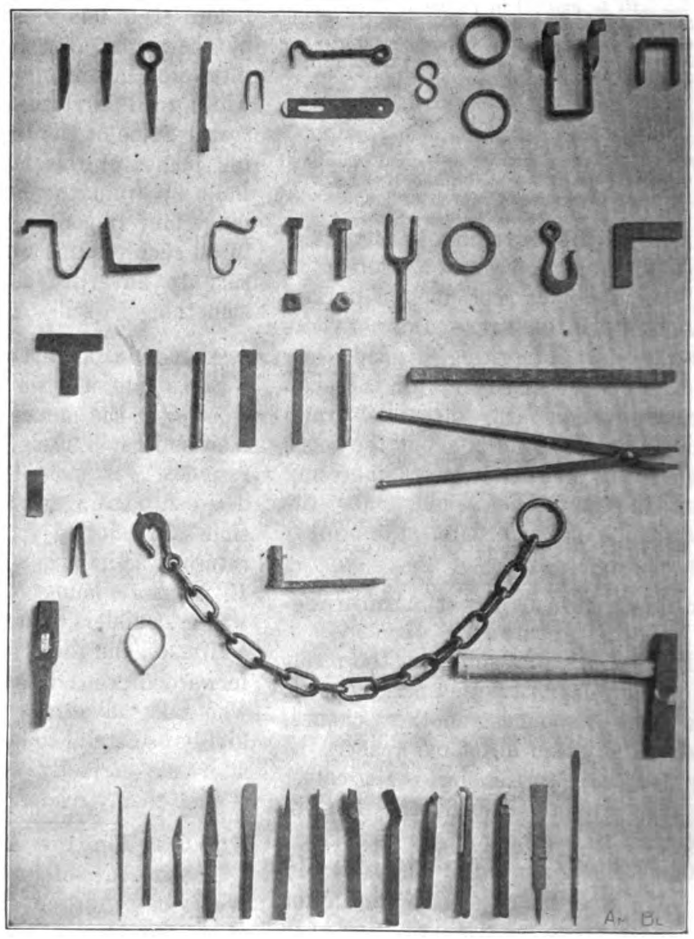


Fig. 1. ELEMENTARY WORK OF COURSE AT THE ROCHESTER MECHANICS' INSTITUTE.

In 1713 a pump was erected in Leeds, and the boy who was hired to open and shut the valves, in an effort to make his

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work easier, rigged up a contrivance of strings and levers that operated the valves from the motion of the working beam over head. This made the engine automatic and marked another stage in its evolution.

This boy, Humphrey Potter, afterwards became a good workman, and was sent to Hungary to erect the first engine set up there. This valve motion was afterward improved by Henry Beighton in 1718.

This engine, as it was now constructed and continued to be until the days of Watt, consisted of an underground furnace, over which was placed a semi-spherical boiler, the flat side of which had a deep spiral groove, along which the flame and heat passed to the chimney, in which at first was no damper even. Immediately above the furnace was the cylinder, braced in place by the timbers of the building. About twelve to thirty feet above was the cistern for condensing water, from which descended a pipe to the bottom of the cylinder. Another pipe carried the water of condensation to the hot well. Henry Beighton also used this water for boiler supply. High above was the huge wooden walking beam pivoted on the wall of the building. The piston was suspended from the beam by a chain that was kept central by winding on an arc on the end of the walking beam. From the beam also came the rod and pegs for operating the valves. From the other end of the walking beam outside the engine house, and directly over the pit mouth, was at first another chain, connecting to a single acting solid pump plunger. At first the boiler bottoms were made of copper and the tops of lead; later on sheet iron was used, but not until 1743 was cast iron used for this purpose. The steam space was eight or ten times the cylinder capacity. The third engine to be erected was at Ansthorp. It had a 23-inch cylinder, 15-inch stroke, 9-inch water plunger, and raised the water in two lifts of thirty-seven yards each. For this Newcomen was to receive $1,250 a year, for which he was to operate and keep it in repair.

In the years that followed, the size of these engines increased until Smeaton erected some with cylinders six feet in diameter. By the aid of these engines the mines could be sunk to twice the depth possible before, but the expense was very great, involving in one case $15,000 a year for coal for the engine.

It was a model of one of these engines that came into the hands of James Watt for repairs that set his mind at work upon the problem, and resulted in the modern high pressure reciprocating engine.

Newcomen himself was a man of very great modesty and worth. He was very religious, and was accustomed to preach in Baptist chapels wherever Sunday found him.

No record of his death is known, but it is supposed that with the increase of the vexations of business competition, he retired northward to private life, and died about 1750.

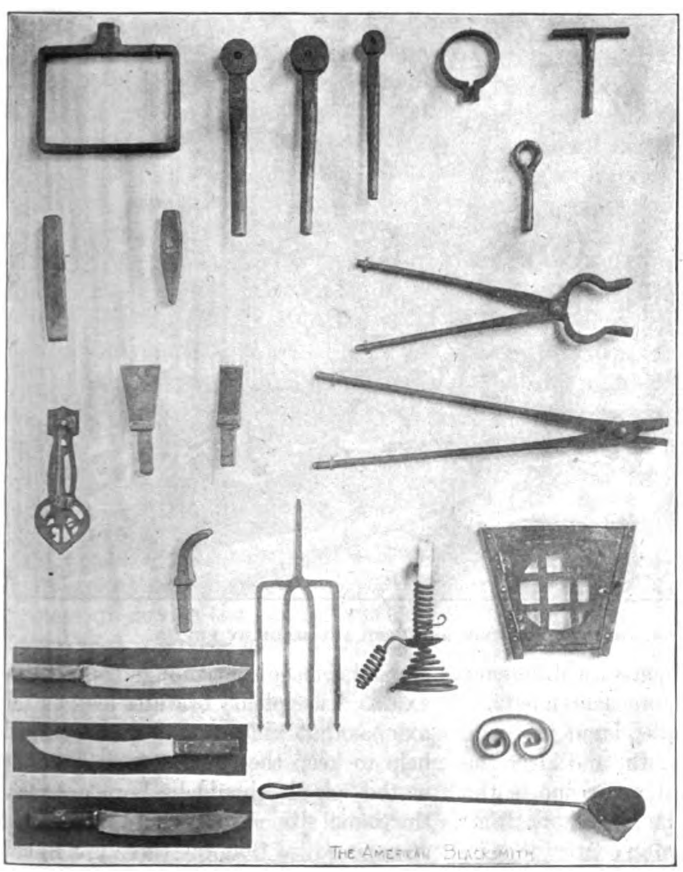

Fig. 2. ADVANCED WORK IN THE COURSE OF FORGING.

His is the story of a man who was always alive to his opportunities, and who knew how to profit by them. It is unfortunate that his skill and labor did not secure him a greater reward, for his services were of no small benefit in early engineering.

The Summer Course in Forging at the Rochester Mechanics' Institute.

C. F. MOORE.

The Summer School of the Mechanics' Institute, Rochester, N. Y., will hold its first class in forging this summer.

A STRIKING PICTURE.

There has been a demand for such a school from several sources. It is to the Manual Training teachers, possibly, that the course will be best fitted. Nevertheless, it will be valuable to any one requiring a good general knowledge of forging, those who may wish to test their natural liking for the trade, or those who wish to enter technical schools with advanced standing on this subject. The course is similar to those offered in higher technical schools and will compare favorably with theirs.

As the regular school work here is along the lines of purely educational and industrial training (represented by the day and evening classes), the needs of both are known, and the course therefore so prepared as to meet them.

Fig. 1 represents the regular graded exercises which are taken up in succession by the students. Fig. 2 illustrates the work introduced at the end of the year, while Fig. 3 shows some of the ornamental iron work made by the pupils.

The equipment is among the best. The shop is well lighted, comfortable in summer, and has forges and tools for sixteen students. It may be unnecessary to describe such a course to the

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readers of THE AMERICAN BLACKSMITH, as it will be similar to that outlined some time ago by Mr. John L. Bacon, of Chicago.

We first consider simple drawing out, bending and twisting of Swedish iron. Refined iron is then used and the comparison is readily made. More difficult forgings, such as sharp corners, irregular outlines, punching of holes, upsetting, etc., are then introduced. The metals used here are: Swedish iron and machinery steel.

We shall spend about one-third of our total time on the various methods of welding. As each completed weld requires some considerable forging, we believe that this portion of our work is valuable training. It develops quickness and self-confidence. One of our best exercises is the making of a fagot weld. Two pupils are given pieces of scrap iron weighing about 10 pounds and are required to weld them into one solid piece. This may well illustrate the method employed by the blacksmith years ago when he required a piece of iron larger than any which he had on hand. Our work in welding includes Swedish and refined iron and machinery steel. An opportunity is available for testing welds upon a Riehlé 100,000 lb. testing machine.

The work in tool steel will be thorough and complete. The different kinds of steel will be used by the students or illustrated to them. The self-hardening and air-hardening steels will be shown, together with the method of forging them. The meaning of temper and temper number, and the ordering of steel will be explained. The various methods of tempering and annealing will be practiced.

Along with the work in the forge shop the student will be required to study the subject of metallurgy from a reputable text-book. We take this subject up in our regular secondary school work and believe that it is a valuable adjunct. Some may say that this is going too much into the technical side of the thing, but, since the use of iron is being spread out in every direction, from the erection of steamships and buildings, to the construction of highways, it is believed that every one should have some idea of its nature and manufacture.

Those who desire it, will be permitted to do special work in ornamental iron, brass or copper. It is hoped that many will take up the last two materials, as they offer an attractive field of work. Many boys leaving schools after passing the grammar grades, are perfectly familiar with the use of wood, but not of any of the metals. A small amount of this work could be introduced into such schools at a slight cost and great benefit. As affording something to be worked on at home, for the beautifying of the home, these metals can hardly be surpassed.

Rules for Making Wooden Axles.

M. A. FOSTER.

I will endeavor to give a brief explanation of how I make wooden axles, with simple rules which will apply only to narrow tread wagons of 4-foot 8-inch track. For 5 feet 2 inches the difference must be added to the measurements.

For a 9-inch spindle, I cut my axle 5 feet 2 inches in length, and after the axle is trued up, I strike a line in the center, lengthwise, top and bottom; also across the bottom in center; that is, half way from each end. These three lines are my gage lines to work from. I measure from the end of axle the length of spindle back towards the center, and mark a line around the axle at that point. For a straight wheel, I take off $\frac{1}{4}$ inch from bottom of axle.

If the wheels are badly dished I don't take off any, but leave the axle perfectly straight. Then I get the size of my spindle inside at the small end, and set my compasses accordingly, and mark out the exact size of spindle inside by giving it $\frac{3}{16}$ inch gather, more or less, according to the wear of the spindles. If new, $\frac{1}{8}$ inch is all right, but if badly worn, less is better. Great care should be exercised in fitting spindles. If properly fitted they won't drive more than $\frac{1}{4}$ inch. Now, for a 9-inch spindle, I set it up until it will measure from shoulder at boxing 22$\frac{1}{2}$ inches to center of axle. The spindle should be slightly heated before driving, just enough to expand, but not hot enough to burn the axles. I use plenty of white lead on the axle, as that will preserve the wood and help to keep the spindle on. The hole in the spindle should be bored exactly the same size of the solid part of lag screw used, so that the threads will cut their own way as they go.

Now as to the way this axle is laid off: This rule will apply to all sizes except in length. For a 10-inch spindle the axletree is 5 feet 3 inches, and will measure when spindle is on from center of axle to shoulder of spindle 22 inches. For a 11-inch spindle, the axle is 5 feet 4 inches, and the measurement from

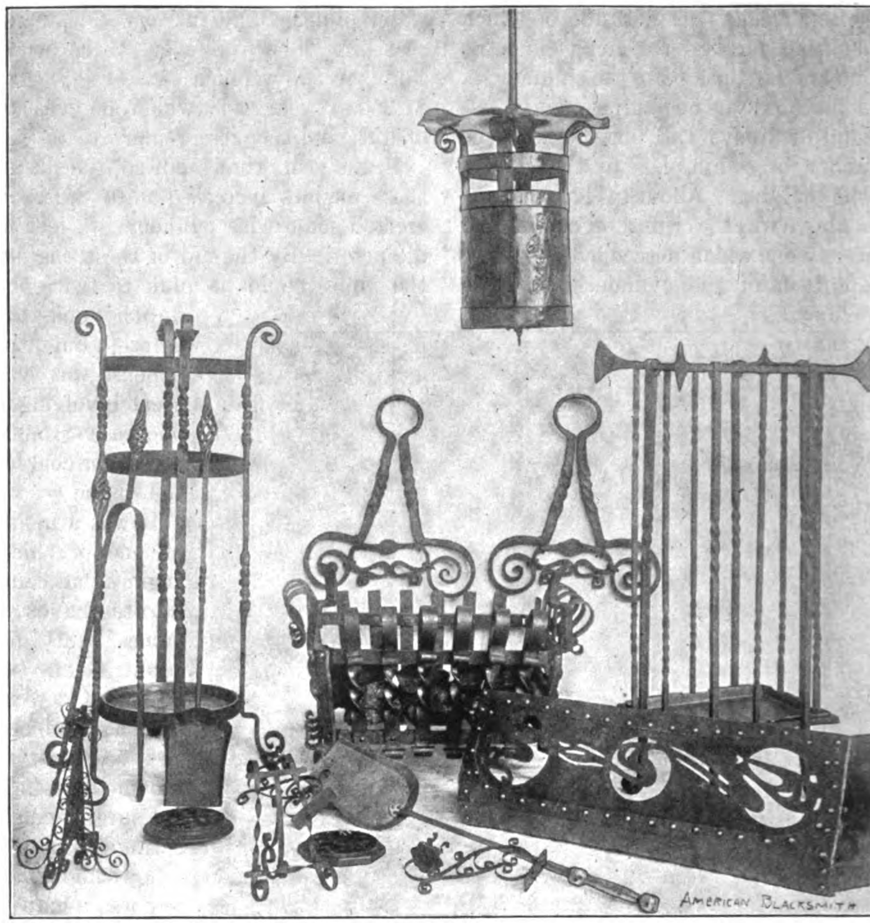

Fig. 8. ORNAMENTAL FORGINGS SELECTED AND MADE BY PUPILS.

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center of axle to shoulder is 21½ inches. Larger and smaller spindles will be measured in proportion. I have used these rules for 20 years and never had any complaint, although on some parts it is necessary to vary a little, according to the conditions of wheels and spindles.

Talks to the Jobbing Shop Painter.—15.

Characteristics of Varnish.—The Spotting and Cracking of Varnish.—Their Causes and Cures.—Graining Out of Surfaces.—Remedy Suggested.—Practical Observations Upon the Use of Varnish, etc., etc.

M. C. HILLICK.

During the spring and early summer months the jobbing shop painter meets with many and varied difficulties in handling and getting his varnish supply into service. The average country paint shop, with a varnish room more or less unadapted to strictly high class results, and located in districts where pavements and water hose connections are unknown, handicaps the finisher to an extent not easily understood by those outside of the trade.

In the spring and early summer the painter doing business in the country or village shop must guard continually against getting his varnish into service before it is sufficiently hard to withstand the effects of mud and other injurious substances common to rural highways. The varnish upon a surface when dry enough to use in city service would in most cases be insufficiently hard to use over country roads. Moreover, in the city the vehicle user, or his servant, is more particular in the matter of washing his carriage immediately after a drive that "muddies" the varnish than his friend of the country who does not understand, or perhaps does not care, that mud or dirty accumulations are highly injurious to varnish if permitted to dry upon the surface. Against this class of service the painter must enlist his best energies, conducting a campaign of education until his customers become schooled in the art of caring for the newly finished carriage in a proper way.

Perhaps some proprietors of country shops meet with difficulty in using high grade varnish upon their work. Such an one lately wrote THE AMERICAN BLACKSMITH that he recently tried to successfully finish a certain job with an English varnish of world-wide repute, but failed. Undoubtedly, local causes and conditions, and not the varnish, were the chief reasons for the failure. It is well understood, or should be, that the higher the grade of varnish, the more delicate and sensitive its nature, and, if you please, its temperament; necessitating, among other things, a practically perfect surface for its reception and its subsequent support. Most English varnishes of high grade are light in body and for the display of their chiefest charms require a surface of surpassing smoothness and depth of body. And such surface conditions are not always to be had in the small shops, and for the money which carriage owners outside of the large towns and cities are willing to pay for painting, These exceedingly fine and delicately adjusted varnishes need great care for a long time after going into service. frequent washings and housing in apartments well ventilated and absolutely free from atmospheric impurities being urgently necessary. And what is true of the highest grade English varnish is likewise true of the same grade made in this country. For a strictly fine, high class surface, upon which unlimited skill has been expended, and which is guaranteed the care necessarily a factor in the early life, at least, of such surfaces, the writer would advise the employment of the high grade American or English varnish, but for all other surfaces, and the conditions of service which usually obtain in American communities, high quality but less sensitive varnishes are recommended. This much in reference to a subject which several readers of THE BLACKSMITH have lately desired information upon, and which may prove of general interest.

Spotting of Varnish.

Some varnishes are much more sensitive to mud or other accumulations, and, therefore, spot more easily than others; and highly elastic finishing varnish with a large percentage of oil in its composition, spots more easily than other kinds. The spotting of varnish from mud accumulations gives the painter more trouble, as a rule, than all other forms of spotting. City mud, which is commonly charged with a high percentage of ammonia, and the mud of lime districts, constitute the most destructive road accumulations against which the painter is apparently expected to safeguard his varnish. The mud acts upon the varnish in this wise: When allowed to dry upon the freshly varnished surface the suction, or technically, the capillary attraction of the dry mud extracts the oil from the varnish, causing the dull, lifeless splotches to appear. In some cases, as chemical experiments have shown, the spotting is due to the actual saponification, by the alkaline mud, not only of the oil, but of the gum constituent of the varnish.

Spotting of this kind, as indeed, spotting from mud accumulations of the mildest sort, is rarely cured save by rubbing the varnish with water and pulverized pumice stone and then revarnishing. Especially is this true of the highly elastic finishing varnish. The quick, hard drying, and therefore more inelastic finishing varnish, is more susceptible to a cure by washing the surface with clean cold water before the accumulations become too hard, than the elastic one.

To reduce the trouble incident to mud spotting to the lowest possible limit, the carriage painter should study the practices and customs, so far as possible, of his constituents, and endeavor to anticipate the needs of each individual customer, and to meet those needs. It is quite as much the painter's duty to instruct the carriage owner in the proper way of caring for the paint and varnish applied to the carriage, as it is to know how to apply such materials. And it is generally easier to explain the details of caring for the newly varnished carriage than it is to defend his position, and the quality of his varnish, once the varnish goes wrong. While it is usually cheaper to revarnish the carriage free of cost than to lose a good customer, it is advisable to bear in mind that varnish and labor are the two most expensive commodities consumed in the business of painting and varnishing vehicles.

Upon the carriage that is to go into immediate general service, exposed to all the varied elements of wear and tear, and to road conditions as they are found regardless of the weather, it were better to use a high class, reliable, quick, hard-drying finishing varnish than the elastic one with a pedigree of four generations of international fame back of it. In other words, ascertain the conditions of service to which the vehicle is to be exposed, and use a varnish best adapted to stand up and hold its natural brilliancy against such service. Invariably this will prove the just and satisfactory way to all parties concerned.

Spotting due to soapy or dirty water which may or may not contain a percentage of alkali or acid, may generally be cured if washed with clean water before the spots have long remained upon the surface. Otherwise resurfacing and revarnishing will be necessary. Coal stove and smith forge gases

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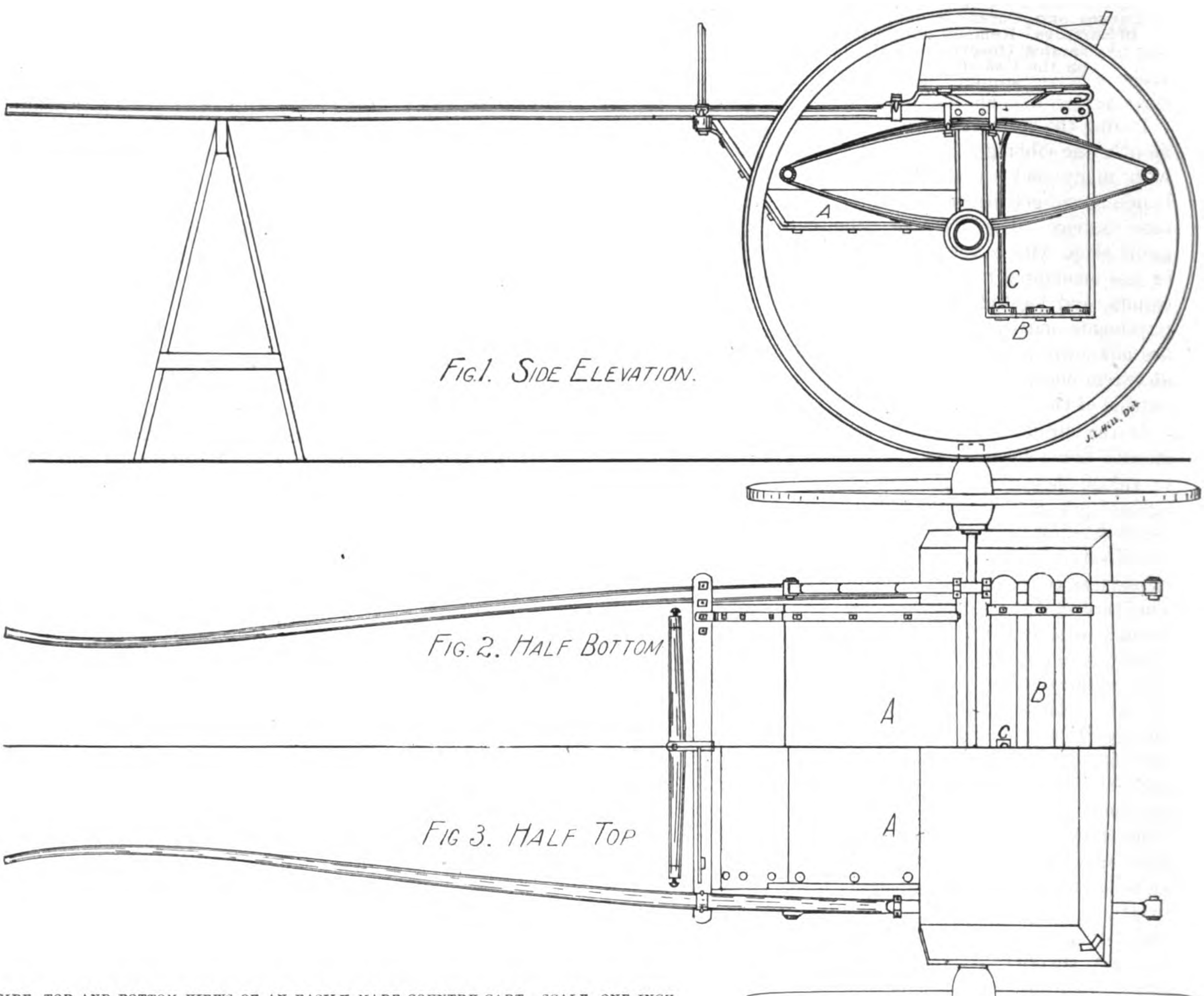
cause dull, greasy spots to appear upon the surface. If noted in time they may be eradicated by washing, and if not, revarnishing is the only cure. Some varnishes will spot distinctly under the effect of strong air currents, but as a rule this form of spotting yields readily to the water bath.

Cracking of Varnish.

In cracking and fissuring varnish to ammonia—a fearfully destructive enemy to varnish,—moisture in the wood or in the foundation coats of paint. The long and usually circular cracks at the corner of the carriage seat, or across the seat raiser, or just over the step, on the panel, are force cracks, and in case of light, insufficiently stiffened panels, they are technically known as vibration cracks. Then there varnish, the only remaining remedy that will prove really effectual is to remove the offending varnish by scraping down to the color coats, or removing the varnish with some one of the varnish removers now on the market. If the cracking is due to some disturbing factor in the color or foundation coats, then burning off, or removal with a paint and varnish remover,



SIDE, TOP AND BOTTOM VIEWS OF AN EASILY MADE COUNTRY CART. SCALE, ONE INCH EQUALS EIGHTEEN INCHES.

simply responds to a natural law which provides that it is the ultimate destiny of varnish to become inert and break like glass. All the cracking which occurs prior to the time when the varnish has lost its elasticity, or in other words, worn itself out, is due to several causes. Briefly, these are: Applying one coat of paint upon another before the first one is thoroughly dry. Imperfectly dried rubbing coats, antagonism between varnish coats or between the color coats and the varnish. Exposure are the fine gossamer checks which appear often upon a rather newly finished surface, and called "fire checks." These, along with force and vibration checks, if taken in time, and before they have broken too deeply into the surface, may be obliterated by lightly rubbing the surface with pulverized pumice stone and water and revarnishing, applying one coat of rubbing varnish and one coat of finishing. When the cracks have gone too deep for effective eradication under fresh coatings of is the only sure remedy.

These two varnish difficulties considered with that of "graining out" which is due to unseasoned wood, and which revarnishing will materially assist to conceal, but not cure, constitute the chief difficulties which the jobbing shop painter is compelled to handle during the spring and early summer in connection with the use of varnish. Cracking and "graining out" are all the year round problems, but spotting, more bothersome than all the rest,

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is a spring and autumn ailment of varnish. In a subsequent issue some of the mid-summer varnish deviltries will be taken up and remedies suggested.

(To be continued.)

Details for Building a Country Cart.

J. LAWRENCE HILL.

The accompanying drawings illustrate a very convenient two-wheeler for country use, suitable for carrying besides one or two passengers, a sack, or basket, or other medium sized package. Carts similar to this are used extensively in the West, they being found handy to get about in, also cheap, for any blacksmith can make them.

Fig. 1 shows the side elevation, Fig. 2 the half bottom, Fig. 3 the half top, and Fig. 4 the back view.

As will be seen by the various illustrations, ingress and egress is obtained at the back, and for this purpose the seat is divided in half, one half being fitted with hinges, so that by opening, it admits of an easy passage in or out; the other half is securely fastened to the shafts. Fig. 4 shows this clearly, and also the method for keeping the seats up in the center.

By referring to Figs. 2 and 3, it will be noticed there is very little compass to the shafts, so that if the builder wishes he can cut them out of a 1½-inch plank. To do this, lay out on the floor in chalk a straight line, which is to be the center line; mark off the length of shafts and distance of crossbar from the points; lay off on each side the half distance between springs on the axle, which will be the inside of the shafts, also the widths at bar and points, and then draw in the shafts. When shaped to suit, transfer to the plank and mark the width out, at the bar 2¼ inches; at spring, 1¼ inches; at tip, 1⅛ inches. Saw out and dress up. The tip is 1⅛ inches round, tapered back 26 inches, where it is 1⅜ inches, the taper continuing back to the bar.

A is a tray 19 by 33 inches on the bottom, and 4 inches deep. The sides, back and bottom are ⅝ inch deep, the toe board ⅞ inch; round this is bolted an iron strap 1¼ by ¼, which is bolted at the front end underneath the cross bar. The back end is twisted so as to run along the inside of the shaft through which it is bolted. This same method is employed for holding up the back step B, thus securely fastening the whole thing onto the top of the springs.

In the center of B is C (side view and shape of top end seen in Fig. 1.) This is to form a solid support for the seat in the center. By having a long thread and two nuts on the bottom end, the height of the seat in the center can be adjusted to suit that at the ends.

Two ordinary "T" hinges are used on the opening seat. The short end is riveted on to the seat raiser, while the long one is screwed and bolted underneath the seat; at the center end of the lifting-seat a plate is screwed, which has two studs riveted into it. When the seat is closed, these studs enter holes drilled in another plate which is fastened under the stationary seat. The seat raiser above referred to is made from a bit of steel tire 1¼ by ¼, bent as shown in Fig. 1, and fastened to the top of shafts by a clip in front, and bolt behind.

Following are a few of the principal measurements: Wheels, Sarven, 50 inches; spokes, 1⅛ inches; tire, 1⅛ by $\frac{5}{16}$ inch, round edge steel; axle, 1⅛ inches, half patent; track, 4 feet 9 inches out to out. Springs, center to center of eyes, 40 inches; four plates, 1¼ inches wide, 10 inches opening inside, 34 inches apart on the axle. Top of seat board to bottom of tray, 16 inches. Extreme length of shafts, 10 feet 1 inch; from points to bar, 6 feet 6 inches. Painting: seat, tray, hangers, dash, axle and clips, black; wheels and shafts red, striped with one ¼-inch line of black.

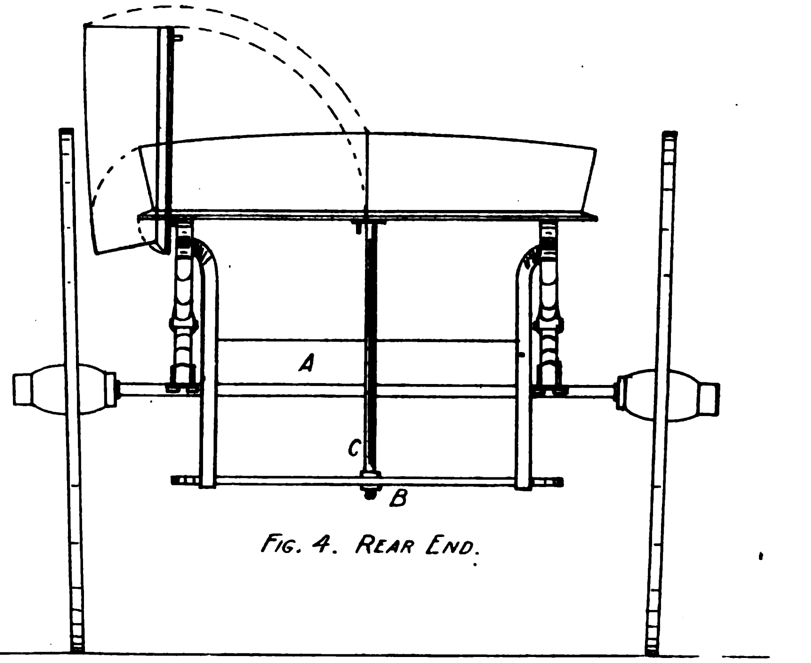

Fig. 4. Rear End.

REAR END ELEVATION OF COUNTRY CART. SCALE, 1 INCH EQUALS 18 INCHES.

Pointers on New Wagon Work.

Prize Article.

M. A. FOSTER.

Endeavoring to explain how I construct some wagon work, I will first take the wheel say for a 3¼-inch farm wagon. The hub must be perfectly dry, and 8½ by 10 inches This is for a new wheel. The spokes should be 2¼ inches, carefully selected and well seasoned. With a pair of calipers, I get the size of mortise next to the boxing, then the size at the surface of the hub, which is a little larger. I then get the depth of the mortise for the length of tenon. By this measurement, I cut a perfect pattern out of heavy paste-board. I lay this pattern on the spoke tenons and mark them all just the size of the pattern and carefully cut to the pattern. Next I place my bub on a bench suitable for driving the spokes. I set my gage for a straight wheel, use white lead on the tenons and drive with a wooden mallet. The spokes must fit the mortise exactly. If some are loose and others exceedingly tight, the job is worthless. After the spokes are all driven, get the length. Say your wheel is three feet eight inches in diameter. Take half of that, 22 inches, and 4¼ inches (half of the diameter of the hub) would leave 17¾ inches from surface of the hub to the end of the spoke. Gage all the spokes and saw them off 17¾ inches from the hub, and set your gauge back the depth of your rim, which is usually 2¼ inches, marking each spoke as before. Pains should be taken to point them to the center of the spoke. Then you proceed with the hollow auger to cut the tenons, which for 1½ inch rims should not be larger than ¾ inch. In boring tenons you should not bore straight with the spoke, but straight with the face of the wheel. Then the rim will go on level and stand perpendicular. Hubs in the rim should be the same size as the tenons on the spokes so they will drive on tightly, and not have to be wedged, as that has a tendency to weaken the tenon. The rim should fit snugly against the shoulders of the spokes and be carefully jointed at the ends of the felloes. Leave ⅛ inch open at one joint for the draw.

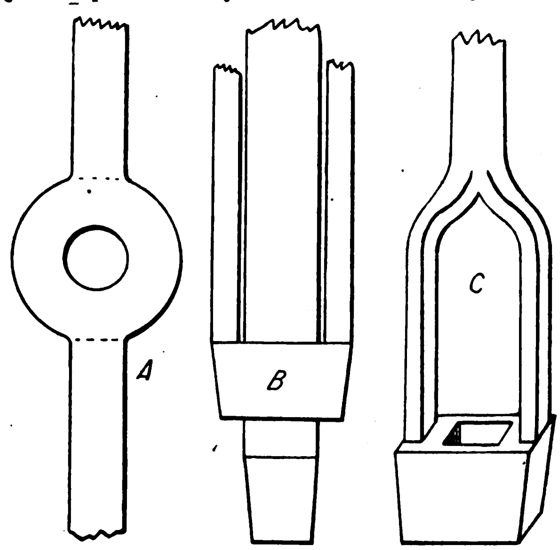

Fig. 1. FORGING A HANDY SOCKET WRENCH.

Dress the face side of the rim first. Then for a 1½-inch tire, set your gage 1-16 inch smaller than the tire you use. True up rim for the tire and square the surface where the tire goes true with the face of the wheel and perfectly round. Now it is ready for a primer coat of paint before the tire is set. This is very important, for the paint has a tendency to keep out the water that a wheel gets in tire setting. If the tire is heavy, say ½ by 1½ inches, and is given the proper draw by the smith, the wheel will have ⅛ inch dish.

Now comes setting the boxing, which if done by hand, can only be properly done after the tire is on. Plug up the hole in the hub, get the size of your boxing, take the compass and center the hub, lay off the size of the boxing, fitting the small end perfectly tight, but a little larger for the large end, so as to give room to wedge and true up. Provide a gage that will fit in the hub and gauge your boxing with the edge of your tire, taking pains to get it perfectly true for on this depends much the running of the wagon. The boxing should be well wedged so no grease can get in the hub, for after a hub has become saturated with grease, it is useless, as the spokes will work loose and the grease also has a tendency to soften the hub.

Every part must fit perfectly before the tire is set. I have heard many remark that a tire would bring a certain piece all right, but the tire is not calculated to build a wheel. It is only to hold and support a wheel after it is built.

A Useful Method of Making a Socket Wrench.

L. VAN DOBIN.

The accompanying sketch is of a socket wrench we have used for many years. I made a set of six with which I can place or replace any size nut from ¼ inch to ⅝ inch inclusive, can do it ten times quicker and never skin a finger. The device is so simple I think any smith will readily comprehend it, and I know no smith will do without it after learning that it is so easily made.

To make, use Norway iron or machine steel, size according to size of wrench to be made; for ¼ inch or $\frac{5}{16}$ inch wrench use about 1¼ x ¼, for larger about 1¼ or 1½ x $\frac{5}{16}$ inch. After shaping as at A, Fig. 1, bend shanks up at dotted lines, drive round mandrel in hole, and draw out socket while on mandrel, as shown at B. After this put in square mandrel and square up to proper size, then hang shanks between vise jaws and with light hammer true up end of socket. Insert square mandrel and finish socket. Bend ends of shanks together and weld, as at C, then from band iron ⅛ inch thick cut out piece like that at D, Fig. 2, place on top of socket between shanks, take light borax heat and stick it. Drill a hole, as shown at E, to accommodate the end of the bolt when putting on or taking off nut.

Weld on to round iron to form brace stock, and after putting knob or ball on the other end, bend to shape as is seen in Fig. 2, which shows the finished wrench. The size of round iron we use for brace stock is ½ inch for ¼ and $\frac{5}{16}$ inch wrenches; for larger use ⅝. Any smith can get the length near enough. Considering cost, this is the handiest tool in the shop. The writer can make a dozen a day, and the "monkey" or "S" wrench is a makeshift compared with it.

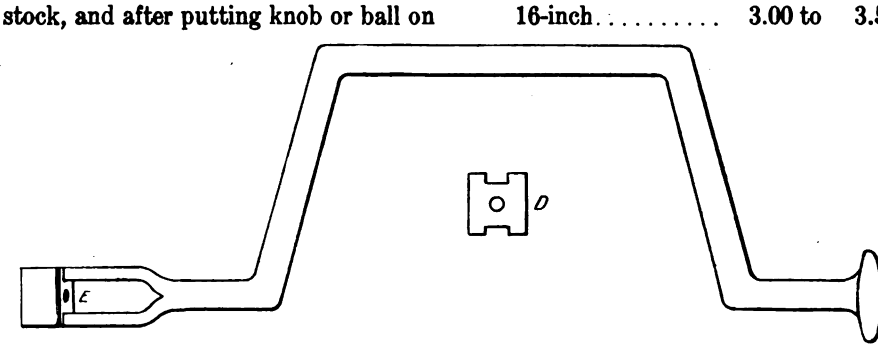

Fig. 2. THE COMPLETE WRENCH.

An Apprentice's Attributes.

BY H. W. T.

To make a good blacksmith an apprentice should be:

Active,
Bright,
Cheerful,
Diligent,
Energetic,
Frank,
Good tempered,
Honorable,
Independent,
Just,
Keen,
Laborious,
Manly,
Noble,
Obliging,
Persevering,
Quick,
Resourceful,
Sensible,
Truthful,
Unselfish,
Virtuous,
Wise,
'Xcelling,
Young.

A List of Prices From Missouri.

R. L. HOOPER.

Shoeing, toed, per horse	$ 1.20
Plain shoeing calks	1.00
Filling wagon wheels per set	12.00
Tiring buggy, 1 by ¼, per set	5.00
Wagon tires, 1½ by ½, iron, to ⅝	6.00 to 8.00
Plow Shares—	
12-inch	2.50
14-inch	2.75
16-inch	3.00 to 3.50
Farm wagon, double box	10.50 to 12.00
Tongues	1.50
Tongues, straight without hounds, complete	2.75
Wagon reaches	.75 to 1.00
Setting tires on farm wagon	1.50
Setting tires on farm wagon, bolted	1.70

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Tire setting, buggy	2.00
Tire setting, spring wagon	2.25
Buggy shafts, per pair	4.50
Buggy tongues	2.00
Spring wagon tongues	2.50

The Making, Hardening and Tempering of Rock Drills.—2.

W. P. WOODSIDE.

On page 45 of the December issue I described the style of drill which I consider the best, and the reasons why it is the best. The next step is to make one and harden it properly.

It will be seen (Fig. 2), that the first

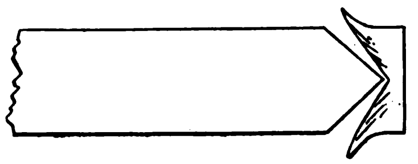


Fig. 2. MODE OF CUTTING DRILL BIT READY TO FORGE TO SHAPE.

operation is to cut the bit, which is done with a thin hot chisel. Next flatten the bit with a couple of heavy blows that will be sure to work the steel clear through (that is, the center of the bar should be moved as well as the outside). Next take the drill dressing hammer and shape up the bit and bring it to edge and gage. Fig. 3 shows styles of hammer used. I have used both styles and like them equally well, although A is a little handier, having the gage on the back, while B has the advantage of the bevel face, which helps to draw the drill to an edge very quickly and easily, though some smiths do not approve of it. I think the reason is

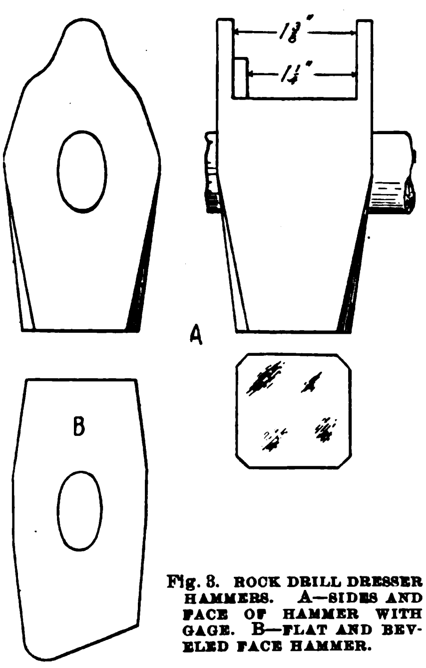


Fig. 3. ROCK DRILL DRESSER HAMMERS. A—SIDES AND FACE OF HAMMER WITH GAGE. B—FLAT AND BEVELED FACE HAMMER.

they did not use it long enough to get used to it, as it bothers one considerably at the start, but with a little practice one will find it quite easy to use. Hammer A is made of 1¾-inch square tool steel; B is made from 1½ or 1¾-inch square stock, and has the flat face on one end and the beveled face on the other. If the smith is at all handy, two heats are all he needs to cut the bit on a new drill and sharpen it ready to harden. In fact, I have often seen it done in one heat, but two heats is very good work. The size of steel I am referring to is one inch or 1⅛ inches, octagon drill steel for hand drilling, or, as called by some, "jumpers." Now, if we are not rushed the drill is laid down to cool, but if in a hurry like most drill dressers, we put it back in the fire and bring the heat to the hardening heat which I will not attempt to describe any more than a low red, or cherry red, as called by some, though this varies as does the color of cherries. When your drill bit comes to a nice, even, low red heat, plunge instantly into the hardening bath, which should not be ice cold, but about 60 or 65 degrees Fahrenheit, and composed of either salt and water, or clear water. I use mostly clear water for ordinary rock, but if the rock is very hard, such as one strikes in mines and rock cuts, I use about one bushel of salt to 30 or 35 gallons of water. If a brine tester is used it should show about 65 to 70. Be careful in putting the steel into the bath, and do not drop the steel to the bottom of the tub right away, as there is more or less dirt gathered in the bottom from off the drills. If the edge of the drill comes in contact with this before it has cooled enough to prevent softness, it will make the edge of the drill soft. That is the reason why I do not always use salt, as the water gets dirty so quickly that one has to be making new brine continually. If the smith is kept busy on drills every day the water should be changed at least every month, and better if every two weeks.

Prices on Blacksmithing at Perryville, Ark.

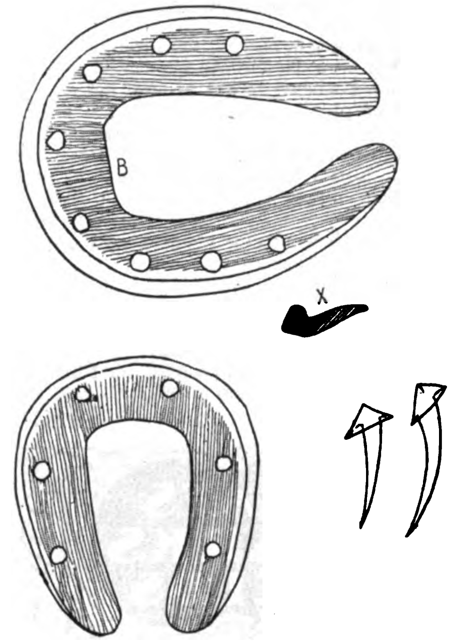
M. A. VANDALSUM.

Horse shoeing	$ 1.00 to $ 1.20
Wagon tongue	1.75
Wagon axles	2.50 to 3.00
Wagon bolsters	1.25
Wagon reach	.75
Double trees	.50 to 1.00
Single trees	.50 to .75
Sand board	1.00
Wagon hounds	.75
Filling wheel	3.50 to 5.00
Setting tire	.50 to 1.00
Buggy tire	.75
Setting buggy axle	1.00
New tires	2.00 and up.
Setting thimble and boxing	.50
Log chain hooks	.25
Sharpening plows	.10

Korean Horseshoes.

NELS SANDELL.

The sketches herewith show what seem to me to be timely subjects, and I shall endeavor to describe them briefly. They represent shoes made at Chemulpo, Korea, hand forged and of seemingly



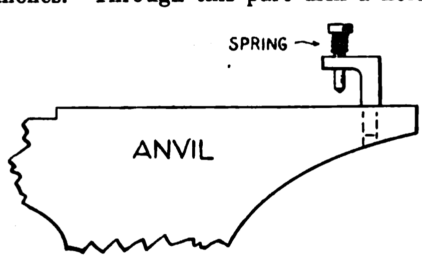
KOREAN HORSESHOES AND NAILS, HALF SIZE. X, CROSS SECTION OF SHOE AT B.

tough iron, resembling Swedish iron. The holes are round and cold punched. The two shoes together weigh 3½ ounces, and the sketches show them half size.

A Very Handy Center Punch.

M. A. SHARP.

To make a handy center punch for anvil, with a spring, take a piece of iron of suitable size, swage to fit anvil hardy hole. Then bend it two inches above at right angles and let it extend out two inches. Through this part drill a hole



A USEFUL ANVIL PUNCH.

and make a center punch with a hole through the body and a head, so that a coiled spring will hold the punch ⅝ inch from the anvil. I use this for punching tires and do not have to call help.

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Dobbin's Despair.

I have no differential clutch
And no pneumatic tire;
I guess I don't amount to much,
For none come to admire
My form or speed—I have no cam;
And, to my deep remorse,
I must confess I only am
A one-horsepower horse!

They used to stroke my sorrel side
And tell how I could go,
Today they speak in tones of pride
Of some bright red tonneau.
But, though my sorrow is so great
And anger is so keen,
I'm glad to have a chance to state
I don't eat gasolene.

I don't know how to carburet,
Nor how to radiate—
When I wished to get up and get
I simply struck my gait.
'Tis true, in casting out the beam
For fairness I should try—
But 'lectric, gasolene or steam,
The "mote" is in my eye!

I have no wondrous steering gear—
But still they rush to see
A thing that has, I'm pained to hear,
A horseless pedigree.
They used to pet me all the time,
But now they only shrug
Their shoulders, and pass by, for I'm
A poor old sparkless plug!

—*Ex.*

HEATS SPARKS WELDS

Dry weather—loose tires.

Stand up for the good old craft.

An ounce of thrift is worth a pound of wit.

Be sure that the end of the spoke doesn't project after the felloe is driven.

Why must axles be given pitch and gather? Is the reason clear in your mind?

Quoth the farrier: "Money may make the mare go, but the mare makes the money come."

Have you a photo of the shop, inside or out? Send it in for publishing in our columns.

Don't forget to advertise your business, —all the time, too. There are many ways of doing it. Think them over.

There's many a slip—the man who is sure pay now many not always be so—and the big failures are the worst.

Seek the orders. He who waits for them to come often finds that the other fellow catches them before they get as far as his shop.

There's more than one way to go after the man who doesn't pay promptly. It's well to know them all, too. Collecting is an art in itself.

Summer moments here and there can be profitably employed in helping us swell our subscription list. See announcement on page 161.

What side line are you thinking about putting in this spring? There's generally something the smith can turn his hand to at odd times for increasing his income.

Here it is June, and our friend Tom Tardy hasn't yet taken down the stove that he tries to warm the shop with in winter. It is awfully in his way, and in his customers' way, too.

Count up the crafts in the whole page of the world's industry, and see how few are they that do not at one point or another depend upon the blacksmith's skill and strength.

Your favorite journal—don't forget to say a good word for it to brother craftsmen. Many smiths show their appreciation by sending in a new subscriber or so occasionally.

Lots and lots of AMERICAN BLACKSMITH readers are taking advantage of the long-time subscription rates for two or more years in advance. Seem to be getting more and more popular.

Here and there women are engaged more or less actively in blacksmithing and similar pursuits. THE AMERICAN BLACKSMITH would like to be informed of any such. Can some reader tell?

Make the jobber give you a discount for prompt pay, and then pay prompt. Saves a good big sum in a year. Works a benefit at the other end by making you look more carefully to your own collections.

A World's Fair feature of general interest is the Japanese exhibit of diminutive trees, only two or three feet high, although several hundred years old. This forest of little trees is a part of the attractive display of many interesting exhibits which Japan shows at the Fair.

How many smiths in your locality take no journal relating to the craft? Give them a friendly call, show them THE AMERICAN BLACKSMITH and get them to subscribe. You do us a service, them a service, and we give you a premium or cash commission. Write for particulars.

The telephone is an indispensable adjunct of up-to-date city shoeing shops. The country blacksmith finds it will also pay to be connected with a 'phone line, many of which are now being run in rural districts. It is a big convenience to the customer, as well as the smith, and stamps the smith as progressive.

Blind as a bat—that's the condition of some smiths who can't see anything for them in craft organizations. Doesn't take much studying to find out who is benefitted by price cutting. The liberal minded smith always looks into every movement for better craft conditions—generally he supports them heartily.

Drillers in a Texas oil well, when they reached a depth of 1,000 feet, encountered the trunk of a tree. Large pieces of bark and wood of clear grain have been brought to the surface in a perfect state of preservation. The wood is very hard and the tree measured, as near as could be estimated, between two and three feet in diameter.

A small boy in Wilkesbarre recently was curious to see what the jaws of a lazy-looking snapping turtle were like. The boy suddenly found his hand so cruelly held in the turtle's mouth that neither he nor men who came to aid him could get it out. A blacksmith came, armed with stout pincers and a big file, and after much effort managed to free the youngster's hand. This is a new line of work for blacksmiths.

Women blacksmiths—A blacksmith's shop managed entirely by three women is one of the interesting sights to be seen in Kansas. The mother took entire charge of the business about fourteen years ago upon the death of her husband and had her daughters brought up not only to shoe a horse, but to understand every branch of the trade as well. The mother died, and now the three daughters, one of whom is married, have five men in their employ and carry on a very prosperous business. They personally superintend the shoeing of every horse.

It goes without saying that net profits may be enlarged by increasing receipts or decreasing expenses. Greater receipts result from more business or better prices, though collections go hand in hand with both. The business blacksmith looks also on the expense side of his books, in his effort to make the shop yield greater net returns. He watches every opportunity for stopping wastes. He is a shrewd buyer, and does not tie himself up to any one house. He knows that competition is keen and takes just advantage of it. He knows that many firms will make low quotations at the start to secure his business, and hence frequently requests figures from different houses. He takes advantage of discounts for prompt pay—in many such ways he reduces expenses and increases profits.

A reindeer express—The capacity of the reindeer for team work is remarkable. His hoofs are very broad and do not penetrate the snow crusts. His average weight is about four hundreds pounds. He will swiftly draw a sled carrying six hundred pounds, and with this load can cover thirty, fifty, and even ninety miles a day. The reindeer teams now carry the mails a distance of six hundred and fifty miles on the most northerly post route in the world. No food is carried for the deer. At the end of his journey, or at any stopping place, he is turned loose and at once breaks through the snow to the white moss which serves as food. It costs nothing to feed him. As the white settlements increase in the mineral bearing parts of Alaska, and in many places remote from railway and steamboat transportation, the reindeer express will be one of the most important factors in far north territorial life.

Drilling is quite an art in itself from the standpoint of the inquiring machinist. Drill soft castings dry. In hardcast iron deep holes, put a drop or two of machine or lard oil on the body of the drill occasionally, but never any on the cutting edge. In wrought iron the best results are obtained by keeping the drill continually flooded with a sal soda solution, six quarts to half a barrel of soft water. Soft steel, machine steel and cold rolled steel, treat like wrought iron as to lubrication, but give a higher speed to the drill. Tool steel can be drilled using clear lard oil or the sal soda solution, but never machine oil. Grind the drill with less clearance back from the cutting edge. Drill tempered steel with a flat drill, tempered hard as possible, using a half and half mixture of chloroform and camphor on the cutting edges. Drill brass dry, with a straight fluted drill.—[Ex.]

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American Association of Blacksmiths and Horseshoers.

Once more let us urge upon those who are thinking about starting a movement for better prices not to delay making the first move. Send for the plans which we have prepared to guide those who wish to take up the work and which we are glad to furnish without charge. Do not delay any longer, but begin at once, enlisting the aid of other progressive, energetic craftsmen to help out, if possible. Many letters come from various parts, with encouraging reports of good progress. It cannot be expected that a week's work or a month's work necessarily will mean raised prices all over a county. No movement of this kind was ever successful without overcoming some obstacles. The point is, there's everything to gain and nothing to lose by an effort to bring the smiths of any county together. Our experience is that some gain almost invariably follows, even if there are a few men who, refusing to look farther than their own noses, cannot recognize the many benefits of such a mutual organization for the co-operation of its members. The moral of it all is, take up the work; take it up now, take it up with enthusiasm and determination to make it go.

Regular meetings are being held at this time in Cortland, Cayuga and Tompkins counties, New York, for taking in new members. The time when they will be admitted upon the present advantageous basis will soon expire. The recently elected officers of the Cortland County Association are: J. McCloud, president; Walter Hodgson, vice-president; Charles W. Cropser, secretary, and W. Skhane, treasurer. Active work is now going on in Seneca County, New York, for the purpose of organizing the craft in that locality at an early date.

A Plea for Lien Laws and Organization.

W. B. NEWTON.

I am heartily in favor of the lien law. I have learned by experience that it is one thing for the blacksmith to earn his money, but often a more difficult job to collect it. Our farmers, merchants and various classes of business men must have a mortgage, security or similar means of making their earnings safe and secure on the material they sell. But the blacksmith can buy his own material, give his time, his talent, his physical strength, the use of his tools, and, above all, plenty of patience, and get—a promise of pay. This promise may be fulfilled in a month, a year, ten years, or maybe never. Other creditors *must* be paid, but the blacksmith can "trust," and yet should they look on the other side of the question they find that the blacksmith must purchase the necessities of life at the highest cash prices. Even should his own customers have produce to sell the bill must be settled at once.

Of course this latter part is perfectly right; we believe in honesty, in prompt settlement, but why then should we not also have a law to protect our rights? A law whereby we may collect our just deserts? If the farmer or horse owner has property enough to justify him in going to the blacksmith for repairs, why should this same property not be used for payment if he will not pay in any other way? For where can we find a class of mechanics or business men who are as poorly paid today for their skill and labor as the blacksmith?

I am also strongly in favor of an organization whereby we might have a universal price established all over the State. I fear that neither this lien law nor the blacksmiths' union has been urged enough among our fellow workmen. Many do not understand the value of this. If it were possible for us to have an agent to visit each smith in the county or State and explain the benefits of this law and also of a higher and more fixed price for labor, I believe that success would crown our efforts. Let us be up and doing.

We want to put our best material, our best workmanship, into all work we do, but we want also to be properly remunerated for so doing.

The Construction of Locomotive Lifting or Tumbling Shafts.—2.

W. B. REID.

To complete the lifting shaft, after the method described in our former article, the same operation is repeated in the welding of the three arms, good judgment and accuracy being, of course, requisite to the proper adjustment of the parts.

The arms in this instance being forged from bar iron, the boss has to be formed by welding, as shown at Fig. 4. While this is generally considered inferior to the piece as forged in the solid, it can be made substantial enough in this way if proper care is taken in welding the parts. In the necessary haste of piece work, however, this is not always conscientiously done; resulting in subsequent breakage and indiscriminate condemnation of the practice.

The long bent arm of the shaft is generally put on short and straight, to permit the turning of the journal, after which the arm is lenghtened and proper sets put in.

In the railroad repair shop, where the forging of a complete new lifting shaft

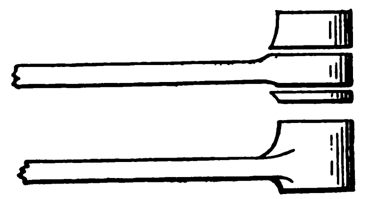

Fig. 4. WELDING ON THE BOSS.

is not of very frequent occurrence, the job could probably be done in a more convenient and substantial fashion as follows: Forge the shaft from an old axle, leaving the stock sufficiently full where the arms are to be welded on, Fig. 5A. This makes it unnecessary to upset the iron at these points and may also dispense with welding the strip around the bottom to form the collar, as was necessary in the first method. The scarfing of the shaft and the arms would also be different in this case. A deep triangular piece is cut out straight across the shaft, Fig. 5X. The arms are forged from the solid, leaving sufficient stock at both ends for the boss and scarf, Fig. 5B.

The scarf of arm should be of substantial size, to suit the cavity in shaft, see Fig. 5C. No method of welding a lifting shaft arm is superior to this, although undoubtedly it is much slower than that first described.

A third method we have seen practiced, of forging the lifting shaft, is

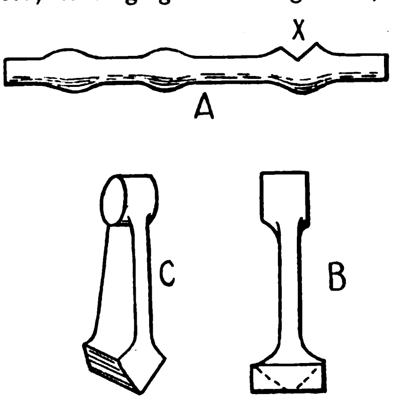

Fig. 5. FORGING LIFTING SHAFT FROM OLD AXLE.

shown in Fig. 6. Here the shaft is forged from the axle with the collar definitely shaped, and the parts scarfed and welded as shown. While this may appear very practical at first sight, experience will prove the method to be much inferior to those already described. In the first place, to forge the

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shaft in this manner occupies too much time. Secondly, the welding point is too close to the shaft and of too narrow a surface to make a substantial weld. No matter how carefully welded,

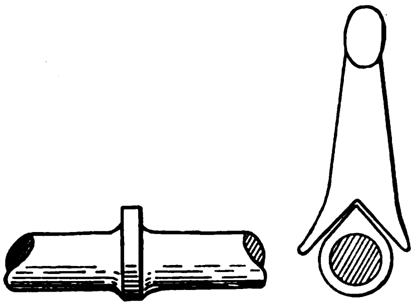


Fig. 6. ALTERNATIVE METHOD OF FORGING AND WELDING.

the parts are very liable to separate when straightening and adjusting the arm, an unfortunate condition likely as not to happen when the shaft is nearly completed.

Welded as in the first and second methods shown, particularly the second, the arm can be worked and bent with comparatively little danger of any similar unfortunate result. It may be accepted as a rule that, in all welds of this kind, the deeper the parts are embedded in each other the more substantial will be the result. Especially is it so in cases where the forging is to be machine-finished all over, a practice more common in former years than it is at present. It is hardly necessary to state that it adds materially to the stability of the forging if left black or unfinished, except at essential working points.

Many years ago, when employed as a young man in a locomotive contract shop, the writer observed a forcible object lesson upon this point which he could never forget. A set of ten passenger engine lifting shafts had, through

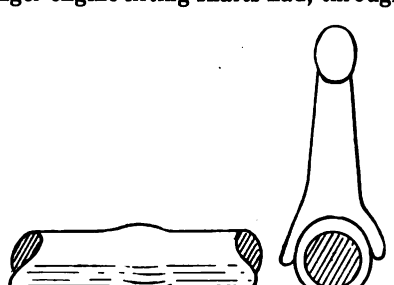


Fig. 7. INCORRECT METHOD.

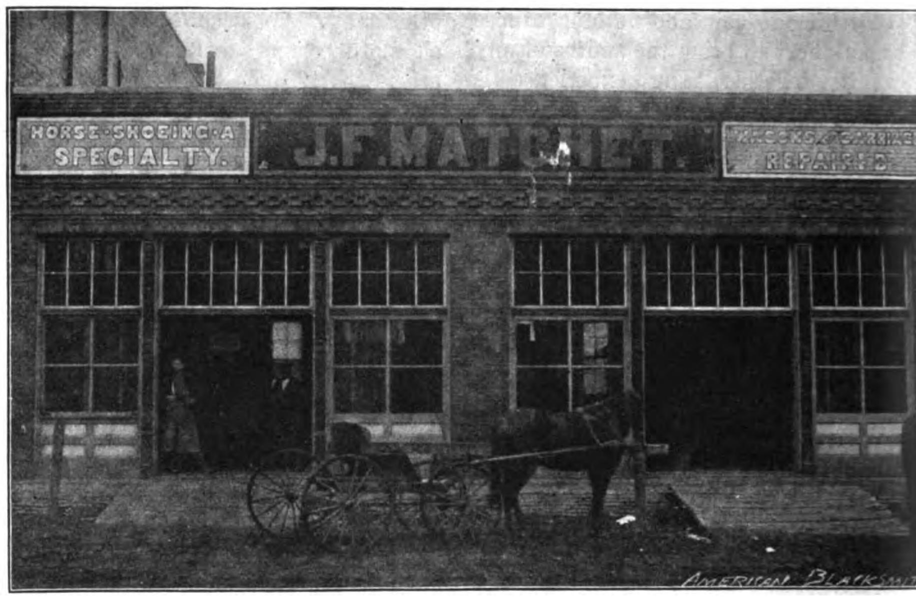
some inadvertance, been made in the worst possible way, as in Fig. 7, which shows the arm scarfed in circular form and simply welded around the exterior surface of the shaft. After being "machined" all over, some imperfections at points of weld were observed. To test them the arms were struck with a sledge, when nearly all of them rolled off their bases like so many nine-pins, to the sad discomfiture and loss of the blacksmith.

In some details the designs of the lifting shafts of different classes of engines vary, but on the whole the principles of construction, as outlined in these articles, will prove of general application.

Butcher Knives and How to Make Them.

GEORGE NABLO.

It is perhaps out of season to write about the making and tempering of butcher knives, but if those of the craft who have a little spare time this summer will care to utilize their old millsaw files to advantage, I believe that this article will be useful,—at least I have made many a dollar in that way.



SHOP OF MR. J. F. MATCHET.

The files most suitable for farmers' butcher knives are the 8-inch millsaw; that is, if made with a tang for handle. I have made a great many and prefer them to these with side handles fastened by rivets. I take the file and first heat it the whole length to prevent breaking while forging one end. I next heat the top or front end, and work it down to a tang or stem, to about $\frac{3}{8}$ inch in thickness and about three inches in length. I then turn it end about and forge the blade. I first cut off the tang on file; i. e., the old one, and forge the point, tapering from both sides equally to a point. Next I begin to draw out the blade, commencing at the point and on along the whole side. That is to form the cutting edge. In that way the knife will assume its shape, the thinning of the one side giving the natural curve.

I then continue to draw the knife to any desired thinness. After the knife is shaped, I allow it to cool in the open air until black, when I quench it in the water tank, and proceed to file it up ready for tempering. I file it almost to a cutting edge, so as to save a lot of unnecessary grinding.

When I have done filing, I proceed to the tempering. This is my method: I have a box filled with sand, 6 by 12 inches, and about 3 inches in depth, which I use, thoroughly wetting the sand all through with rain water and pressing the sand firmly down. Next I take the knife and press it with edge in the wet sand its whole width, and then take it out and heat to a good red color all over the blade, and when ready, put it in the cleft or slit of sand previously made. With both hands I press the wet sand firmly against the sides of blade, in order to facilitate the cooling off process. When cooled off, I take it out of the sand and find that the edge is too hard, especially where it is the thinnest. Therefore, I hold it over the fire and draw the temper until a millsaw file will begin to take a slight hold on the edge (a slightly worn file is best.) Then I put it in the ashes of forge for cooling. A little practice will soon enable the smith to get the right hardness.

This method has several advantages over others that I formerly used. A knife will not crack nor warp and the back will not be so brittle as when tempered all the way alike. It is not so liable to break, and the temper will be good for about the half of the width

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of back, which is all that is required. I have made butcher knives for 35 years and have tried different methods of tempering, but none could compare with the method given. No matter how thin the blade is forged, it will neither warp nor crack and can be made as hard as any one may care to have it. I might say that I have the reputation of making the best knives in this county and make a great many every year.

For handles, I use dry appletree wood. I do not taper the tangs, but make them of even size the whole length. I simply bore a hole in the handle, drive on the tang nearly to the blade, shape handle and run some babbitt metal on the front end, then dressing to suit.

A Missouri Shop with Good Facilities.

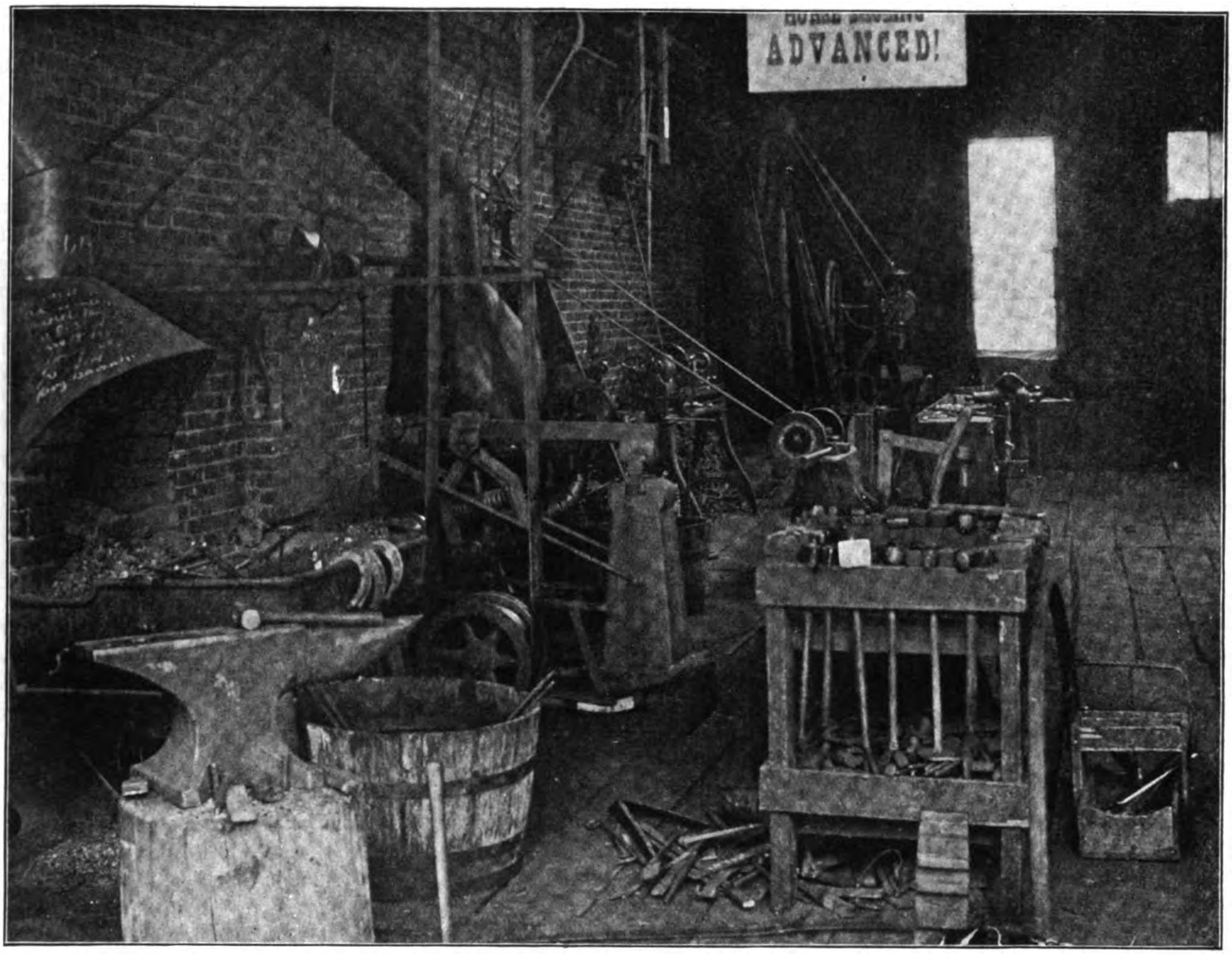
J. F. MATCHET.

The two pictures herewith show my shop, 48x68, as it now stands, which I believe will compare with any received by THE AMERICAN BLACKSMITH. I am situated in the county seat of Monroe County, Missouri, the population being two thousand. I learned my trade here and have been in business for forty years. I am 63 years of age, and still hammering, as in my younger days, and cannot let go. We do a business of about six thousand a year. My work has increased much with my increased facilities. The shop is in two rooms, one for smithing and one for wood work. The picture does not show the position as it should, but rather aims to give the more important parts of the business, showing the machinery which we have put in and which all smiths should have. I have a 2½-horsepower engine, made by Fairbanks-Morse, Chicago, and it gives me all the power I need. I run everything with it and have power to spare. I also have a drill, lathe, trip-hammer, emery and buffer. I also run the fans to my forges and shall, from time to time, add other machines for convenience. I am strictly in favor of machinery for small shops, and think it adds to the interest, as you will see from the sign hung up on the shop.

We also are making some improvements in prices. Having worked up an interest in the matter among the smiths of the county, we have succeeded to some extent, and have raised the prices a little. The following are some of our charges:

Horseshoes, plain	1.20
" toed	1.40
" setting	.70
" toed	1.00
" hand made .... 2.00 and	2.50
Wagon tires, per set,	2.00
Buggy tires, set	3.00
Rubber tires with channels 28.00 to	35.00
New rubber only, per lb	.85
Pointing plows, 12-inch and 14-inch	1.00
Pointing plows, 16-inch	1.20
New shares, 12-inch	3.05
" " 14-inch	3.50
" " 16-inch	3.75
Sharpening 12-inch, on stock 25, off stock	.20
Sharpening 14-inch, on stock 30, off stock	.25
Sharpening 16-inch, on stock 40, off stock	.35
Pointing the point of wing	1.00
Wagon tongues	2.75
Buggy or spring wagon pole	3.25
Splicing tongue brace	.50
Buggy shaft	1.50
Cross bar	1.00
Singletree	.50
Steel bow socket in top	1.00

Other prices are in the same proportion.



INTERIOR VIEW OF A MISSOURI SHOP RUN BY MR. J. F. MATCHET.

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I will stop now by saying that I am much in love with The American Blacksmith, have been taking it for several years and shall continue to do so.

The Gas Engine and its Advantages.

Prize Article.

WILLET CREED.

To the question, "Does it pay the blacksmith to put in a gas engine?" I want to say, most emphatically, that it does. And why? I am proprietor of a shop in a city of 2,500, my main building being 20x80; run two fires, and do horseshoeing, general blacksmithing and rubber tire work. I have a four-horsepower gas engine, made by the Springfield Gas Engine Company; with which I run a 21-foot line shaft, a double emery wheel, a 4-foot grind stone, disc lathe and a drill.

I grind plows and tools of almost every description, and save a lot of work daily on laying and pointing plows. You can hold your work against the emery wheel and smooth it up. If you are dressing chisels or hammers it is more of a pleasure than work to step to the emery wheel, where you can grind them in a few moments. You can have all of your machinery in motion at the same time, or you can have a lever shift to change the belts. In my shop I use the lever shift for belts, which I find very convenient. If you have drilling to do, you can drill five holes by gas power to one by the old way—hand power.

I have had quite a great deal of boiler repairing. I first cut out the sheet, which, of course, is very rough edged, unless you do a great deal of filing, and when I get my sheet or boiler plate cut, I can emery it off in three minutes' time. I have had work of grinding to come in that I would not attempt or think of doing if I had no gas engine. Where one is located in a town having electric lights, almost any kind of grinding or drilling can be done neatly and with absolute safety at any hour of the night. In my shop I have these conveniences and run my engine at night as well as during the day.

As to the expense of running my engine, it has been very light; in fact, the item is so small that it is hardly worth mentioning. The batteries have been renewed only once in two years. I keep on hand two extra batteries to renew with. It will cost about $6.00 to renew a set of six. It costs me about 50 or 60 cents per day to run my engine, if run steadily. I can start my engine and machinery in half a minute, and when I stop it all expense stops with it.

Another point not to be overlooked and which is quite an item, is that it requires no engineer or mechanic to run it, and scarcely no attention need be given it, as it practically runs itself when once started. From my own experience I am safe in saying that one man can turn out as much work by the aid of a gas engine as three men can without one. I can not see how my neighbors get along without an engine. You can polish up a job and make it look so much neater and better, and that is a secret that goes a long way and makes many pleased customers, and many new ones. If I was to start a new business in any locality, I most certainly would add a gas engine in preference to steam.

Does it Pay the Blacksmith to Put in a Gas Engine?

Prize Article.

WALTER MCCOY.

After reading so many able articles in your valuable journal, a little over a year ago, I concluded to put in power, so I installed a 2½-horse-power Webster vertical gasoline engine, and it clearly demonstrated to me that it pays to put in power in a blacksmith repair shop. I prefer the gas engine for the following reasons: First, the cost of a gas engine is less than for any other power; second, it does not require such close attention as is necessary with steam; third, the saving of fuel, from the fact that unless your gas engine is in actual use it is not consuming fuel, which is not so with the steam engine; fourth, the fuel is so much nicer and easier to apply to the gas engine, and as nearly as I have been able to figure the cost to run my engine it will not exceed 50 to 75 cents per day, and has cost nothing for repairs.

At the present time I run a disc sharpener, emery grinder and polisher, trip hammer, buzz saw and wood lathe, and contemplate putting in a tennoning machine and iron lathe this spring, and I am confident my little Webster engine will handle them all.

I am located in the great wheat belt of Kansas, and therefore my principal and heaviest work is disc sharpening, plow and cultivator sharpening and pointing. During the season of 1902, before I put in my engine, I only pointed eight cultivator shovels at a price of 40 cents each, a total of $3.20, and it was very plain to see that this class of work was going by me to other places where they had power and means of polishing. Then after putting in power, during the season of 1903, I had 159 shovels at a price of 50 cents each, a total of $79.50, intimating a gain in favor of power of $76.30,—$16.30 more than I paid for my engine. My increased income, together with the fact of seeing this class of work again returning to me, is very encouraging.

Besides this, I am able to do a better quality of work now, which is more satisfactory to my customers, and the blacksmith as a rule holds a special pride when he can please his customers with good work. By the use of my trip hammer for plows I can do just as good sharpening in one half the time I take by hand, requiring only 10 to 15 minutes and from 4 to 5 heats to each lay. In pointing I weld on and draw point to edge at three heats, which with the average smith to do the same work by hand would require from five to six heats. This would mean a loss of time, expense of coal, and a lot of hard labor. In sharpening disc plows, of which there are quite a number in my vicinity, and which are almost impossible to sharpen by hand, I find it an easy matter with either disc sharpener or the power hammer. I prefer the latter as there is no waste of material.

I sharpen 14-inch discs under my trip hammer at from three to four heats. This, of course, requires careful heating and quick work.

There is a wide range of other forging done with the power hammer. It is very good for forging down axles after welding on new stubs, finishing each weld at one heat, saving of time, coal, labor, and great drops of sweat. These all lend force to the argument in favor of power.

I bought my engine second-hand. Went to the machine shop, gathered it up in pieces out of different parts of the shop, put it together, shipped it home, placed it in my shop, and as long as I feed it gasoline and oil it never fails to go when I want it to.

I built my own trip-hammer at a cost not to exceed $10, and if any brother smith is interested in such a hammer I will gladly furnish him any information I can for construction. As for shut downs, well—

My engine stopped for me one day,
Alas, he would not run;
I found that he was out of gas,
The little son-of-a-gun.

I suppose there are a great many smiths in just the position I was a year ago, undecided whether an engine would pay them or not. To such as these, let me say, get an engine by all means, and you will soon wonder how you

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ever got along without one. There is everything in favor of them and nothing against, as far as I can see. Don't hesitate, but try one.

Advantages of the Gas Engine.

Prize Article.

F. A. WHEELER.

I am convinced that it pays to run a gasoline engine in a blacksmith shop, and shall attempt to tell AMERICAN BLACKSMITH readers why. I have always operated a two-man shop, first without any power, and later have worn out two steam engines, and for the past year have used a gas engine—a four horse-power Witte, made by the Witte Iron Works, Kansas City, Mo.

I suppose it is taken for granted that an up-to-date shop that contains a reasonable number of tools requires power. Then it is a question between steam and gas. I run an emery wheel, a circular saw, a one-horsepower hammer, turning lathe, spoke tenoning machine, drill and disc sharpener; also an iron saw (on same mandrel with wood saw), for cutting gas pipe, cutting teeth on stoneworkers' tools, etc.

As a general proposition it must be conceded that with these tools and a gas engine two men can do the general work four men would ordinarily do, and do it easier—therefore making the ownership of the machinery highly profitable to the employing blacksmith.

Here it will cost 65 cents to run a four-horsepower gas engine 10 hours—6½ cents per hour. When the machine is idle the expense is stopped, and your attention relaxed. It can be started in five seconds and stopped as quickly. The probable cost of operation, one day with another, will not exceed 25 cents. You run the hammer a few moments now, while you sharpen a plow, the emery wheel later to grind and polish it, the drill, and then the disc sharpener—all little jobs. You are equipped to do all classes of work economically at the shortest possible notice, never piling up work for a convenient time to "fire up," as you do with steam.

To particularize, for instance, suppose a farmer wants a plow sharpened. Hammer it out rough (just let the hammer shape the share), then in less than five minutes you can grind it, making a better finish and doing three times as much work in a day as can be done by hand. Again, do a piece of forging. Save your time in trying to hammer smooth, but grind instead; you can do more grinding on the most of work in 10 minutes than you can file in an hour, and there is no cost of files. Suppose a man comes into your shop with a wooden pitman cast-head broken. Start your engine, go to your emery wheel, and in two minutes you can grind the head off of every rivet, and stop your engine. Then the most trying ordeal of the job is ended, and the short run hasn't cost the fourth of a cent. How many readers have turned sickle work away because they had long-back sections when the patron needed short-backs? With an emery wheel and a gas engine the longs can be made short in a mighty short time and for the fraction of a cent in the cost of oil. I will wager you can't find a man in the Union that will run a rip saw for 6½ cents per hour, yet my saw runs for that, and it will saw more wood than 10 men can saw.

More, my saw will work a minute at the same ratio, and then keep off the pay-roll until I need it again. Here is another one: I bought a hand disc sharpener last year, and it took 2½ hours to sharpen a set of discs, and it was harder work than shoeing a refractory mule. I attached it to the engine later and now I can dispose of the job in half the time, and it is very much easier.

That is the secret of the whole business. It lightens the load. All your hardest work is done by machinery. It is done economically, because it is done cheaper than you can hire it done by hand. It is done better and more promptly. Then power is essential.

A gas engine is much more adapted to job work than steam. It is always ready. There is no heat, it is much cheaper and requires less attention. The engine of today has passed the experimental stage. Aside from the battery, I have needed no repairs and a machine of the same kind has been in operation in this town for seven years without repairs of any kind.

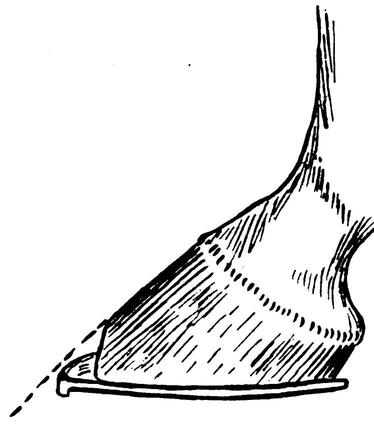

Fig. 14. TOE WORN SHORT. DOTTED LINE INDICATES NORMAL DIMENSIONS.

In concluding, I advise my brother smiths to cease going to mill horseback with your grist in one end of a bag and a rock in the other, but get in line, do a larger volume of work with less help, do it easier, do it better, make more money, save your muscle,—use gasoline power.

The Practical Scientific Treatment of Interfering Horses.—6.

Forging or Clicking.

E. W. PERRIN.

Forging or clicking is a phase of interfering peculiar to line trotters—horses whose hind feet move over the track of the front ones. The pacer and passing-gaited trotter does not forge. Forging consists in the animal striking the toe of the front shoe with the toe of the hind foot on the same side (see Fig. 13B), thus making a clicking noise, which is very unpleasant to the ear. Some times one foot only is affected, generally both, but usually one foot is more affected than its fellow, as is indicated by the sound and wear of the toes of the hind feet. In horses that forge badly it is common to see the toes of the hind feet worn quite short, as in Fig. 14, as a result of constantly striking the toes of the front shoes.

Fig. 13. FORGING. A, PASSING CLEAR. B, IN ACT OF STRIKING.

Forging results from lack of unison in the locomotion of the four limbs, that is, the front limbs are out of time with the hind ones,—the horse is not balanced.

Causes.

The causes of forging are various. First, a conformation of body and limb that predisposes the animal to interfering is the most prolific cause of forging. Long legs under a short body, or hind legs set too far under the body—too near the front legs—predisposes a horse to forge. All such horses travel dangerously close; that is, the toes of the hind feet pass closely under the toes of the front ones when trotting, and consequently anything that impedes the motion of the front feet or accelerates that of the hind, will cause the front and hind feet to collide while in motion, thus causing that clicking noise known as forging. Hence it will be seen that pain in a front foot or limb may cause forging, and this in my judgment is the most prolific cause of the trouble. It is a fact well known to all horsemen that the front feet of working horses, especially those which do fast road work, rapidly deteriorate. In fact, about 85 per cent. of all foot lameness (except that resulting from injuries), is in the front feet.

A young horse comes from the pasture with his hoofs cool and moist, wide at the heels and sound. We bring him to the city, shoe him and work him on paved streets. He goes all right for a while, but after a few months of street work, the front feet have shrunken; they are slightly narrower at the heels, and the sole that would pare as easily as a piece of leather at the first shoeing, is now as hard as oak.

The horse may not show any lameness, and to the casual observer there is nothing the matter with the feet, but a dry, shrunken condition of the hoof will cause sufficient soreness to impede the motion in front, so that the front feet are out of time—they do not raise quick enough, and hence collide with the hind ones.

The other causes are embraced under the broad head of defective shoeing,

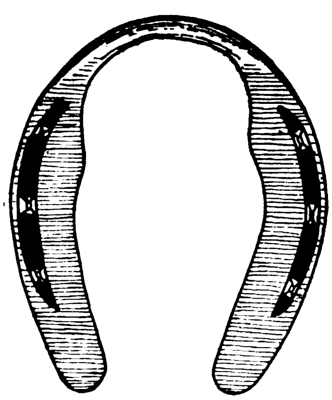

Fig. 15. A—HEEL WEIGHT SHOE, WITH ROLLER MOTION TOE.

such as improperly prepared hoofs, or the application of unsuitable shoes, or weights that do not suit, but all the defects in shoeing operate in the same way; they delay the action in front or accelerate it behind; they put the locomotary apparatus out of time—the horse is off his balance.

Treatment.

In the majority of cases the forging horse is a young one that has not been working on the streets very long. Perhaps he did not forge until his last shoeing, and the shoeing may have something to do with it, but not necessarily so, for it is common to find the hind feet sound, while the front ones of the same horse may have corns, contraction and sidebones. If the shoeing is suspected, closely examine the workmanship and ascertain if he is shod with the same pattern shoe that he wore when going clear. If the front shoes are worn thin on the outside, it is probable that you have the outside of the hoof too high, or there is some pain on the inside of the foot. Look out for a corn or a weak inside quarter. If the toes of the front feet are too long, shorten them and roll up at the toe. If the hoofs are in good condition with a well-developed frog that will reach the ground, then use shoe as at Fig. 15A, fitted so as to obtain frog pressure. If there is some contraction with a dry hard condition of the hoof, then use a heel weight bar shoe, as at Fig. 15B, and poultice the feet every night for a week, and follow that by stopping the hoofs with wet clay every time the horse is in the stable.

Now about the hind feet. It is common to see the toe of one or both feet worn very short by constantly striking the front shoe (see Fig. 14), often caused by inexperienced shoers fitting the hind shoes back on the hoof, thus leaving the toe of the hoof projecting beyond the shoe. This reprehensible practice modifies the clicking noise, at the expense of wearing away the toe of the hoof, and when the hoof is worn back to the shoe—generally in a few days—the clicking noise recurs. Remember that shortening the toes of the hind feet aggravates the trouble, because the shortening of the toe quickens the "pick up" of the hind feet. Instead of shortening the toes of the hind feet, they should be lengthened to their normal dimensions (Fig. 14.)

If the toes are too low then build up to the proper angle with layers of leather. Also use a light shoe with a toe calk and fit full at the toe so as to obtain the proper angle of the foot, as in Fig. 14.

There is a prevalent theory that shoeing a horse heavy in front and light behind will prevent forging. The very opposite is as often true. There is no rule that can be applied to every horse with success; each individual case must be studied with a view to ascertaining the cause, and although indifferent shoeing is a cause of forging, it must be remembered that sore tendons or joints, incipient splint or ringbone, sore feet, and all such causes of forging cannot be cured by shoeing alone. Therefore many a case of forging needs the advice of a veterinary surgeon as well as the skill of the horseshoer.

A Treatise on Horseshoeing.—5.

JOHN W. ADAMS, V. M. D.

Preparation of the Hoof for the Shoe.

After raising the clinches of the nails with a rather dull clinch-cutter ("buf-

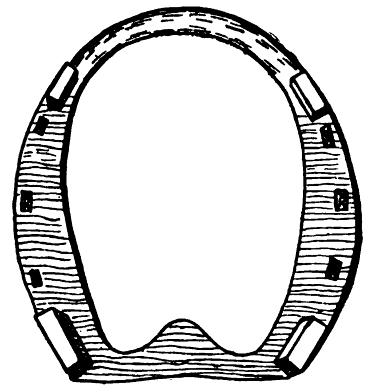

Fig. 15. B—HEEL WEIGHT BAR SHOE, WITH HALF ROUND ROLLER MOTION TOE.

fer") and drawing the nails one at a time, the old shoe is critically examined and laid aside. Remaining stubs of nails are then drawn or punched out and the hoof freed of dirt and partially detached horn. The farrier has now to "dress" the overgrown hoof to receive the new shoe; in other words, he has to form a base of support so inclined to the direction of the pasterns that in motion this surface shall be set flat upon the ground. He must not rob the hoof nor leave too much horn; either mistake may lead to injury. If he has made a careful preliminary examination he knows what part of the wall requires removal and what part must be left, for he already knows the direction of the foot-axis and the wear of the old shoe, and has made up his mind just where and how much horn must be removed to leave the hoof of proper length and the foot-axis straight.

A greatly overgrown hoof may be quickly shortened with sharp nippers and the sole freed of semi-detached flakes of horn. The concave sole of a thick-walled, strong hoof may be pared out around the point of the frog, but not so much as to remove all evidences of exfoliation. The wall should be levelled with the rasp till its full thickness, the

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white line, and an eighth of an inch of the margin of the sole are in one horizontal plane, called the "bearing surface of the hoof."

The bars,if long,may be shortened, but never pared on the side. The branches of the sole in the angle between the bars and the wall of the quarters should be left a little lower than the wall, so as not to be pressed upon by the inner web of the shoe. "Corns," or bruises of the pododerm, are usually a result of leaving a thick mass of dry, unyielding horn at this point. The frog should not be touched further than to remove tags or layers that are so loose as to form no protection. A soft frog will shorten itself spontaneously by the exfoliation of superficial layers of horn, while if the frog is dry, hard and too prominent, it is better to soften it by applying moisture in some form and allow it to wear away naturally than to pare it down. It is of advantage to have the frog project below the level of the wall an amount equal to the thickness of a plain shoe, though we rarely see frogs of such size except in draft horses. The sharp lower border of the wall should be rounded with the rasp to prevent its being bent outward and broken away. Finally, the foot is set to the ground and again observed from all sides to make sure that the lines bounding the hoof correspond with the direction of the long pastern.

Characteristics of the Shoe.

The shoe is an artificial base of support, by no means ideal, because it interferes to a greater or less degree with the physiology of the foot, but indispensable except for horses at slow work on soft ground. Since a proper surface of support is of the greatest importance in preserving the health of the feet and legs it is necessary to consider the various forms of shoes best adapted to the different forms of hoofs. Certain properties are common to all shoes and may be considered first. They are form, width, thickness, length, surfaces, borders, "fullering," nail holes, and clips.

FORM.—Every shoe should have the form of the hoof for which it is intended, provided the hoof retains its proper shape; but for every hoof that has undergone change of form we must endeavor to give the shoe that form which the hoof originally possessed. Front shoes and hind shoes, rights and lefts, should be distinctly different and easily distinguishable.

WIDTH.—All shoes should be wider at the toe than at the ends of the branches. The average width should be about double the thickness of the wall at the toe.

THICKNESS.—The thickness should be sufficient to make the shoe last about four weeks and should be uniform except in special cases.

LENGTH.—This will depend upon the obliquity of the hoof viewed in profile. The acute-angled hoof (Fig. 5*a*) has long overhanging heels, and a considerable proportion of the weight borne by the leg falls in the posterior half of the hoof. For such a hoof the branches of the shoe should extend back of the buttresses to a distance nearly double the thickness of the shoe. For a hoof of the regular form (Figs. 5*b* and 8) the branches should project an amount equal to the thickness of the shoe. In a stumpy hoof (Fig. 5*c*) the shoe need not project more than one-eighth of an inch. In all cases the shoe should cover the entire "bearing surface" of the wall.

SURFACES.—The surface that is turned toward the hoof is known as the "upper," or "hoof surface," of the shoe. That part of the hoof surface which is in actual contact with the horn is called the "bearing surface" of the shoe. The "bearing surface" should be perfectly horizontal from side to side and wide enough to support the full thickness of the wall, the white line, and about an eighth of an inch of the margin of the sole. The bearing surface should also be perfectly flat, except that it may be turned up at the toe ("rolling-motion" shoe, Fig. 5 *a*, *b*, *c*). The surface between the bearing surface and the inner edge of the shoe is often beaten down or concaved to prevent pressure too far inward upon the sole. This "concaving," or "seating," should be deeper or shallower as the horny sole is less or more concave. As a rule strongly "cupped" soles require no concaving (hind hoofs, narrow fore hoofs.)

BORDERS.—The entire outer border should be beveled under the foot. Such a shoe is not so readily loosened, nor is it so apt to lead to interfering.

FULLERING.—This is a groove in the ground surface of the shoe. It should pass through two-thirds of the thickness of the shoe, be clean, and of uniform width. It is of advantage in that it makes the shoe lighter in porportion to its width, and, by making the ground surface somewhat rough, tends to prevent slipping.

NAIL HOLES.—The shoe must be so "punched" that the nail holes will fall directly on the white line. They should be confined to the fore half of front shoes but may occupy the anterior two-thirds of hind shoes. For a medium weight shoe three nail holes in each branch are sufficient, but for heavier shoes, especially those provided with long calks, eight holes are about right, though three on the inside and four on the outside may do.

CLIPS.—These are half-circular ears drawn up from the outer edge of the shoe either at the toe or opposite the side Ball. The height of a clip should equal the thickness of the shoe, though they should be even higher on hind shoes and when a leather sole is interposed between shoe and hoof. Clips secure the shoe against shifting. A side clip should always be drawn up on that branch of the shoe that first meets the ground in locomotion.

(To be continued.)

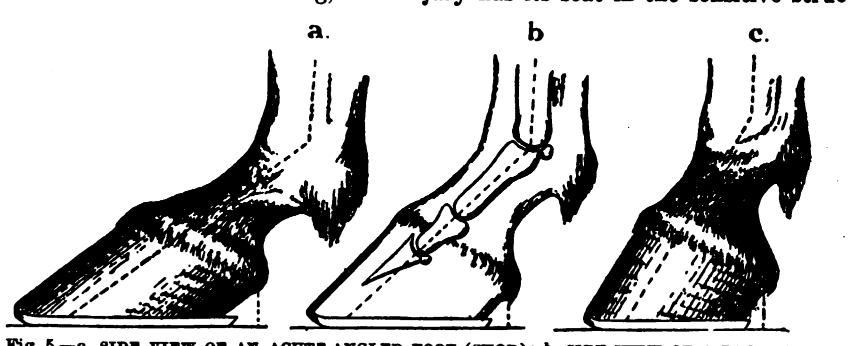

Fig. 5.—*a*, SIDE VIEW OF AN ACUTE-ANGLED FOOT (SHOD); *b*, SIDE VIEW OF A REGULAR FORE FOOT, SHOWING THE MOST DESIRABLE ANGLE OF OBLIQUITY (45°); *c*, SIDE VIEW OF A STUMPY, OR "UPRIGHT" FORE FOOT; OBLIQUITY ABOVE 50°. IN *a*, *b*, *c*, NOTE PARTICULARLY THE RELATION BETWEEN THE LENGTH OF THE SHOE AND THE OVERHANGING OF THE HEELS. NOTE ALSO THE TOE ROLL OF THE SHOES.

Corns and Their Treatment.

DR. HERBERT L. PARKER.

The term corn refers to a diseased condition of the posterior part of the foot, and especially of the heels. The injury has its seat in the sensitive structures of the quarters, in the sensitive bars or in the sensitive sole. They are divided into two classes, moist and dry, and are shown by a red spot at the heel.

CAUSES: The fact that the posterior part of the hoof is often the seat of the trouble, is possibly due to the great

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mobility. The movements of the hoof are most apparent at this point and rupture of the soft structures therefore more liable to occur. Then again, the heels carry a larger portion of the weight and the horn covering them is the weakest.

The more frequent occurrence of corns in the inner heel and in the fore feet, must also be referred to the great weight borne and in the greater concussion during rapid movement. Corns are favored by long, weak fetlocks, and by defects in formation, especially in the fore limb. In animals that stand with feet well apart, the inner heel is most generally affected; in the opposite conformation, the outer. The weaker the horn at the heels, the more readily do such injuries occur. Rings on the surface of the heel suggest the existence of a corn. Abnormally narrow feet are generally the seat of corns, and in contracted heels they are almost always present, but wide hoofs are also liable to them; in such cases the corn being an injury of the sole, while in narrow hoofs the wall is more often affected. The principal external causes are faulty shoeing, especially improper paring, the use of too long or too narrow shoes, or allowing the shoes to remain on the foot too long.

As corns are rare in unshod feet, the idea is held by many that they are produced by pressure of the shoe, and for this reason farriers often endeavor to prevent the injury by rasping away the inner wall so that it no longer touches the shoe. The result shows, however, that the idea is wrong, for corns occur just the same, and in addition a sand crack often forms at the coronet. It therefore seems clear that the heel should be supported by the shoe; if not, it descends and leads to a rupture of the soft parts.

TREATMENT: The immediate cause must, if possible, be removed, and the shoeing receive attention. For horses with broad, flat feet, the shoe should be fitted long at the heels, and should be broad over the cover. In a moist corn, after it has separated, a bar shoe would be all right. On the other hand, horses with high, blocky feet often go better in tips. The three-quarter shoe is good, the branch of the shoe being cut off on the side corresponding to the injury. The three-quarter bar is also recommended. In dry corns nothing further is required. Paring out the corns is undesirable and even injurious, because, after removal of the reddened masses of horn, the soft tissues are often exposed and infectious matter can enter the foot, such as sand, dirt, rocks, etc. In moist corns there must be good drainage for pus, and all dead tissues removed. Flaxseed meal poultices, iodine, carbolic acid, turpentine or any good antiseptic poured into the opening is good. Protect the opening from dirt. A good treatment for moist and dry corns is a few iodine scales placed over the corn with a little turpentine poured over it, holding it there for a moment.

QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

Shoeing Crooked Feet.—I would like very much to hear from some of the craft on how they go about shoeing feet that are crooked. WM. MCKEEVER.

Cold Tire Setters.—I would like to ask some good brother which is the best and most practical cold tire setting machine for a common repair shop. WILLIAM DARLING.

Sand Belt.—As to Mr. T. L., in the May number, will say he can get a sand belt from the Sligo Iron Store Co., St. Louis, much cheaper and better than he can make one. J. V.

A Number of Questions.—I would like to ask, through the columns of the AMERICAN BLACKSMITH, how to turn a solid eye; also the proper way of making vessel rudder irons. Any information given will be greatly appreciated. A. W. HARVEY.

Milling Machine.—I wish some of the craft would send in for publication plans for a small hand milling machine for metal—also a wood working machine for cutting grooves, something on the order of the Union Combination Saws, only more simple than that. WM. DUFF.

Petroleum in the Forge.—I notice in the January issue an article on an axle factory using petroleum in the forge, because it is free from sulphur. Can some one advise as to the best way to use the petroleum, and how much would be required for an ordinary forge per day? Also does petroleum furnish sufficient pressure, or is a bellows or blower required as with coal fire? T. M. MAY.

A Testimonial.—I am delighted with THE AMERICAN BLACKSMITH—it is the best paper of the kind I have ever seen. I know it will be a great benefit to me. Have just received the hoof knife that you offer to induce smiths to take the paper. It is a splendid knife and I am proud of it. Much obliged. C. S. POINTEL.

How Drill Chilled Mould Board?—I would like some reader to kindly inform me through these columns, by what process I can drill holes in a chilled cast mould board of a plow. In a recent issue I saw camphor gum and turpentine recommended, and tried it, but it would not do. Perhaps I did not use it the right way. I have some to drill now and would like to hear from some of the craft. J. B. JEX.

Plow Lays-How Harden?—We have had trouble this spring in hardening plow shares or lays, and would like to ask some reader to help us out. We use a barrel of rain water with a compound in it, and have just had it removed this spring. The lays crack in the throat. We use the Star No. 1 lay, and always had good results until this spring. Will some one tell us a good way to harden them so they won't warp or crack? The paper is all right and we wouldn't be without it. JACK.

A Seedy Toe.—I have a mule to shoe that has a seedy toe, or that is what I suppose it is. The mule is three years old, and its hind feet have grown extra long, running out in front. The hoof is hollow in front nearly to the hair, and the heels have gone forward about ¾ of an inch. The hoof grows in front, but the heels do not grow towards the ground. The toe cannot be cut down so as to put the foot in shape. I have cut to the quick, and the toe was too long for the heel. Let me know what to do in this case. M. L. CHUNN.

To Shoe for Interfering.—I saw several questions of late asking how to shoe a horse to keep him from interfering. The following is my experience: If the horse's foot is low on the inside and turned out at the toe, I take an old shoe, cut it off at the front hole one-half inch, draw to a slope from the heel to the toe, and weld on the inside of shoe. If low on the outside, reverse it. I have been shoeing this way for several years and have never failed to stop the interfering. J. B. PRIDDY.

Blueing Steel.—In reply to R. B. Thompson about blueing, would say that I work for the American Gas Furnace Co., of Elizabeth, N. J., who build furnaces for blueing articles of all kinds and give a certain depth which lasts some time. Also case hardening furnaces are made and no doubt Mr. L. M. Emig would be able to get something to suit him there also. Then again there are furnaces for melting soft metal or hard metal and perhaps Mr. S. J. McDonald would find it to his advantage to try their furnaces. If either of these gentlemen think it worth their while, they might write to the American Gas Furnace Co. G. G.

Prices from Indian Territory—Not seeing anything in the paper from the Indian Territory, I thought I would send in a few of our prices:

Shoeing, plain	$ .25
" rough	.35
Resetting shoes, per pair	.25
Wagon and buggy tongue	2.50
" axles, front	3.50
" " hind	3.00
Setting buggy tires	3.00
" wagon "	2.00

As the plows which we sharpen vary from six to sixteen inches, of course there are different prices.

We are of the same opinion as A. M. McGeary, of Colorado, with regard to the Lien Law, as we have suffered considerably from losses in collection, and would very much like to see the time when we could all have the same protection.

W. M. COOPER & SON.

Axles and Dish.—Mr. R. O'Hearn asks why I take two heats on an axle. This is to make a better job, as I do not call it a good job if you can see the weld. He also

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criticises my method of taking dish out of wheels. Won't a wheel look better with half the spokes turned, than it would with a 2½ or 3 inches dish? I think it would. Of course it would look better new spoked.

Mr. O'Hearn, I notice, says that every article ought to be criticised if not of the best. Now, he says in his article that he pounds or strikes the end of the flange to take the dish out of wheels. I don't think this would do much good on a wheel with 2 or 3 inches dish. Also how about the Warner patent shell band wheels? I am a young smith, so I will leave this for some one else who I think knows more than us both. C. D. Briddell.

Gas Power.—I have noticed several articles on power in the shop, so have decided to give some of our experiences. We put in a six-horsepower gasoline engine about seven months ago, and kept adding machines, until now we have more than it can pull. We decided to get a larger engine, but could not see our way until work picked up, so we bought a 1½-horse second hand engine to help out. We do a great deal of finish work for the jobbers of Kansas City, Mo., and Kansas City, Kansas, which is paying for the machinery, and some over besides. We have now seventy-five oak wagon tongues in the shop to finish for a jobbing house across the State line, also thirty finished tongues in stock that we sell for less than jobbers' prices on rough tongues. Our greatest mistake in putting in power in the shop was in buying too small an engine. At present we have 7½ horse-power, but have ordered a fifteen horse engine and hope soon to have power enough for all purposes. T. M. May.

A Letter from Maine.—I run my shop without power, as a woodworking mill is at hand and all such work is cheaply done there. I use a Henderson tire setter with perfect satisfaction and would not be without one. I notice several smiths give a list of prices they get for work. They however, do not make it quite plain to us what they do for the money. The following are some of my prices:

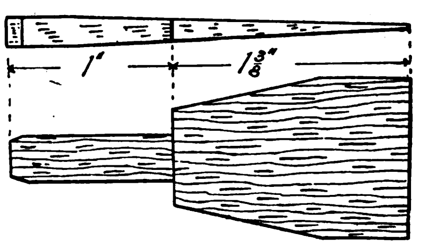
Setting light tires, per wheel	$ .25
" heavy " " "	1.00
Putting in shaft	1.50
" " whiffletree	.75
" " crossbars	.75
Rimming light wheels, 1¼ and under, per wheel	1.25
Putting in spokes	.20
New axles, per set	5.00–6.00
Good painting job	7.00–10.00
Recovering buggy dash	3.00

S. L. Lord.

Sarven Wheels.—Mr. M. A. Foster says that he has built and repaired wooden hub wheels, also Sarven flanged wheels for a good many years, and has found by experience that a good wood hub, such as white oak or birch, will surpass any flanged hub for the simple reason that so many smiths' don't understand repairing the Sarven hub. I commenced work in the shop when 12 years of age, and I have repaired a few Sarven hubs in my life. The reason why the flange springs and the spokes get loose is that when riveting smiths use too light a rivet and then they think it must be set down with a sledge. There is where they make their mistake. When you use too heavy a hammer you bend your rivet, and when the strain comes on the spoke it straightens the rivet and that is what makes your spokes loose. A wood hub is all right for a level country, but in mountains it is no good. That has been my experience. C. W. Metcalf.

Butcher Knives.—In reply to Thos. Long and Samuel Krebs, inquiring how to temper butcher knives *so as not to warp*, would say I wish they would try my plan and let me know how they like it. Heat to a cherry red and plunge into fish oil (any kind of fish oil will do), and they will come out as straight as before put in, and as hard as though plunged in water. Then heat a piece of flat iron, and after cleaning the knife bright with sand or brick dust, hold the knife over the hot iron with the back of knife resting on the iron and the edge slightly elevated, as the edge, being the thinest, if laid flat on the iron, will heat the quickest. Draw to a color between a deep blue and straw color. In drawing temper be very careful and get it even, but if it should draw to the right color in part and not all over, cool off and place the part not drawn down on iron as before. After trying this plan please let me hear from you through the columns of The American Blacksmith. G. M. Goudey.

Sarven Wheels.—I saw in the April number the method of Mr. O'Hearn for taking the dish out of Sarven wheels. I don't believe Mr. O'Hearn or any other man can make a solid wheel by closing the flanges and tightening rivets. They are still loose in the wood part of the hub and will work the same as a joint. I have tried everything, even to taking off the flanges and canvassing them, and never made a wheel tight until I commenced to wedge the same as a wood hub.



TWO VIEWS OF WEDGE FOR WHEEL REPAIRING.

My method of straightening Sarven wheels is to cut four opposite rivets, draw eight spokes and wedge the same as wood hub. The sketch herewith is that of a wedge made for the purpose. Put the bolts in to hold the flanges, cut other four rivets and wedge the other eight spokes, put in new Sarven rivets and you have a solid wheel. I always use glue. I always make the wedges in the winter. I have bought factory wedges for wedging spokes, but threw them in the fire, as they are no good whatever. E. H.

Plow Lays.—We are readers of your valuable paper and don't think we could well be without it. We have watched earnestly to see if some brother smith would tell how he makes a plow lay, but have been disappointed, so will explain how we make a lay. First fit the lay to the mould, seeing that it fits perfectly. Then fasten it to the frog with a screw clamp and fit the landside bar, being careful to fit it perfectly to the lay, getting it level with the bottom of the long bar and the same on the outside. We are then ready for welding. Take an "Ideal" plow clamp, and clamp on the point. Begin welding at the top and weld to the point, using borax on the steel, but none on the iron. After welding, see that the edge of the lay presses along on the leveling board, and have the point perfectly level. Grind up, and you have a share that will run.

We have a gasoline engine, 3-horsepower, with which we run a band saw, emery wheel and other things, and would not be without it, if only to run the emery wheel, for you can do your work ever so much better. Oberg Brothers.

A Simple Axle Gage.—I wish to say that The American Blacksmith is a great help to me. I read each month with interest a good many articles on horse shoeing, axle and tire setting, wheelwright work, etc. I see in the May number where Mr. Breckinridge gave us a good talk on building wagons. I build a lot of new wagons and agree with him, only I have thin poplar patterns for all new work.

I have an axle gage that is very simple and find it to be the best yet, I think. It is nothing but a straight poplar piece 6 feet long, 5 inches wide and ⅞ inch thick. Hollow out one side of gage, beginning about 12 or 14 inches from each end. This is for arched axles. Use this hollowed-out side for bottom side. On one end have two screws of the same height, say ⅞ inch, and one screw the same height on opposite end. This will give bottom gather. Now, this is for common axles, but if you are setting patent axles the shoulder, of course, is swelled or larger, so have your collar screw 1-32 inch shorter. For front gather on common axles, have all screws the same except the end screw, which should be 1-16 inch shorter. For patent axles have same length screws on each end. Try this, for it is O. K. Eugene Middlebrooks.

Axes.—Having been a reader for only a short while of your valuable paper I already do not see how I could do without it. I especially like the Queries and Answers column. In answer to R. Moore in the April number on axes, as I have drawn out and steeled many thousand in the last fifteen years with excellent success, I will say to draw out an old axe be careful never to get the axe too hot, and never to stave the steel, but draw it out and trim the edges with a sharp cutter. Any experienced smith knows that staving or upsetting ruins steel. An axe can be made much thinner than factory axes are when new. Never make an axe too square on the edge, but round the corners off well after the axe is shaped up all O. K. Then hammer well with water. Let axe cool off and then file to a good shape.

To temper, first prepare the fire and heat on top of fire to an even cherry red as far or nearly to the eye. Then be careful to hold the axe with the edge straight down when dipping in water (rain water is best). Cool off to about one inch from edge and then hold edge over the fire until it will burn a shaving when hammer handle is scraped over it. Then plunge into water. If properly done ninety-nine out of each hundred will stand any kind of temper.

For steeling axes, cast steel is best. Split axe and put steel in, weld and finish as in old axes. H. L. Kibler.

Flue Welding.—In further regard to our recent question on the matter of flue welding would say that we chamfer our old flues as well as the tips in a lathe, so they fit close together, and we generally have no trouble to weld them, but we had at intervals sometimes a set that were just as stubborn as they could be and it seemed that the heat could not be gotten to proper welding point. Then again when up to what appeared the proper heating point the tip would not weld solidly to flue anyhow, or at least would not stand the test that we put all flues to before we put them in the boiler, which is to fill the inside with water and lightly tap the weld in search of leak or loose joint. Have sometimes put fault to the fire not being good, too dirty, or not having the proper blast, yet it seemed after cleaning and putting in best

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of shape no improvement would follow. At other times it would be playing to do the welding on another set of flues. We have tried different welding compounds or fluxes, but it does not seem to change things materially. Generally sand is the proper flux. Now, if you can get some light in this matter, we shall certainly be much obliged. We have been in the business, that is, doing general machinery repairing, for ten to fifteen years, and do quite a lot of flue work and when we occasionally get such a stubborn set of flues to weld, it gets very aggravating to not be able to locate a remedy. We weld in the fire, using good smithing coal and a power blower. J. M. K.

A Tire Setter Testimonial.—I am highly pleased with your journal and am sorry that I have been missing so much useful information. I noticed in the April number that a subscriber wishes some information in regard to cold tire setting. I wish to say I am using a Henderson Tire Setter, manufactured by the Standard Tire Setter Company, of Keokuk, Iowa, and to say that I am highly pleased with it is to put it mildly. This is the third season that I have been using it, and it has never disappointed me. I have set all kinds of tires with it from ¾ by ¼ to 3 by ½, low separator wheels and high hay rake wheels. I bought the machine on a ten days' trial and the first tire that I set was 1¼ by 5/16-inch and I made it 1¼ larger than the wheel by actual measurement as I thought I would give it the limit. It set the tire just as smoothly as if it grew there. The beauty of this machine is that it does not disturb the bolts and leaves no marks of any kind on the tire or felloe. For setting a tire on a wheel that is dished the wrong way, why it is a "cinch." Another desirable feature is that it can be used as an axle box press. I have set boxes 3½ by 10 inches. I bought the second one that was sold in the State of Ohio and I looked the matter up thoroughly in regard to durability and wide range of work. The "Henderson" will last a life-time, as there are no small parts to break or wear out, and it will set a greater variety of tires than any other machine on the market. The logical conclusion is that for a general repair shop it has no equal. My customers are perfectly satisfied and I know I am. It will be the same with all of the opposition if they purchase a good machine. It is my candid opinion that a repair shop without a tire setter is behind the times. My helper and I have set thirty-five tires and twenty horseshoes in one day. I would further say that you can soon pay for such a machine, not only by setting tires, but by the increased amount of other work you can do, and by the time saved, to say nothing of tire bolts, fuel and the cost of hired help. JACOB SUTER.

More on Pitch and Gather.—It has been said that pitch is good for gather, and to prove this one gentleman exhibits a ring moving in a straight line over a smooth surface and says: "It will continue in this straight line as long as it stands straight up," and as soon as it begins to pitch, you will have to give gather. He further asserts that a buggy wheel would do likewise. Suppose, however, that a buggy wheel was set in motion over a smooth surface with sufficient force to cause it to move in a straight line; it will be found to pitch towards its face in much the same manner as it does on the buggy, and why? Because on account of the dish in the wheel the weight of the hub and spokes are thrown to one side of the center of this ring, and in order to balance itself it must pitch; as soon as the speed permits it to straighten up it will commence to gather. Mr. Youngstrom seems to have overlooked the fact that there is anything to the wheel but the ring, and to clinch his argument he produces a wheelbarrow and proceeds to cut the figure eight and other graceful turns. Then he moves the bearing slightly out of true, like he does when he gives gather and says that you could not push this wheelbarrow straight ahead unless you gave it pitch. But let us see. Suppose you had two wheels on the wheelbarrow, and moved the two outside bearings slightly ahead, you would then have the exact position of the buggy wheels, the spokes standing plumb, from hub to floor, with the wheels narrow in front. In this position you could push them straight ahead, but they would run together. It has been said that we give pitch to prevent gather, but that is not the exact truth. We give pitch to stand plumb and omit gather to be straight on the side. I could refer to a score or more carriage factories that do the same, but one will suffice. Write to Mr. D. W. Connell, Velie Carriage Co., Moline, Ill. He is a practical man, has worked his way up from behind the anvil to superintendent of one of the largest buggy manufactories in the country, a concern that builds something like 20,000 jobs a year, and I am sure he would tell you that he knows of no large concern that uses gather in light vehicles. Nor is it a new idea. I learned it just 15 years ago. The assertion that the tire will produce friction with the ground is absurd. To do this the wheel would have to slack its speed and drag, and if the nut was off it would drop off. That such is not the case has been demonstrated by setting the axle so that the spoke stood plumb, leaving the gather out. You can push the job ahead, or run it backward over a level floor, and the wheel will never leave its position at the collar as long as it continues in a straight line. NELS PETERSON.

Flue Welding.—In reply to an article on flue welding by J. M. K., in the March number, I will say that I have had over twenty years' experience, both in hand and machine welding, and the only trouble I have ever had has been with galvanized flues. With ordinary flues of steel or iron I have never had any trouble. It is difficult to tell where J. M. K.'s trouble lies, from the fact that he does not describe his method, does not say whether he welds them in or out of the fire, or whether he puts the safe end on the inside, or uses both top and bottom swage, or how his mandrel is arranged. He also neglects to state what kind of fuel he uses or how he manages his fire. All of these things have much to do with welding flues and without knowing where his difficulty lies it is difficult to suggest a remedy. The following is my method:

For hand welding, I put the safe end on the outside, making a very short scarf on the end of the old flue, and choking it just a trifle so that it will readily enter the safe end. I go over all the flues first and stick them up handy to get at. Next I scarf the ends on the horn of the anvil, enlarging them slightly. Put the end back in the fire and get the end of it a nice heat; put it on an iron block which is level with the floor, hot end up. The helper has the flue ready and drops it into the end and jars it down till it is lapped ½ or ⅝ of an inch. Then while still standing on end, with a light hammer close the thin scarf of the end down close against the flue so that there is no open place for dirt to sift in while taking a welding heat. This joining process must be done very quickly, else it will get too cold for good results. When all the flues are ready for welding, I build a fire with block and pound down wet coal as hard and solid as possible. On each side I put fire bricks, if I have them, and if not, use wet coal for banks. I feed the fire with hard coke if I can get it. If not, I use ordinary coke taken from the fire. In heating I begin with an ordinary blast and gradually increase, finishing off with quite a fierce blast, as there is no danger of burning off the flue if careful to have a good body of coke under it. When a welding heat is reached have the helper hit it on the end enough to stick it, and be careful that the end is kept in line with the flue. When a good soft welding heat is reached, with a small hammer having an iron handle, weld the thin scarf down all round. Do not do this till a good heat is reached. This process will choke the flue slightly. I use a steel mandrel hung loosely (except that it cannot move endways) at the farther end and having a short sharp point at end over which the flue goes. This mandrel lies in a bottom swage, which is chamfered on the end so that the flue will not catch. Take from the fire, slip onto the mandrel and weld with four or five blows from a five or six pound hammer in the hands of the helper. H. CHISHOLM.

Hardening Query.—I am employed as a tool dresser in a railroad shop and am seeking a little information. I have had very good success thus far, having an "American Steel Worker," by E. R. Markham, but see no remedy for the following in his book: Our boiler shop uses the large size Monarch pneumatic air hammer for calking radius stay bolts on the crown sheet. We make the cup carefully, but it is impossible to make them stand. How am I to harden to avoid their breaking? They either break at the bottom of the hole or shank, or the shank that goes in the hammer breaks. The hole is 1½ inches deep. We will say that Markham's book is the only thing for a hardener of tools. We have also found good information in your journal. ANDY RITTER.

In reply to the question of Mr. Andy Ritter, would say, in the first place do you suppose you are using the right pressure in your pressure system? If so, you may possibly be using too high a steel, that is, one containing too high a percentage of carbon. Would suggest attention to these matters. When forging the tools do no forge at *too low* a heat, as it ruptures the steel and makes it weak. Of course I do not advocate heats that are too high, but forging heats can safely be considerably higher than hardening heats.

After forging and before working be sure to thoroughly anneal. Do not anneal by heating red hot and sticking in cold damp lime, as many do, as this makes the steel brittle and liable to break under shock. Neither should it remain red hot long, but follow instructions given in the "American Steel Worker," page 73, for annealing between boards. When hardening, heat to the lowest heats possible and dip in warm water, as warm as it can be made to do the work. If this does not prove to do away with your trouble dip in a mixture of equal parts of sperm oil and tallow, or it may be necessary to add a little resin. I think, however, you will find warm water will put you right, provided you have observed the other instructions. The annealing will put the forging in good condition for hardening, as well as remove the tendency to break in shoulder from brittleness. Be sure to look to your air supply, as too great a shock on the hammer from too high pressure is serious. E. R. MARKHAM.

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THE AMERICAN BLACKSMITH

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Unwrapping Your Papers.

It seems a small matter to make this subject of an address to AMERICAN BLACKSMITH readers, yet perhaps the following hint may profit some. It refers to opening the paper when received. Remove the wrapper by slitting with a knife, taking care not to cut the journal itself. Then to straighten out, roll it carefully and firmly backward once or twice, as may be necessary. The paper can thus be made to lie out flat and without crease, well repaying the slight care needed to accomplish the result.

A Suggestion to Smiths.

Blacksmiths and wagon builders who are about to invest in any tools or machinery will always do well to send for the catalogues and prices of competitive manufacturers before purchasing, as much can often be saved by so doing. THE AMERICAN BLACKSMITH is in constant correspondence with reputable manufacturers of all kinds of blacksmith's tools and supplies. If the smith who is thinking of buying will write to the AMERICAN BLACKSMITH Company, stating what he wishes to purchase, we will put him in correspondence with several firms that can supply his needs, thus saving him the trouble of writing many letters. Oftentimes the blacksmith does not know who makes the tool he wants, or when he can get it, and in such a case, also we shall be glad at any time to help our readers. The AMERICAN BLACKSMITH Company has no goods to sell, outside of a few books, and is interested in the sale of no tools or machinery. The above suggestion is simply an offer of our services, without charge, for the convenience of readers.

Pass It Along.

If you have been taught any specially useful kink in your work, remember to teach others as you were taught. If through skill, ingenuity or experience you have learned a way of doing some job or piece of work quicker, better, or cheaper, don't keep it to yourself—pass it along. Of course there are mechanics who prefer to keep new ideas to themselves, being governed by no other motive than selfishness. Fortunately for the good of the craft, most smiths are broadminded and generous in such matters and freely give the information which comes to them by experience and experiment. Others learn from them and they learn from others, in turn. Knowledge of any kind would not advance at all if everyone kept to himself the lessons he learned. Hence we say if any reader knows of a shop kink or short cut that would benefit his brother craftsmen, let him tell it to them by sending it in to THE AMERICAN BLACKSMITH for publication and circulation. If you have gained any special knowledge of this kind, give publicity to it through these columns. Pass it along.

Old-Time Blacksmithing.

PROF. AMBROSE S. OTTEY.

I went to learn my trade in 1859, with my father, and I am still pounding away. Blacksmiths are a class of men that strike, but never go on strike, for there is no use of it. When they work they are always on a strike.

We were past fourteen years of age when put in the shop by our father, because we were too troublesome or mischievous to be allowed to go to school, which fact we have had occasion to regret many times since. But we have tried to educate ourselves, and during a constant labor of some thirty-six years, we have written not less than nine books on the Bible alone. This was done at night, after our day's work. The Bible, outside of our trade, is our "hobby." We have read it through one hundred and twenty times.

Three days after we entered the shop, we had to clinch shoes, and in six months time we were doing the fittings, while the new boys were doing the former. We were a family of blacksmiths from 'way back—the grandfathers, fathers, sons, and uncles and nephews, twenty one of us altogether.

A blacksmith, I honestly think, stands today, and always had stood, pre-eminently above all other mechanics, because he can make all of his own tools and those used by other tradesmen. What a wonderful change there is today in doing our work from what it was forty years ago! At my time of apprenticeship we made all of our horseshoes, and oftentimes made them while the horse was waiting to get shod. Then we made all of our own horseshoe nails and, before using, had to point them on a pointing block set in a post with a seat back of it to sit on.

In summer times we had to be in the shop at work before six o'clock in the morning, and work till sundown. The only time off was when eating our meals. In winter we went to work at sunrise, and worked till dark. After supper we went back into the shop and worked till eight o'clock. The work done after dark would be drawing molds, nail rods, etc.

One night's work consisted in drawing one dozen molds, or sixteen feet of nail rods. Oftentimes through the day in winter, the same work was done. For a day's work in molds we had to turn

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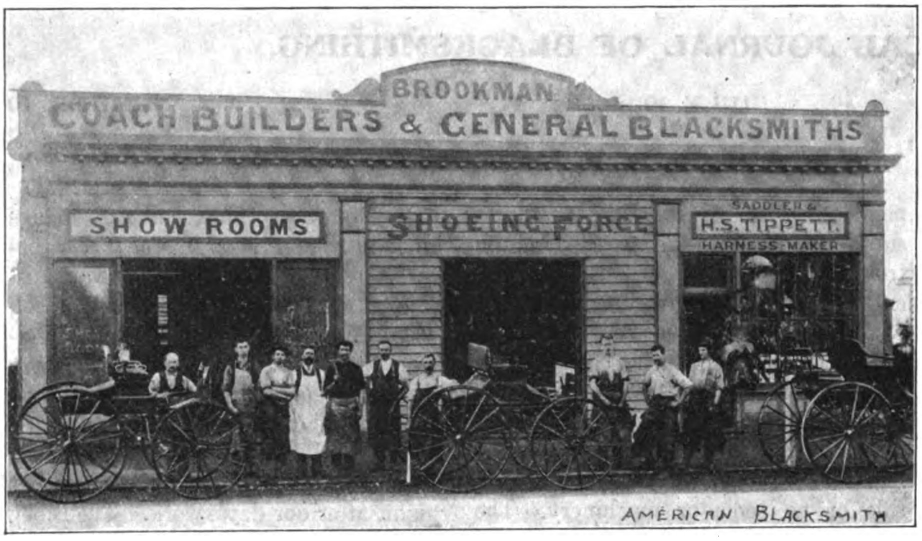
seven dozen ready-made molds, or six dozen out of the bar, one dozen allowed for bending. For two or three weeks at a time in October or November, not much of anything else was done, yet all through the winter the drawing and turning was continued.



AN INTERESTING AUSTRALIAN CARRIAGE AND SHOEING SHOP.

To complete a day's work in horseshoe nails one thousand of them had to be made, and hundreds of pounds has the writer made, and he could generally complete his day's work by three or four o'clock, after which we were free to go and enjoy ourselves if we so desired.

When making shoes I never cared much for using the hammer, but generally used the sledge with which to do the striking. Mr. Malin, whom I helped, was a first-class shoe turner, and we could be done with our day's work by one or two o'clock p. m. I have been in business for thirty-six years, but have never as yet had a man in my employ that could do it as well as he could, nor make the number of nails in a given time, and nine out of ten could not make a good nail, let alone a better shoe. In making nails, it took about forty strokes of the hammer to make it, so one thousand a day, would be forty thousand licks struck.

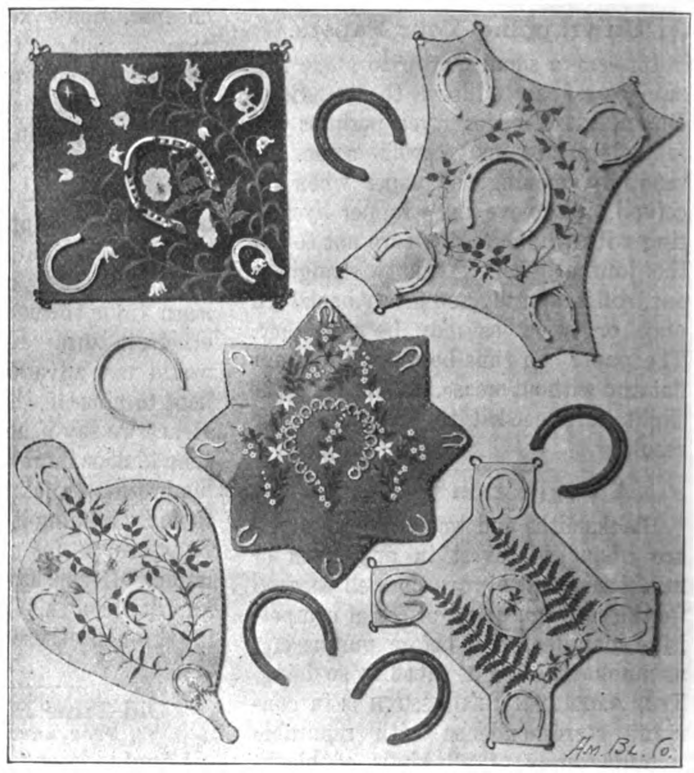
The first thing the boy had to do when learning the trade was to open the shop, make the fires, get in the coal, cut wood and get water. The boy advanced probably after serving from three to six months, and would then be put at the fire drawing old horseshoes, making chains or hinges, of which many were made in those days.

The reason the blacksmiths are not as busy now as they were in times past, is because they buy nearly everything ready made. Of course, there are not the plows, cultivators and wagons to repair as there were then.

The price paid for horseshoe nails, even at this time, would pay a good nail-maker to make them yet, as he could make very near as good wages now as they did then. The journeyman had to be a very good workman if he got over nine and a half dollars a week.

The boys got their board and clothes, very often the old ones of the boss, and sometimes his old hats or shoes he had probably worn for years. The next year he would get, according to his advancement, thirty dollars, but no clothes; the next, forty; the next, fifty, and if he had been a good, industrious fellow, would, when free, get a freedom suit, that is, new clothes from head to foot, costing probably eight or ten dollars.

In shoeing horses we then used the butteris, which has gone out of fashion because of the supposed danger in using them. I have not used the tool for the last ten years, because a better tool has taken its place.



SAMPLES OF FANCY SHOE TURNING.

In shoeing horses in those days, when a bad horse came to be shod, especially a bad kicker, the only alternative was to run and catch his foot, and when you got a hold, to hold on. Of course the twist was often used, but it was not always successful. It made some of them worse and now what a wonderful improvement has been made on this line.

In putting on tires at first, we bent all of our tires on a half-moon shaped block of wood, bolted up against a post with a clevis and a pin at one end of it. Did not know what a tire bender was; and well do I remember when the first shrinker was brought and put up. It was looked at as a wonder by all who saw it, yet it was one that was fastened about seven feet from the ground, with the lever overhead, and you had to lift the tires to it. All tires were cut and shut before this. All drilling was done on a large frame made on the order of an upright wheel trestle, with a long lever at the top with heavy weights hanging on one end. The drilling was done with a frame made in the shape of a large brace, pointed at the top end. Then there was what was called the "devil," which was put against the breast to do the very light drilling.

In the forging of many articles, the holes were generally punched. The next drill to supersede this was a drill on a bench for which you fed the power by hand. The next was an

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upright drill, which fed the power for drilling.

What a change has been made in this! If the boys nowadays who use the new machines had to use the old ones, they would want to quit work in a twinkling.

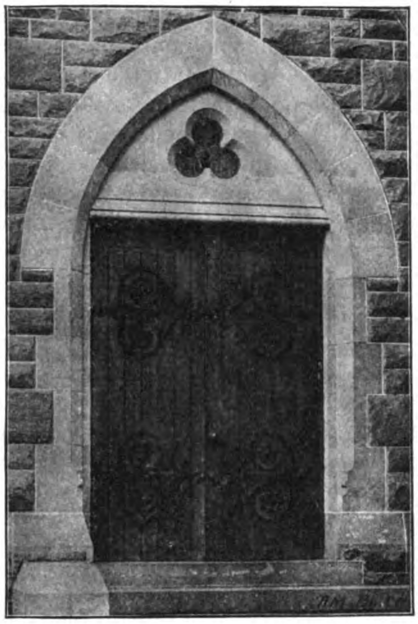
Bolts had to be cut with dies and stocks, which you had to run up and down three or four times before you would have anything like a thread on it. The small bolts below five-eighths were nothing, but when you had a lot of bolts from three-quarters to one and a quarter on a hot day, how it would make the cutter puff. Now we have dies that one run-down does the business, and you can cut all the bolts and throw them on the ground, and tap your burr, and any one will fit any bolt. We forged then all the circles and boxes, and made many of the bolts wanted.

I think if all the blacksmiths would follow a rule that my father did, it would be to their interest. We would put an estimate on a job, so much for cash off. On repair work, four per cent. off. If a man didn't pay by the end of six months quit him.

The prices then for shoeing were one dollar a set for calked steel shoes, eighty cents for plain, forty cents for moving. Now the prices are on an average, one

AUSTRALIAN ORNAMENTAL IRON WORK.

dollar and twenty-five cents for calked steel shoes, one dollar for plain, fifty cents for moving. In my shop my son now runs, he gets as high as two and a half for steel shoes, one and a half for plain, and from fifty to one dollar for moving. We used then the old style of



IRON HINGES FOR CHURCH DOORS.

bellows, didn't know what a fan or a blower was.

Artistic Iron Work by an Expert Australian Smith.

B. C. LEONARD.

The accompanying photographs show some specimens I have made of a class of work taken up since I began reading THE AMERICAN BLACKSMITH. I find it one of the best of things in connection with my trade, that of a general smith. It has taught me one of the main points, and that is patience. I also find it most instructive and a good advertisement. The articles which one can make are very useful. The photographs show only a few of the many things I have made in my spare time.

One photograph shows the shop of Brookman & Co., Terang, Victoria, where I did the work, leaving since to travel for experience. Another shows a collection of horseshoes made of aluminum and mounted on handpainted satin, making a very nice lot. One of the tables is made of $\frac{1}{2}$ by $\frac{3}{16}$-inch iron, the bottom parts being all solid and of very pleasing design, though I am afraid the photograph is not any too clear. Standing on the table is a rose, my first attempt. Another and simpler table is also shown, which may give some hints to the beginner. The church door hinges are of my make and may be of interest. The last figure shows a buggy that we build a great many of in this country.

These photographs of my work will undoubtedly be interesting to your many subscribers. I would be pleased to see and hear what other smiths are doing in this line.

Talks to the Jobbing Shop Painter.—16.

Popularity of Natural Wood Finish.—Cleaning and Preparing the Surface. Filling, Varnishing, Stripping.—Washing and Rubbing the Surface. The Various Processes Described in Detail.

M. C. HILLICK.

The carriage finished in the natural wood is a very popular one in both city and country the present season. Such finish possesses a cool, summery look quite irresistible. In the big cities one may see fine and exclusive varieties of timber finished in the highest development of the wood finisher's art converted into vehicles of many styles and kinds. To know how to finish in the natural wood is an important part of the jobbing shop painter's trade education, and a part which he will find it profitable to cultivate, for unquestionably the natural wood finish is destined to increase in favor with road riders the country over.

The first essential in wood finishing is a surface clean, absolutely clean—no finger marks, no stains, no dirt.

This sort of clean surfacing must

A SIMPLE ARTISTIC TABLE DESIGN.

start before the first coat of filler is applied and made to continue all along through the various processes of finishing. A faultlessly clean surface from start to finish is an admonition that deserves to be emphasized. The second

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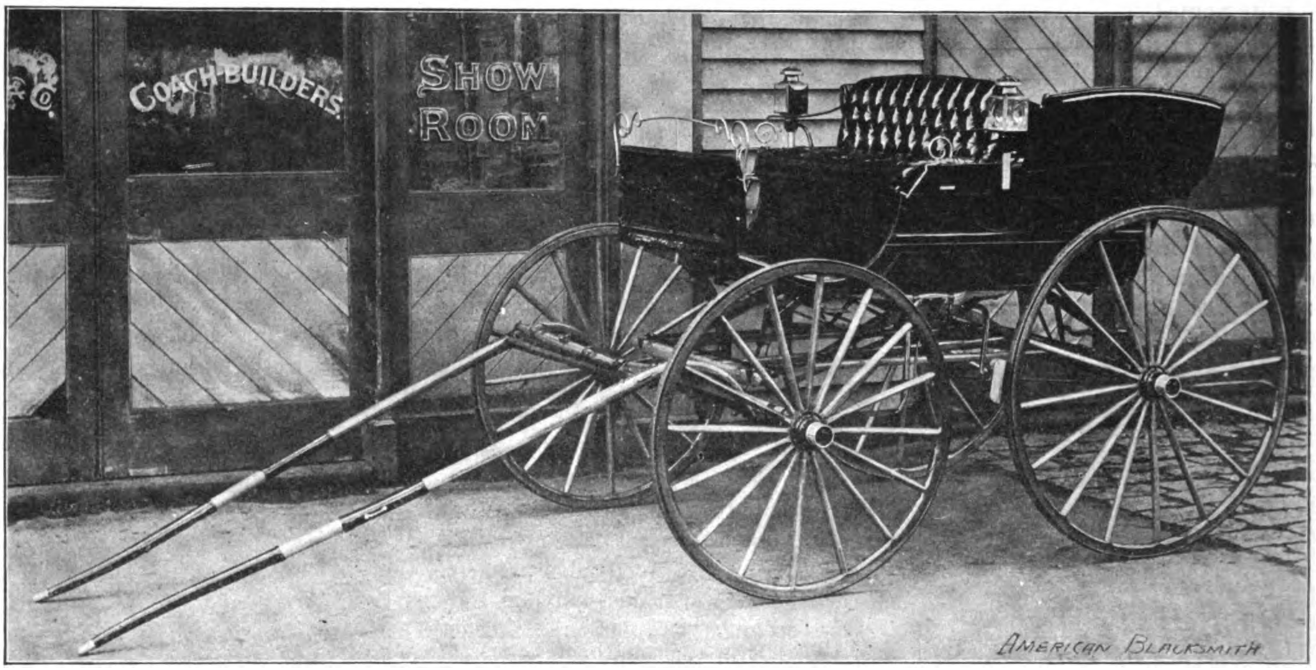
essential, and by no means less important than the first, is a well filled surface. Many first class painters fail to secure a strictly high class finish in the natural wood by reason of failure to fill the grain of the wood completely. The expert wood finisher will tell you, if he speaks candidly, that filling the wood properly is the main secret—or, if you please, the whole secret—of the natural wood-finishing art. The surface that you often see with the grain fairly standing out above the varnish—bristling like stubble over a harvested grain field—is not due to poor varnish, nor perhaps to poor varnishing, nor to inferior or inadequate rubbing of varnish, but rather to an imperfectly filled surface. When the surface is filled so that all the grain of the wood is closed up, and the pores sealed, and the rough places made smooth, and the inequalities of the surface reduced, then the varnishing may be safely proceeded with. When the work comes from the smithshop it will need and should receive a sandpapering that will render the surface thoroughly smooth. Better at this stage to spend an extra 5 hours sandpapering in order to insure a uniformly fine and smooth surface, and a clean one, than consume double this allowance of time and labor later on making good that which was neglected at the beginning. Provide a few mowing machine knives, or some pieces of window glass, or, better still, both, and with these scrape away all greasy or dirty spots which the sand paper fails to remove readily. When the surface has been made clean and white as a hound's tooth, apply the filler coat. It was formerly considered good practice to first apply a coat of oil to the wood, but this has been proved a positive detriment. The oil has a tendency to darken the wood or impart to it a yellowish color which among natural wood connoisseurs is accepted as a mark of inferior workmanship. We would therefore advise against the practice of oiling the wood before filling.

The particular kind of filler to be chosen depends, of course, upon the wood to be filled. If the wood is of a coarse, open fibre, like ash, or oak, or chestnut, or butternut, or woods of similar grain characteristics, a good paste filler is in order. And the best paste filler is that made of silex, and called a mineral paste filler. The old fashioned cornstarch filler has been superseded by mineral fillers purely upon the basis of superiority. The cornstarch filler discolors and shrinks and fails to hold out the finish like the mineral filler, which hardens like adamant, and stays hard for all time, and holds up the finish as long as the body of varnish remains intact. The mineral filler is, or should be, at any rate, perfectly transparent so that the filling is not acccomplished at the expense of the beauty of the wood. All fillers should contain sufficient refined raw linseed oil to act as a binder. And the thinner should be turpentine of an approved quality. Use a good, flat bristle brush with which to apply the filler. In applying be sure that all parts of the surface are thoroughly coated. The ordinary paste filler of good make will set in from 15 to 30 minutes, but as to this the workman must be guided by the appearance of the filler after application. Once the filler begins to change from the wet condition to a dull, dry appearance, it is ready to be wiped or rubbed off, always beginning the work at the point where the filler looks driest. Flax or hemp tow is the best material with which to rub in and off the filler. The tow rubs the filler in, at the same time removing the surplus. If the filler should be rubbed off too soon after application there is danger of rubbing it out of the grain and fibers of the wood.



STYLE OF BUGGY MUCH USED IN AUSTRALIA.

Concerning this feature of the work, the operator must judge for himself, and study to apply no more than can be taken off before it sets too hard. In using mineral paste fillers the workman should take the precaution to stir the material up in the pail frequently. It precipitates rapidly, and when the solids go to the bottom the remaining top portion is practically useless for filling purposes. It will not pay the carriage painter to make his own filler. It may be bought cheaper than the individual consumer can make it, and if obtained of reliable firms it may be depended upon to give first class results.

In case the wood is a close, hard grained, compact textured growth, such as, for example, hickory, birch, maple or beech, paste filler may be omitted in favor of the liquid wood filler. Many wood finishers, however, prefer to use the paste filler upon the close grained woods, thus making sure of a smooth, satiny finish. To a large extent the workman must be governed by the condition of the wood as he finds it, and use the best filler which that condition suggests.

Having the wood filled properly, and adequate time given it to dry, the next step in the process is to apply rubbing varnish. Select a very pale rubbing varnish, sufficiently elastic to work freely under the brush, and apply a freely flowed on coat. When dry, rub this coat with No. 00 pulverized pumice stone and water, using a perforated rubbing pad of felt, obtainable at the paint supplies store in various thicknesses, the ½ -inch pad being preferred for large flat surfaces, and the ¼-inch thick pad for running parts. Pieces of plush or heavy broadcloth will answer the purpose very nicely. Indeed, not a few expert surfacers prefer plush or broadcloth for the work. Rub the varnish lightly and uniformly, and wash thoroughly clean. Upon this coat, when rubbed, do all striping and ornamental work.

To enhance the cool effect of the natural wood finish stripe in fine lines of 20th century blue, Prussian blue, cobalt or ultramarine blue, or in fine lines of black. The double and three line stripe is popular, the latter being used upon the running parts of the heavier type of carriage. The metal parts of the gear to be painted a light buff, shaded to harmonize with the wood. Dainty lines of red are also popular upon natural wood finished jobs. After striping, flow on a second coat of rubbing varnish. Permit this coat to harden perfectly, and then rub firmly and uniformly. In washing up, tool out all places where the pumice stone is likely to lodge and hold fast, such as around clips, knuckles, bolt heads, etc.—in fact wash absolutely and perfectly clean. Then in clean surroundings finish with a pale finishing varnish, and your work is complete.

(To be continued.)

Buggy Repair Work.

CHALMER PARIS.

The following gives my way of repairing box buggies where the side bars are pulled apart from the seat. There are two vertical pieces of wood fastened on the inside of the sides just at the front and behind under the seat, with a wooden cross-piece screwed at each end to the vertical pieces in front and behind the seat. Almost all the box buggies here in Ohio are fixed this way, and after running a little while they pull apart at those ends where they are screwed to the vertical pieces. That lets the seat frame come apart, the ends dropping down and splitting. To fix it, I take a ¼-inch rod, weld a ¼-inch carriage bolt on one end, bending the head so that it will fit against the sloping sideboard and putting a neat nut on the other end. I then bore holes through the sides close to the horizontal pieces just under the front or back edge of the seat, or both, if necessary. Put the iron rod through, screw up the nut snugly, cut off the end of the rod, dress up with a file and paint over nut and head. It will be stronger and better than ever before, though the method may be old to many. In this oil country buck wagons are used principally, the box buggies not being strong enough.

A Vermont Shop and Its Equipment.

OTIS GEDING & SON.

We have a shop 28 by 40 feet with a lean-to on one side 10 by 22 feet for a bench room. On the ground floor we have a 16-inch cabinet planer, that planes to 5¾ inches thick, Baxter make, Lebanon, N. H.; one heavy bench saw with cut-off table to run in place of guide; one three-headed molding machine, made by J. B. Smith Company, Smithville, N. J.; one buzz planer, 12-inch knives and 6-foot table; one 36-inch band saw, a very heavy iron frame machine that can saw to 11 inches thick; one wood lathe, 5 feet long and 22-inch swing; one Little Giant power drill; one emery stand for gumming saws and grinding tools, mowing machine guards, etc. We also have a sand drum to run in the lathe, 14 by 26 inches, for sanding small work, and a sand belt to sand whiffletrees, rims, etc.

Our shafting is hung in the basement out of the way, the belts coming up through the floor. In the basement we have a grindstone, 4 feet 6 inches by 3 inches wide; one heavy wood lathe, that can swing work 12 feet long and 30 inches in diameter; also one apple grinder and two hand cider presses, with which we can grind fifty bushels of apples in 20 minutes, and press and barrel the cider in about 70 or 80 minutes more. For the cider we get two cents per gallon. We have a windlass outside to raise the barrels of cider into the farmers' wagons, it being mostly custom work. In this room also we barrel cider, store shafts, rims and wheels, framing pins and small work.

About eight feet from the shop proper we have a building 18 by 28 feet, with a basement 18 feet square, which we have used for smith shop, the ground and upper floors being used for storage of lumber, as well as two sheds at the other end of the shop, and a large barn about eight rods further on, where we keep sleds, wagons, cart and wagon bodies, etc. In our smith shop, we have a Western Chief forge, No. 3, (Canedy-Otto Mfg. Co., Chicago Heights, Ill.), which I recently improved by putting a rim of ¼ by 3-inch iron around just inside the flange and fastening it with clips. I also put a partition across my rim about eight inches from the end of hearth for the tools, such as small punches mostly. I then lined up the fire hearth so as to give a fire about three inches deeper than formerly. We thus have a nice fire, plenty heavy enough for welding 3 by ½-inch tires. We have a 125-pound anvil, a Stoddard four-inch upsetter, made by the Fulton Iron Works, Detroit, Mich., and a Derby screw plate, No. 101, that will cut from ¼ to one-inch, made by Butterfield & Co., Derby Line, Vt.

We are about to move our forge and tools to the ground floor where we will have more room and be handier. We would like some ideas about how to plan the shop. The room is 18 by 28 feet, 10 feet high, with 1¼-inch, matched hard wood floor, and we shall only have one fire. Our work in the blacksmith department is ironing sleds, wagons, whiffletrees, wagon and dump bodies, setting tires and axles, mending chains, buggy and sleigh repairing, and every kind of work except horseshoeing. We keep a horse, but our brother smith shoes her.

We charge a fair price for good work, and let them kick. If any weld or piece of timber shows defect when broken, we replace it without grumbling. Have a good deal of bother collecting, but have lost only $19.00 in three years. We do more wood work than iron work, there being two other smith shops, and no other wood shop. We have water power which is ready at any and all times, except for a short time in winter, when we have less power, but nearly always enough to do our work. Our water wheel is 17 inches in diameter, and will plane 5,000 feet of spruce board per day, the head being 16 feet of water. We shall put in a small wheel to run our fan this spring, as we do not run our machinery enough to run a blower all

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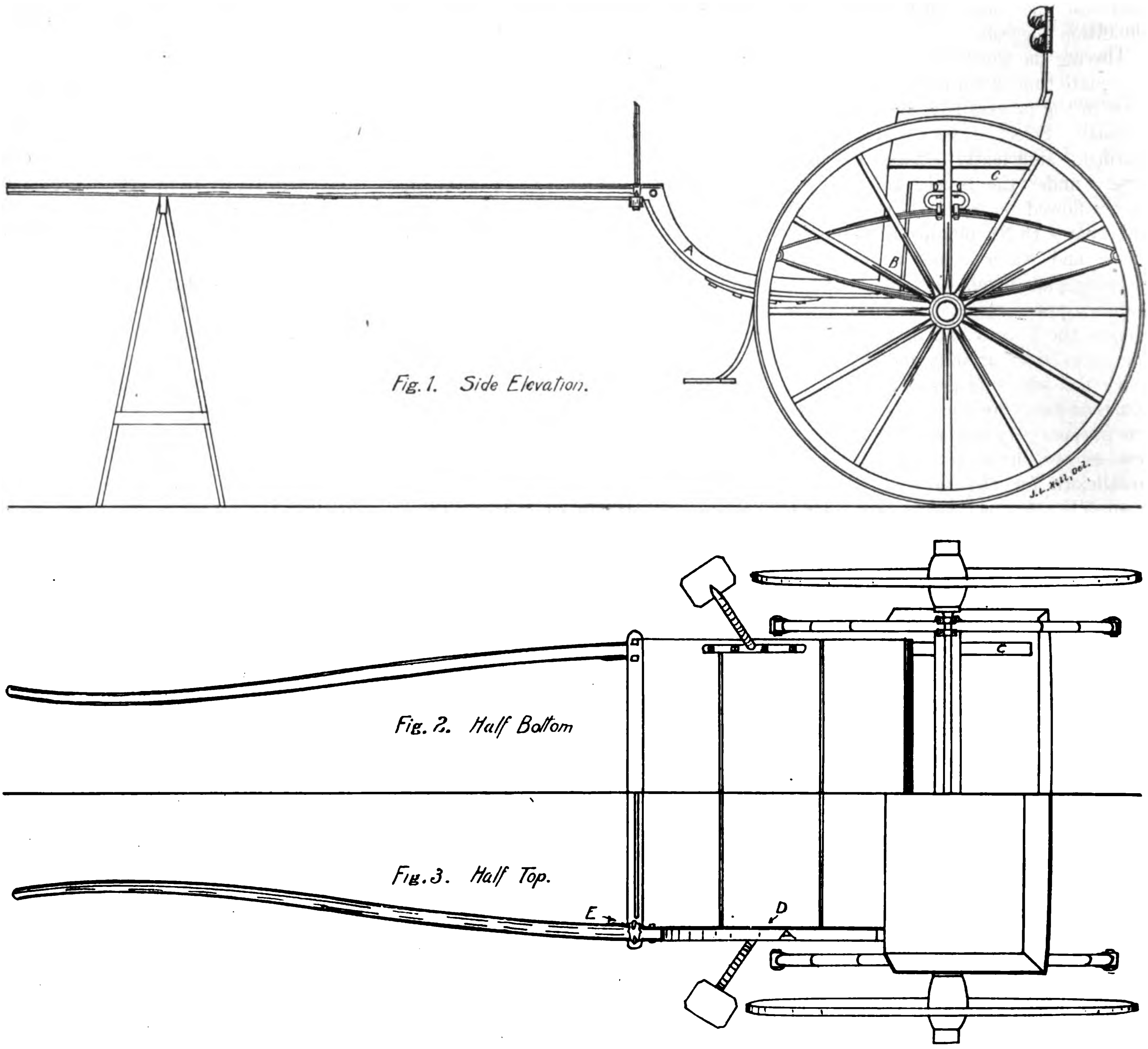
the time. We tenon our spokes with our drilling machine, and bore our hubs and rims on a power boring machine. We also have a foot-power mortising machine, which we built ourselves.

Our prices are plenty low enough, but not as bad as they might be:

New tires up to one-inch	$1.00
Setting buggy tires, each	.40
Setting tires, per set	1.50
Wagon tires up to two-inches	.40
New rims per wheel	1.00
Buggy shaft	1.25
Sleigh shaft	1.50
Wood hub spokes up to $1\frac{1}{2}$ inches	.16
Patent hubs	.18
Whiffletrees, ironed, per pair	$1.50 to $2.00



Figs. 1, 2 and 3. SIDE, BOTTOM AND TOP VIEWS OF SIMPLE RUNABOUT CART.

Plans for Making a Runabout Cart.

J. LAWRENCE HILL.

This style is of very simple construction, easy to get in and out of, light, and in every way what its name implies, a cart suitable to run about in, but not for heavy work. As can be seen from the illustrations, there is nothing complicated about it; in fact it would be hard to imagine a vehicle more simple. The joints used are the common half-lap; the shafts can easily be sawed out of a $1\frac{1}{2}$-inch plank and the bent piece A is half a rim, one end of which has been straightened out. This rim piece, the upright B and the piece C, going underneath the seat, constitute the rockers, and are each $1\frac{1}{2}$ inches deep by $1\frac{1}{4}$ inches wide.

On the inside of the rockers, a plate, D, Fig. 3, $1\frac{1}{2}$ x $\frac{1}{4}$ inch is screwed. One bolt, however, should be used through the heel of shafts, in order to more securely fasten the joint, and keep it so. This plate extends along the inside of shafts for about 6 inches in front of the bar. In the back end it needs to go just beyond the spring bar.

The bottom boards are screwed underneath the rockers after the plates are on and the heel board is fastened on the back of piece B, as shown, but no boards are necessary across C, as the seat is bolted on to this piece. In the center of bottom boards put an iron strap about 1x$\frac{1}{8}$ inch, screw this under front bar, and let it run up (3 or 4 inches) the heel board. Screws will not hold in the bottom boards, so get some inch or inch and a quarter clout nails, and after drilling holes in plate, to fit the nails, drive into bottom, and clinch the nails on the inside, taking care to turn the points of the nails right into the wood.

The loop between top of spring and bar is made from a bit of steel tire $1\frac{1}{4}$x$\frac{1}{4}$ inch. It is preferable to a block as it is

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much neater and lighter looking. The shafts are 2⅛x1½ inches at the bar. They are therefore wider than the rim piece A, and this extra width is cut off on a slant as shown in Fig. 3, at E.

Fig. 4 will convey a better idea of the method of making the joints, than pages of explanation. While it illustrates only the front end of bent rocker and heel of shaft, the same thing is applicable for the other two joints.

The perspective drawing shows the appearance of the vehicle to better advantage, and does away with the necessity of a back elevation, as all the widths can be obtained from Figures 2 and 3.

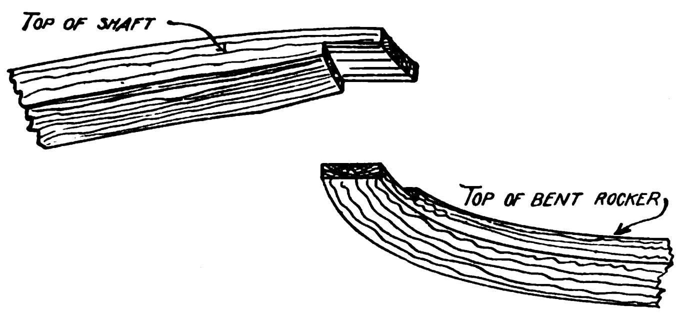

Fig. 4. METHOD OF FORMING JOINTS.

The following dimensions will be found helpful—Wheels: Sarven, 44 inches; spokes, 1 inch; length of hub, 6¾ inches; tire 1x¼ inch round edge steel; track, 4 feet center to center; axle, 1 inch half patent; springs, 38x1¼x4x7 inches and 36 inches apart, center to center on the axle; dash, 12x½x20 inches.

Painting:—Seat, rockers, dash and shafts, black; other parts, medium green, striped with light green.

The above cart would be especially useful to the merchant who has a country trade to call upon.

It is very simple; one which any smith can make and when made in your spare time, if not to order, and put outside the shop, would sell readily.

Making and Repairing Wheels.

E. W. PARKS.

When repairing old wheels I take the hub and remortise it. If it is out of shape I make a pattern the size of the mortise, and mortise all the same size, using that pattern to make my spokes by. I allow enough, however, on the spokes to drive tight. In that way you can make a good wheel out of an old hub, and you can get the dish right. You can see just how much dish the wheel will have.

I also use a pattern when I make a new wheel. The hubs that I buy here are not mortised right and if you don't remortise them the wheel will have too much dish. In remortising them I use a pattern the length of the spoke. If you will drive a block in the little end of your new hub, bore a ½-inch hole, and screw a ½-inch wood screw across the little end of the hub, and then use a straight edge say 2½ inches wide and as long as your spoke, you can in this way tell how much dish your wheel will have. You can turn the straight edge around as you mortise, and use your pattern also. By doing this, your wheel will be true when you get the spokes in, the rim will fit nice, the boxes will be no trouble to get in, and the wheel will be true.

In putting on rims or felloes, I find that most of the cobbler smiths, as I call them, don't have them open enough, so that when the tire is put on, the wheel is rimbound. I always leave rims open from ¼ to ⅜-inch, and sometimes as much as ½-inch. If the wheel hasn't any dish I leave it open a good ways. In putting on the tire I always give it enough draw, often ¼ inch or more in addition to the opening in the rim, depending on the condition of the wheel. A good wheel with tight spokes and well fitting rims doesn't need the tire so tight. Have your hub mortised right, make your spokes right and to fit right, drive them tight, useing good wood, and you will have a wheel that will stand.

Notes on Repair Work for Cheap Jobs.

D. S. CROMB.

To repair wagon wheels that need some spokes and new rims, I screw the wheel on my horse and take the nuts off with a rim wrench. This saves a lot of time. Pull the bolts off with a claw-hammer. This also saves time over the old way of knocking them out with a punch. I take the rim off, cut the heads off the rivets, and pull out the bad spokes. I always repair the hind heels first, as the spokes that I take out will do for the front wheels, thus saving my customer ten cents on every spoke. I glue my spokes in the old wheels if there is no grease on the hub, or if so I use ashes from my forge to dry it up. Then I run the tenons on my spokes, and also run the augur on all the old ones so as to have a good job. Be sure to have them long enough to come through the rim. I mark the rim, bore and finish it in the vise and drive it on.

I prime the rim before putting it on. I always paint the rim as I think it

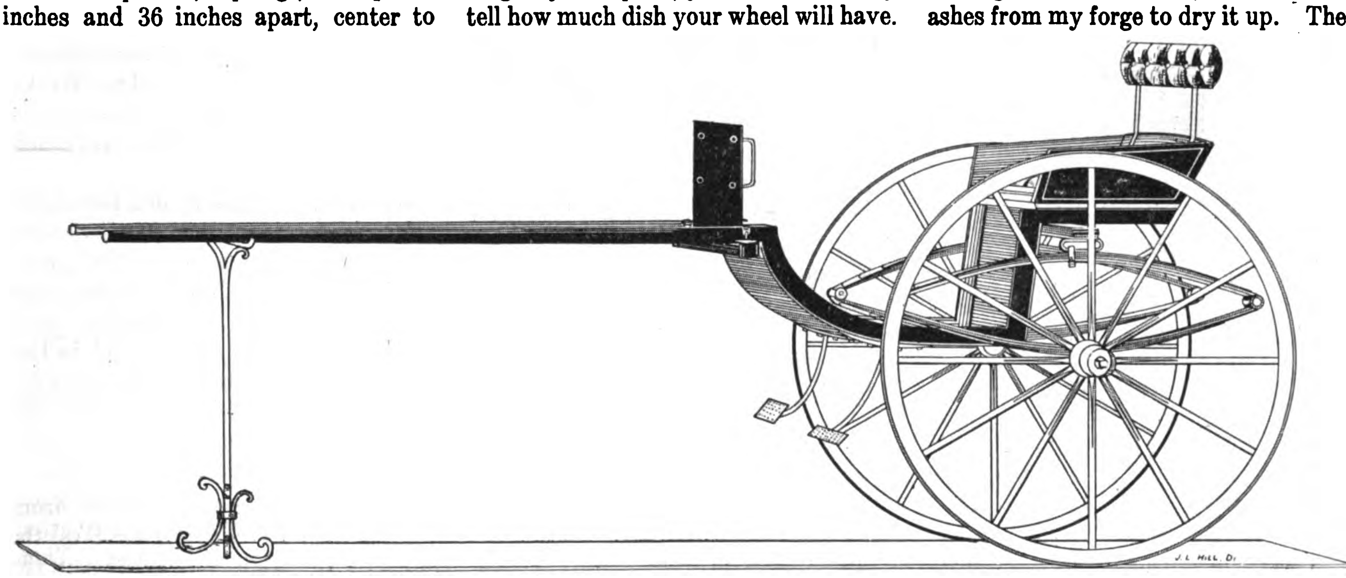

Fig. 5. PERSPECTIVE VIEW OF THE RUNABOUT CART.

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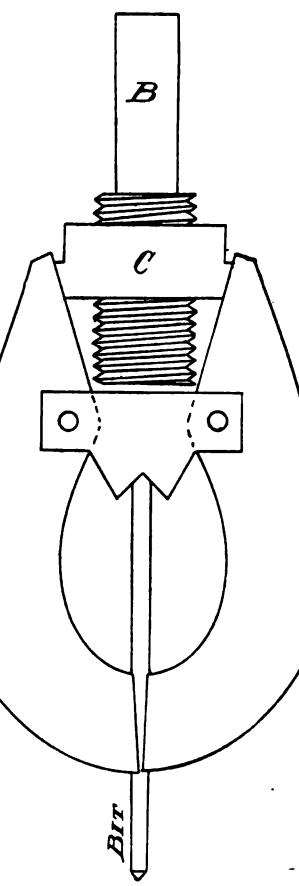
needs it to keep the water out. I put on the tires pretty tight, for it is the tire that keeps the wheel safe. It is also very important to have good rivets to put in the Sarven hubs and to rivet them tight. I use a rivet set when I have only one or two spokes to put in. Cutting them a little long, I often save the work of upsetting the tire.

For a wheel that has gone back, I cut some out of the rim, then get my tire the right size and draw the back of the tire so as to make it tighten on the face, and it will dish the wheel all right.

If the front axle is broken at the king bolt hole and it is too short to weld without putting in a piece, instead of welding in a piece the same size as the axle, as I once did, which I find takes too much time, I put both pieces in the fire, upset and scarf, and at the same time have a piece the width of the axle, half-inch thick, and weld it on the scarf of one axle. This makes a good job and saves time.

For broken shaft irons, I splice lots of shafts, giving them as long a scarf as possible. Glue them, using lots of brads, and rivet them with old tire



HANDY HOME-MADE DRILL CHUCK.

bolts. I think rivets are stronger than screws. Put a new leather on and you have a good job.

Sometimes I have springs to weld. All I can say is to have a good fire and don't heat the steel too hot. When I set up springs I just warm them a little and hammer them up on the anvil. The more a spring is hammered, the better it stays up.

If the shafts on a wagon are bent down, and the customer wants them straightened up, but thinks he can't afford a new pair, I take the shafts apart, wet them, run them through the forge fire until they are hot, put them in a vice and spring them straight, put them together and they are just as good as new. I straighten bent spokes and reaches in the same way

Now we will say that the wagon we have been fixing is ready to be put in shape for the road, so on goes the wheels. If the washers are worn out, I put on new ones, new anti-rattlers, new shaft bolts, paint the rims and spokes as near like the old paint as you can, and touch the nuts on the other wheels, for paint looks better than rust. Have the buggy run without any noise when it leaves the shop, and the customer will feel he has received value for his money.

An old sleigh comes in with a runner broken up on the turn about six inches, and is to have a new one. I take a half rim, wet it and run through the fire, and straighten all but what is needed for the turn. Now scarf, mortise and put it on. This is all right when you are stuck.

A Home-Made Drill Chuck.

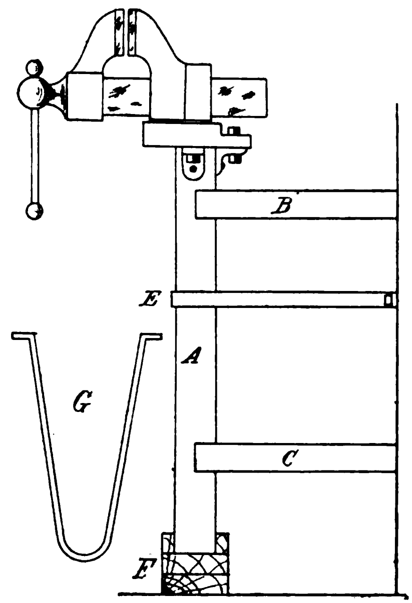
WM. A. DOUGLAS.

The drawing shown herewith is that of a drill chuck which I have been using for two years, and which I find is all right for straight bits. B is the shank forged and turned, and C the nut which spreads the jaws at the back and clamps the bit. The jaws are of steel and groved in end to center the bit. The lower end of shank is centered to let the bit go into the center. I made this tool, and any blacksmith who makes one will find it most useful.

A Convenient Vise Arrangement for Filing.

JOHN W.

Having a great deal of filing to do, I built a vise as follows, the letters referring to the figure herewith. At A is shown a piece of 3-inch pipe, having three angle lugs rivetted to the top with holes to correspond with the holes in the vise. B is the bench, having a half circle cut out of its face to receive the pipe. C is a shelf cut out in the same manner as the bench, and D is a piece of 1¼ by ⅜-inch tire bent as shown at G, and bolted to the wall so that the pipe is free to slide up and down or turn at any angle to get better light. A blow downwards at E fastens the vise in any position or at any height desired, and a slight tap upwards loosens it. F is a block having three different thick-



DEVICE FOR CONVENIENT FILING.

nesses, the middle thickness being the one I ordinarily use for convenience. Ever since finished, my satisfaction with it could not be expressed in words.

A Serviceable Coke Heating Furnace.

W. G. GAMBLE.

The following is a description of a very useful furnace which takes the place of a hollow fire and can be lighted and ready for a heat in fifteen minutes. In my work at the Iroquois Iron Works at Buffalo, I find it a great saving over a hollow fire where there is much machine forging done.

The iron work consists of a box made of ¼-inch plate, rivetted together, with bottom and sides, no top. The grate plate forms the top, between which is ⅛-inch asbestos paper to make the joint air-tight. A 3-inch hole is cut in the side to admit the blast pipe, and a 4 by 6-inch hole in the rear for cleaning out the ashes. The box should be at least 6 inches deep—the legs can be made to suit. Three-inch angles make a good bearing for the joint, which is rivetted all around the top of the box. Then comes the grate plate, which is bolted to top of box. A square hole is cut the width of inside of furnace and 2 inches less than the inside length, which allows an inch at each end for the grate bars. These are bent at the ends to keep them apart to leave the air spaces. They reverse in the center,

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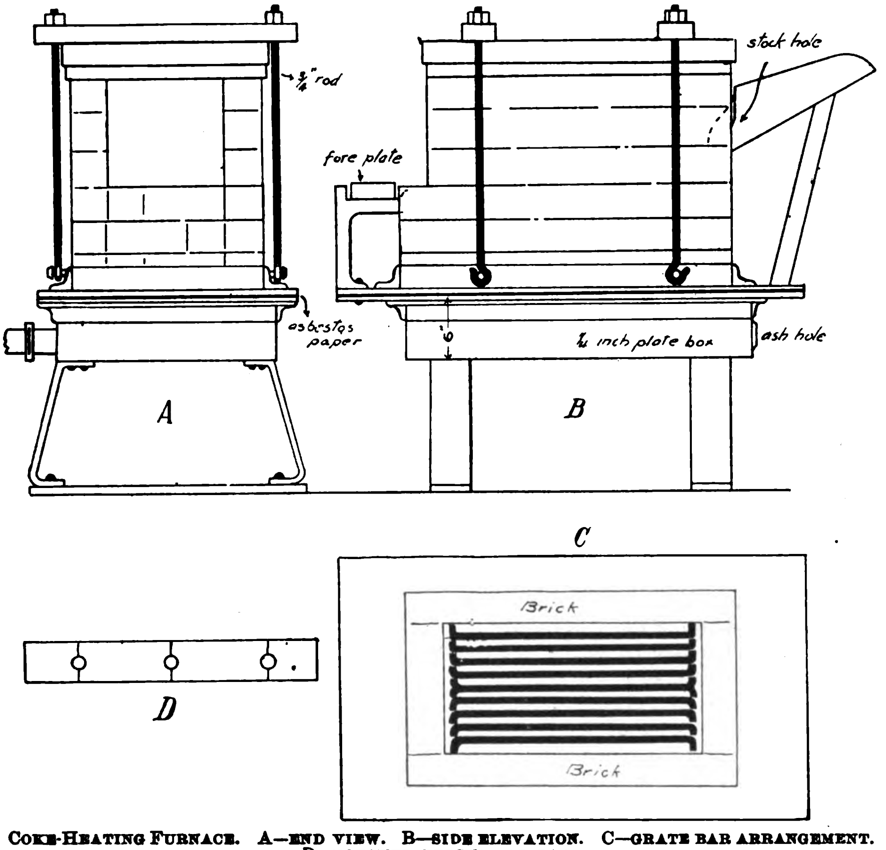
as shown, and in our furnace are ⅛-inch square.

Rivetted at the grate plate are four angles, 3 by 3 by ⅜-inch, with allowance for bricks, 9 by 4½ by 2½ inches, to be placed, also allowing one inch on each end for grate bars. There are four ⅞-inch rivets shouldered down and allowed to project one inch out from the angle to their head. This permits the clamp rods to hook on, as shown. The front has brackets for the fore plate, and the rear has hopper for coke. This hopper is filled at all times, choking the blast and superheating the coke. The hopper flares out to hold a good supply, from which the furnace is fed.



Coke-Heating Furnace. A—End View. B—Side Elevation. C—Grate Bar Arrangement. D—Notched Bricks for Top.

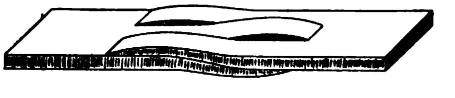
The top is made of 9 by 4½ by 2½-inch fire brick, which are notched out as shown and filled with fire clay. A band is shrunk on to hold them together. I happen to have some large brick that cover the whole top, and these work better. I also have a whole brick for the door, but if the forging comes through the door, we use old broken brick to fill up the door space.

To operate this furnace, run a poker with a small hook on the end down and pull up grates, the ashes dropping down in box. Clean out box at slide and fire up. If in a hurry, shovel in hot coke from a side fire, put on blast and the fire will light up what coke is in the bottom. With a poker displace the ashes, put up the door, and with a good blast for ten minutes the furnace is ready to charge. If the furnace is run steadily, it should be cleaned two or three times a day, which takes more time. Care should be taken to have front and back walls separate from the side walls, for they burn out first and have to be renewed.

Axle Repairing and Spring Welding.

JACOB ZIMMERLI.

The most important part of repair work on carriages is the running gear. In stubbing axles, a way that is used a great deal is to make the axle as long as it was before stubbing. This is all right providing the axle has its proper length and gather, but on the whole it is a haphazard way of doing. There is a sure way, however, of making the axle easy running. Before taking the boxes off the stub, make a mark on the stub at the rear end of the box, put your box in wheel when done, and then measure with rule from outside of spoke to rear end of box. There being two wheels, double the amount, and subtract it from the track, and you have the proper length. For instance, take an inch tire, the carriage to run in the center of the wagon tracks, which here in Illinois are very wide, 62 inches. The farm wagons having 1½-inch tires, that would mean a 61½-inch track for carriages. Now say that from the front of spoke at the hub to rear end of box it measures 4 inches.



Spring Forked for Welding.

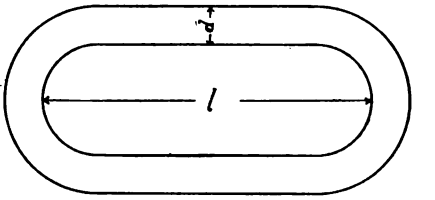
Doubling this, 8 inches, and subtracting from 61½, we get the length from mark to mark, 53½ inches. This rule will give you plumb spokes. Give your axle a little gather, about ⅛ to 3/16-inch, and you will have an easy running carriage.

Referring to spring welding, of the various methods, rivetting before welding, splitting in half and forking, and ordinary lap welding, I always have the best success by making three splits in the end of each piece, thus dividing the end into three parts or tongues of equal width. See figure. Then bending the two end tongues in one direction and the center tongue the other way on each part of the spring, and then scarfing the two respective sides over the edge of the anvil down to a feather edge, I heat both pieces and shove them tightly together, heading the turned pieces as near as I can to a level. This makes a tight clamp. Then I take a heat with borax or cherry heat compound and weld by striking a quick blow. A spring treated in this manner will last almost as well as a new leaf.

Length of Stock for Chain Links.

S. L. LEE.

The following formula for the length of stock for making links of a chain was given me by an old chain maker, and I have never found it to fail. Referring to the figure, the formula is $2l+5d$, where d is the diameter of the stock. For instance, if we wish to make a link 1½ inches long, inside, out of half-inch stock, cut off 5½ inches—($2 \times 1\frac{1}{2}+5 \times \frac{1}{2}=5\frac{1}{2}$). This allows for the weld.



Calculating Chain Links.

The above formula will be found very useful and time-saving, and much better than the "hit or miss" method.

Would be pleased to hear of any other formula or method used by brother smiths in measuring stock for chain links.

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A Lay of the R. F. D.

There's heaps of changes come, of late, around ol' Nasby's Station;
Pears like they try to keep up with the balance of the nation.
They've laid these ce-ment sidewalks down acrost the ol' hog-wallers,
An' trolley-cars go zippin' up the hills an' down the hollers.
The town pump's took out long ago, an', through the young folks naggin',
They've shet the ol' postoffis up an' put it in a waggin.

The other things wuz bad enough—the patent mower's rattle,
An' all this gol-blamed barbled wire, a cuttin' up the cattle;
The hitch-rack gone, an' in its place a "public feedin' stable;"
But us ol' chaps could stand it all, as long as we wuz able
To yarn, while waitin' fer the mail—it kep' the time from draggin';
But now they've took the offis out an' put it in a waggin!

I tell you, there wuz sollum looks when we heard it wuz comin';
It kinder seemed as ef it stopped the very bees from hummin'.
The youngsters an the wimmen-folks, they laffed at our "fool notion,"
An' 'lowed we's "cloggin' pro-gress" with our "fogyish commotion."
But us—we knowed, without them times, the days 'ud go a laggin'
With that ol' postoffis shet up an' put into a waggin!

Why, how on airth kin we keep track of one another's capers,
Er hear all of the gossip that ain't in the city papers?
'Bout all the fun us ol' uns had wuz getherin round at Nas's,
An' swoppin' lies—pertendin' that we'd come fer soap er 'lasses.
I vum, I've squatted 'round down there till both my knees wuz baggin',
But now they've took the offis out an' put it in a waggin.

I reckon that the good ol' times is gone fer good an' ever,
An' I wisht I'd went with 'em, fer I can't git used—no, never—
To all these blame contraptions that the new times is a bringin'—
Th' tellyphone, an' tellygraft, an' trolley-wires a singin'.
But uv all these, the thing that at my very heart's a-draggin'
Wuz when they closed the postoffis an' put it in a waggin!

—*Frank Glover Heaton.*

HEATS SPARKS WELDS

Midsummer, with its long, hot, dry days.

Half the lumber cut in America is produced in the Southern States.

Strange to say, the men who cry loudest against price cutting are usually the first to resort to it.

Cold Tire Setting.—What has been your experience with machines for doing this? Send it in.

When a man you have a bill against takes his work to another shop, it's time to look sharp to collection.

From the top no hill seems half as high as it looks from the bottom. Obstacles dwindle in the effort to overcome them.

Don't run down your competitor. Run up your own reputation by doing better work and his will suffer by comparison.

"Nawthin," was Tom Tardy's reply when we asked him how much money he had spent in the past year on papers, books and trade journals.

"I make everything that comes along," says one smith. Incidently, he makes money, though not all smiths can turn their hand to everything.

The census of 1900 shows the center of population of the United States to be about 20 miles east of Columbus, Ind. In 1790 it was 23 miles east of Baltimore, Md.

Ship smithing and gun smithing are two topics of more or less general interest to the craft. Who can put us in touch with practical men to write upon these subjects?

Some smiths send out statements of account only once or twice yearly. No business man would think of letting so much time elapse, and the blacksmith must be something of a business man to win out.

It pays from a pocket book standpoint as well as from a humane one; to guard against injuries to employees. Failure to properly safeguard life and limb may render the employer liable in case of an accident in the shop.

It has been proved beyond a doubt that shop employees do more work and better work on bright, sunny, days than on cloudy, rainy ones. Take the hint, and make the shop as neat, bright and congenial as possible.

It would be interesting to figure out whether American workmen do not lose more money by strikes than they gain. The industrial wealth of the country suffers much in such unproductive spells. Is the laborer a gainer in the end?

Do you keep your catalogues on file? It pays to have them handy for reference. It is also a good plan to bind your trade journals, year by year, with the index, so that different subjects may be quickly looked up by referring to the index.

Interesting items relating to blacksmiths and blacksmithing are always gladly received for publication in these columns. Blacksmiths who are out of the ordinary, who have made anything unique, who have done something interesting—let us hear about them.

To prevent rust, dissolve one ounce of camphor in one pound of melted lard. Remove the scum. Mix as much black lead with the lard and camphor as will give it an iron color. Clean the machinery well; smear with the mixture. After twenty-four hours rub off. Clean and polish with soft cloth.

Rubber tire work is paying a great many smiths handsomely. It is an interesting line and one that any smith can take care of. A number of excellent tiring machines are now on the market at moderate cost. In such matters as these it pays to be the pioneer, the first one in the neighborhood to take it up.

A neat advertisement for the smith shop consists in a nicely printed business card, stating the kind of work the owner is prepared to do, on the face, and on the back giving the distances in miles by road between fifteen or twenty of the surrounding towns and villages. It is a business card that will be kept by the man who gets it.

Timid as a bird are some smiths when it comes to joining an organization with their fellow craftsmen for regulating prices, They will vow and declare 'tis a good thing, deserving every man's support and efforts, but the minute they are asked to do something definite about joining, up in the air and away they go. Afraid to make a move till their neighbors come in.

The card system is a splendid way of keeping track of running accounts. On a small card may be put the name, the date of each job, the charges, the payments, everything, in fact. It may be easily kept to show the state of the account at any time, and how payments are being made. It is easily filed and easily discharged when the account is dead.

Many, many thousand of dollars annually are wasted in the coal which pours in the shape of smoke from the innumerable chimneys of the land. Many minds have worked on the problem of securing the complete combustion of coal, thus to eliminate the waste and promote cleanliness, and the day of smoking chimneys is undoubtedly drawing to a close.

Bronzing cast iron.—Having thoroughly cleansed the surface and rubbed it down smooth, apply evenly a coat of vegetable oil, say, sweet or olive oil, and heat the iron object, being careful that the temperature does not rise high enough to burn the oil. At the moment of decomposition of the oil the cast iron will absorb oxygen, and this forms upon the surface a brown oxide skim or film, which takes a fast hold and is so hard that it will admit of a high polish, thus bestowing upon the iron a most striking resemblance to bronze.—*Ex.*

An age of wonders is this surely. It is now proposed to print daily papers on shipboard containing the current news of each day. Heretofore ocean voyages were practically without news of the world's happenings from leaving one port till reaching the other. Lately, by the use of wireless telegraphy, it has been possible for trans-Atlantic steamships to keep in communication with one shore or the other the whole way across, and this fact makes possible the publishing of daily newspapers aship board. Arrangements are being made with the Associated Press for supplying the news matter and with the Marconi Company for transmitting it.

At the age of twenty John W. Lounsbury came to Port Chester, N. Y., learned the blacksmith trade, and soon owned a shop. In 1851 he opened a grocery store, which he conducted up to his death, a few weeks ago. From his early craft of blacksmithing he rose to be one of the wealthiest and best-known bankers in his county. He was a very plain man in dress and manner. He never would give up his grocery store, and after he became a rich man he could be seen behind the counter in his shirt sleeves weighing out sugar for customers. He had a hobby, also, for dropping into the village blacksmith shops and swinging the sledge, because it reminded him of olden times when he, too, worked at the anvil.

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American Association of Blacksmiths and Horseshoers.

The far-reaching importance of the question of organization for blacksmiths, horseshoers and wagon builders is shown by the many requests received for our plans for organizing local county associations. These plans set forth the best way of starting such a movement and are furnished free of cost to anyone of the craft upon application to the above Association, Postoffice Box 974, Buffalo, N. Y. This association was formed to aid smiths in bettering their condition and in attaining a greater return from their labor. Specifically stated, its chief objects are to bring about a better scale of prices for smithshop work, to secure State lien laws that will enable the craftsman to collect his pay more promptly and surely by liens upon horses or vehicles, and to overcome as far as possible the evils of price cutting and incompetent workmen. Anyone of the craft can make the effort to start things going in his locality, and *now* is the time. We should like to see an association of smiths for mutual benefit in each and every county of the land, and shall be glad to give whatever aid and advice we can to this end. Those who are interested should write at once.

The Progressive Smith as a Business Man.—9.

Contracts—The Hire of Smithshop Help.

BILLY BUNTZ.

Profit being the object for which business is conducted, the progressive smith considers that he himself can do only a restricted amount of work when laboring alone; hence he seeks means for increasing his custom so he can employ help and thereby make a profit off the hands of others. Knowing that applicants for a job are as varied as they could possibly be, he talks with them as shrewdly as he does with customers.

"Needing any help?"

"Why, how did you know I was needing a man?" he answers, feeling that every one who has worked in a smithshop ought to know a few "kinks" and that by "drawing him out" he may learn something, whether he hires him or not. He may have had a varied experience in up-to-date shops or worked for a competitor. The average workman is quite willing to tell what he knows when he thinks there is a job in sight, whereas were he bluffed by the usual "No, I don't want anybody!" he would be unlikely to impart any information. Sometimes even an insignificant-looking applicant can give some good pointers by the smith asking him questions about work or machines he himself does not very well understand; or he may be a machinist, boiler-maker or foundryman and be able to tell him how he could make money by enlarging his shop so as to handle work auxiliary to smithing.

"Where did you work last?" he continues, eying the applicant and noting his general appearance and deciding whether he looks like a drinking man; while from his actions and talk he judges whether he is honest, boastful or "talking through his hat."

"Ever have experience on plow work?" It may be that he has had, and relates at length that he can do this, that or the other thing to perfection.

"What's your idea about salary?" Usually he has some weighty ideas on the subject and states he thinks his services worth a good, round sum, the same as with a property owner who looks for a buyer at a fancy price.

Having questioned him thoroughly, perhaps asked him how he handles different work, sets a machine or operates a gas engine, he forms an opinion as to whether he would be a good man for his particular shop, or only an ordinary workman, rather slow and somewhat bull-headed. The woods are full of half-fledged workmen. The progressive smith looks for an assistant from whom he can *learn* something and who can *think for himself*, as well as perform a fair day's labor; in other words, he wants a man with progressive qualifications, who is something of a manager and can handle at least certain kinds of jobs without supervision. The assistant who must be stood over to see that he does things right or who has not good ideas about laying out a job is hardly more valuable than a laborer, although he is apt to think he is worth as much as a first-class workman.

Before making a contract, the shrewd smith wants to see what kind of a workman his assistant will prove under test; therefore at the start he has only a verbal understanding with him, and may treat him thus:

"Just now I need some one to help me a bit—just an ordinary workman—and could take you in 'out of the cold,' may be give you steady work if business continues good, but I couldn't pay much at the start. Of course, if you were able to help me get more custom by handling folk nicely so as to increase trade, I might be able to do better by you later on. You see I have a nice shop to work in, would treat you right, and if you can help me get up a big trade I could pay more."

He watches a new assistant closely, notices whether he has any new ways of handling work, or is ingenious in overcoming obstacles or possesses ability. It may be that he is not extraordinary, and after a time gets into a rut or does little thinking, when it is simply a matter of whether he is sufficiently good as an assistant to continue in his

(No. 1)

This Agreement, *made this..............day of...............1904, by and between .... a master blacksmith, doing business in.........., County ...., State.............., party of the first part, and............, of same place, party of the second part;*

WITNESSETH: *That the said party of the first part agrees to hire said party of second part as a Blacksmith or "Handy Man" in his smith shop for a period of one fiscal year, beginning with the date of this agreement, and to pay him at the rate of........dollars for each day of ten hours by him worked; part time or over-time to be paid pro rata, but in the event of said second party being sick, injured or off duty for any cause whatsoever, then no pay to be allowed him for the time not actually worked. Said first party further agrees that should second party remain at work during the entire fiscal year he will pay him..........dollars additional at the expiration of said period as a free gift or bonus in consideration of his faithful service; an absence from duty of a total number of days or half days amounting to thirty ten-hour work days not to count or annul the payment of said bonus, but should second party remain longer away from work for any cause whatever, then............ dollars to be deducted from the bonus for each working day absent over the thirty-day limit.*

Said second party hereby agrees to the above mentioned salary and conditions, and agrees to work under them faithfully for said first party during the period aforesaid. Said second party further agrees to release first party from all responsibility or any suit for damages for, or on account of any injury or accident which might occur to, or befall him while working for first party.

IN WITNESS WHEREOF, *said first and second parties hereto have signed and sealed this agreement on the day and year first above written.*

....................[SEAL]
....................[SEAL]

WITNESSES:
....
....

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employ. It might be that another assistant, with different ideas, could do the work as well, which would allow the smith to extend his own knowledge; hence he tells his former assistant he believes he can do better elsewhere than he will be able to do for him, as business is dull or his year is about up; or he may "shove" him on to a competitor by praising him up to the competitor's friends. The shrewd smith never allows an assistant to get the inside track of his business, showing him that it is his business to do what he is told to do, while the smith runs the shop himself; therefore, when an assistant leaves his service, although he may know something of the routine of his shop, he has only a vague idea of how much money was made or of how the smith got some of his trade.

Where his assistant proves to be an excellent workman, as well as a good manager, with progressive qualifications, he knows it would be wise to retain him; therefore he makes a contract with him to prevent his leaving. However, he does so in an offhand way, or without seeming anxious, as he knows were a good workman told that his services were indispensable he would immediately demand a dollar or two more a day; rather, he is particular to point out little mistakes from time to time, so as to show him that he is not altogether perfect. Where a workman is praised highly he is apt to think he ought to have the biggest chunk of the profit.

Sample contract No. 1 contains a few points, its principal provision being that the assistant is induced to remain in the smith's employ a full year in order to obtain the bonus, or increase in pay, at the end of which time another contract may be made.

Sample contract No. 2 relates to the hire of a boy or an apprentice, where the smith teaches him the smithing trade for a term of years and retains a certain amount from his wages to be paid to him at the completion of his apprenticeship, when he may make Contract No. 1 with him. In many States the employment of boys under a certain age—usually under 14 years—is prohibited.

A contract with a minor is termed "voidable" in law, which means that, generally speaking, the minor may reject or accept its terms at his pleasure, as the law considers he has not mature judgment until he is 21 years old; hence the smith has the boy's parents sign with him, in order to make the contract binding.

As a rule, a boy entering upon a trade does not know whether he will like it well enough to serve a full term, nor does the smith at first know whether he will prove to be a willing worker, as some boys do not like to obey orders, feeling that they are being "bossed."

(No. 2)

This Agreement, *made this......day of......, 1904, by and between................, a blacksmith, party of the first part, and................,a minor, sixteen years of age the 5th of June, 1904, party of the second part, and.................., his father, and................., his mother, parties of the third part,* all resident in the Town of.........., County of........, State of............;*

Witnesseth: *That the said party of the first part hereby agrees to teach the party of the second part the trade of blacksmith according to the way blacksmithing is performed in his shop, and insofar as second party is capable of learning it, the term of service to be three years, dating from the execution of this agreement, and further agrees to pay him under the following schedule for his services in the shop, it being understood that ten hours is to constitute a day's work, and that part time or over-time is to be paid pro rata, but that in the event of second party being off duty for any cause whatsoever, then no time to be allowed him for the time not actually worked:*

For the first year, ...cents per day.
For the second year, ...cents per day.
For the third year, ...cents per day.

Said first party further agrees that should second party remain at work during the entire three-year term of his apprenticeship, he will pay him........dollars additional at the expiration of said term, as a free gift or bonus; an absence from duty of a total number of days or half-days amounting to thirty ten-hour work days not to count or annul the payment of said bonus, but should second party remain longer away from work for any cause whatever, then .... dollars to be deducted from the bonus for each working day absent over the thirty-day limit.

Said party of the second part agrees to work for first party, and hereby accepts and agrees to the above mentioned salary and conditions, and also releases party of first part from all responsibility or any suit for damages for, or on account of any injury or accident which might occur to, or befall him while working for first party.

The parties of the third part assent to second party working for first party under the conditions herein contained, and hereby release, and indemnify said first party from, and against, all responsibility or and suit for damages (etc.). Third parties hereby authorize first party to pay to second party all wages as same become due him, including the bonus (if any), without recourse.

In Witness Whereof, *said first and second parties hereunto have signed and sealed this agreement on the day and year first above written.*

....................[SEAL]
....................[SEAL]
....................[SEAL]
....................[SEAL]

WITNESSES:
....
....

(**Or guardian, in case second party is an orphan*).

Consequently, to avoid the nuisance of having to put up with a boy who is aristocratic, sullen, or unwilling to follow instructions, the smith first gives him a thorough trial before making a contract with him, the same as he would any assistant.

It does not matter much whether the boy's parents are poor or well-to-do, so long as the boy himself is able-bodied, bright, quick, and with a liking for smithing. Some boys are slow acting, "dumpy," "pokey" or unreliable, and apt to take but little interest in their work, or have to be told each time where a tool is, or "fall over it," before they can see it. A good, earnest-working boy should be given lots of encouragement, else he may become discouraged at times when he has worked hard or has made a mistake. Never should he be severely censured about his work, as it should be remembered above all that he has not "an old head" on his frail shoulders. It is a good plan to let him off duty a half day now and then under pay, especially when there is something going on, as a circus, a ball game, picnic, etc., rather than to keep him closely confined in the shop at all times.

It is best to teach a boy only one thing at a time, showing him just how it is done, and then watching and correcting him while he performs the same work. A willing boy so taught will surprise most smiths in a few months by his aptness. In the contract the smith simply agrees to teach him the work as performed in his shop. He does not usually teach him anything about the business end of the work, except possibly as to how certain customers should be treated.

Where the smith has a large custom, he may have three or four apprentices, each on different classes of work, as, for instance, one in his first year, who keeps the shop clean, picks up the tools and keeps them in place or hands them to the smith as he needs them, runs errands, does collecting, etc.; one in his

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second year, who does sharpening or drilling; another in his third year, who handles general work, etc. In this way the older apprentices can be used in instructing the younger ones. An expert smith or one who is well established or has a well-equipped shop, should not pay his apprentices high wages, as he is teaching them a trade on which he himself spent much money and time in order to reach perfection—a trade which may later establish his apprentices in business.

Oftentimes a mutual agreement between a smith and his assistant or apprentice forms a bond of friendship which results in a closer relationship, as an energetic, thrifty assistant who is at the same time an excellent workman, is likely to make an honest, progressive partner where he and his master join hands.

A word about personal injuries: Every master smith should exert himself in keeping his machines well-protected by casings, shields, etc., as an open gearing has amputated many a finger, while unprotected belts might wrench off an arm. It is hardly necessary to say that no matter what kind of contract a smith might have with an employe, he could likely be held liable for damages should an accident occur through his negligence or gross carelessness. Emery wheels should have shields, else the operator should wear goggles when doing heavy grinding. Hammer heads should be kept tight in the handles. The supply tank of a gasoline engine should never be filled when there is a blaze or artificial light around. In fact, precautionary measures not only protect employes but enable the smith himself to avoid injury.

The next number of THE AMERICAN BLACKSMITH will contain an article interesting not only to assistants or apprentices who have become full-fledged, but particularly to smiths who are renters, entitled "How to Accumulate or Procure Money to Buy a Smithshop;" to be followed by a companion article citing "How a Smithshop Should be Bought." These articles will give any smith pointers on how to reach the goal of independence.

(To be continued.)

A Treatise on Horseshoeing.—6.

JOHN W. ADAMS, V. M. D.

Special Peculiarities of the Chief Classes of Shoes.

A shoe for a regular hoof (Figs.7 and 8) fits when its outer border follows the walls closely in the region of nail holes and from the last nail to the end of the branch gradually projects beyond the surface of the wall to an eighth of an inch and extends back of the buttresses an amount equal to the thickness of the shoe. The shoe must be straight, firm, airtight, its nail holes directly over the white line, and its branches far enough from the branches of the frogs to permit the passage of a foot pick. Branches of the shoe must be of equal length.

In fitting a shoe to a hoof of regular form we follow the form of the hoof, but in base-wide and base-narrow hoofs, which are of irregular form, we must pay attention not only to the form of the hoof, but also to the direction of the pasterns and the consequent distribution of weight in the hoof, because where the most weight falls the surface of support of the foot must be widened, and where the least weight falls (opposite side of the hoof) the surface of support should be narrowed. In this way the improper distribution of weight within the hoof is evenly distributed over the surface of support.

A shoe for a base-wide hoof.—This shoe should be fitted full on the inner side of the foot and fitted close on the outer side, because the inner side bears the most weight. The nails in the outer branch are placed well back, but in the inner branch are crowded forward toward the toe.

A shoe for a base-narrow hoof.—This shoe should be just the reverse of the preceding. The outer branch should be somewhat longer than the inner.

A shoe for an acute-angled hoof.—This shoe should be long in the branches, because most of the weight falls in the posterior half of the foot. The support in front should be diminished either by turning the shoe up at the toe or by beveling it under the toe (fig. 5a). p. 177.

A shoe for a slumpy hoof.—This shoe should be short in the branches, and for pronounced cases should increase the support of the toe, where the most of the weight falls, by being beveled downward and forward.

In many cases, especially in the hoofs of draft horses that stand very close together, the coronet of the outer quarter is found to stand out beyond the lower border of the quarter. In such cases the outer branch of the shoe from the last nail back must be fitted so full that an imaginary perpendicular dropped from the coronet will just meet the outer border of the shoe. The inner branch, on the other hand, must be fitted as "close" as possible. The principal thought should be to set the new shoe farther toward the more strongly worn side. Such a practice will render unnecessary the widespread and popular fad of giving the outer quarter and heel calk of hind shoes an extreme outward bend. Care should be taken, however, that in fitting the shoe "full" at the quarter the bearing surface of the hoof of the quarter be not left unsupported or incompletely covered, to be pinched and squeezed inward against the frog. This will be obviated by making the outer branch of the shoe sufficiently wide and punching it so coarse that the nails will fall upon the white line.

Hot Fitting.

Few farriers have either the time or the skill necessary to so adjust a cold shoe to the hoof that it will fit, as we say, "air-tight." Though the opponents of hot fitting draw a lurid picture of the direful consequences of applying a hot shoe to the hoof, it is only the abuse of the practice that is to be condemned. If a heavy shoe at a yellow heat be held tightly pressed against a hoof which has been pared too thin, till it embeds itself, serious damage may be done, but a shoe at a dark heat may be pressed against a properly dressed hoof long enough to scorch and thus indicate to the farrier the portions of horn that should be lowered, without appreciable injury to the hoof, and to the ultimate benefit of the animal.

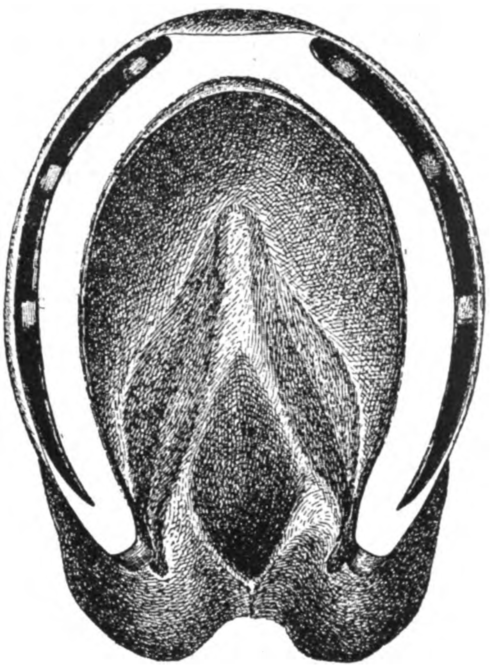

FIG. 7.—Left fore hoof of regular form, shod with a plain "fullered" shoe. Note the distribution of the nails, length of the fuller (crease), and the closeness of the ends of the shoe to the branches of the frog.

The horse owner should insist on the nails being driven low. They should

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pierce the wall not above an inch and five-eighths above the shoe. A nail penetrating the white line and emerging low on the wall destroys the least possible amount of horn, has a wide and strong clinch, rather than a narrow one, which would be formed near the point of the nail, and furthermore has the strongest possible hold on the wall, because its clinch is pulling more nearly

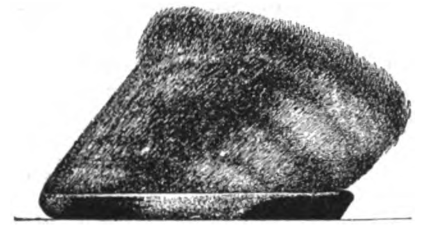

FIG. 8.—Side view of hoof and shoe shown in fig. 7. Note the straight toe, weak ring formation running parallel to the coronet, clinches low down and on a level, length of the shoe, and the under-bevel at the toe and heel.

at a right angle to the grain (horn tubes) of the wall than if driven high. Finally, do not allow the rasp to touch the wall above the clinches.

The Bar Shoe.

The bar shoe (fig. 9) has a variety of uses. It enables us to give the frog pressure, to restore it to its original state of activity and development when by reason of disuse it has become atrophied. It gives the hoof an increased surface of support and enables us to relieve one or both quarters of undue pressure that may have induced inflammation and soreness. The bar of the shoe should equal the average width of the remain-

FIG. 9.—An acute angled left fore hoof shod with a bar shoe. Note the width and position of the bar and the fact that the nails are placed well toward the toe, so as not to interfere with the expansion of the quarters.

der of the shoe and should press but lightly on the branches of the frog. The addition of a leather sole with tar and oakum sole-packing allows us to distribute the weight of the body over the entire ground surface of the hoof.

The Rubber Pad.

Various forms of rubber pads, rubber shoes, rope shoes, fiber shoes, and other contrivances to diminish shock and prevent slipping on the hard and slippery pavements of our large cities are in use in different parts of the world. In Germany the rope shoe (a malleable-iron shoe with a groove in its ground surface in which lies a piece of tarred rope) is extensively used with most gratifying results. It is cheap, durable, easily applied, and effective.

In the large cities of England and the United States rubber pads are extensively used. They are rather expensive, but are quite efficient in preventing slipping on polished and gummy pavements, though not so effective on ice. Figure 11 is an illustration of one of the best of many rubber pads. The rubber is stitched and cemented to a leather sole and is secured by the nails of a three-quarter shoe. Such a pad will usually last as long as two shoes. They may be used continuously, not only without injury to the hoof, but to its great benefit. The belief, unsupported by evidence, that rubber pads "draw the feet" keeps many from using them. A human foot encased in a rubber boot may eventually be blistered by the sweat poured upon the surface of the skin and held there by the impervious rubber till decomposition takes place with the formation of irritating fatty acids; but there is no basis for an analogy in the hoof of a horse.

(To be continued.)

The Practical Scientific Treatment of Interfering Horses—7.

E. W. PERRIN.

Scalping.

Scalping is a phase of interfering peculiar to runners; it is done at a gallop, at a high rate of speed. The hind feet pass the front legs, while the front feet pass the hind ones, and when the edge of a shoe strikes a leg in passing it strips off the hair and often the skin, which is called scalping. Some horses scalp the hooks with the front feet, while others hit the side of the cannon bone or knee with the hind feet.

The causes may be that the animal is out of condition, not in perfect training, or has too heavy a rider, or else has hoofs that are too long or wide. In this connection I wish to call attention to the fact that in a natural state, the unshod hoof coming in contact with the ground, all surplus growth wears away and extra width chips off, but when protected by the shoe, the hoof often grows abnormally wide.

As to treatment; from the shoer's point of view, the best he can do is to level the hoofs, and then use a light rimmed steel shoe with the rim turned to the inside. See Fig. 16. Reduce all surplus growth of hoof and fit the plates very close; the remainder of the treatment is with the trainer, who must see that the horse is rigged up in suitable boots that protect the parts he strikes, without adding unnecessary trappings that would tend to lessen his speed.

Speedy Cutting.

Speedy cutting, as its name implies, is a phase of interfering peculiar to fast

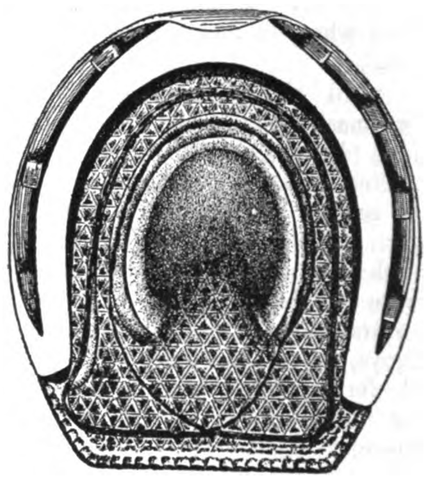

FIG. 11.—Left fore foot of regular form shod with a rubber pad and "three-quarter" shoe. (Ground surface.)

horses. It is done in the act of the front feet passing the hind legs, or by the hind feet in passing the front legs, in the long stride of the passing gaited trotter. There are but few horses that speedy cut, except those that do track work, and whenever it is known that a horse is prone to speedy cut, he should be properly booted, so as to protect the part he strikes, which will vary in different horses. Some horses strike the shin, coronet or pastern of a hind leg with the toe of a front foot. Some strike the cannon bone, knee or fetlock of a front leg with the toe of a hind one.

The causes of speedy cutting are defective conformation of the limbs, improper shoes, unlevel hoofs and inexperience or want of discretion of the driver or rider.

The safest way to obtain the proper level of the hoofs, is to use the horse without the shoes until he has worn the hoofs to the shape that suits him best. Then shoe with light rimmed steel, which can be obtained from hardware houses that handle horseshoers' supplies.

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In making these shoes for a speedy cutter, however, turn the rim to the inside of the shoe, round the outside of the shoe by hot rasping, and then fit close. If you cannot obtain the rimmed steel then shoe with half round steel, as light as is practicable for the work. Any horse known to speedy cut should not be put to speed unless he is rigged up in properly fitting boots that will protect him from injury.

Over-Reaching.

Over-reaching is a phrase of interfering peculiar to fast horses, especially saddlers, but it may occasionally happen to any horse by accident. It consists in the animal over-reaching his stride, and in so doing he steps on the heels of a front foot with the toe of a hind one. An over-reach may cause a simple abrasion or a very ugly wound. Sometimes the wound is so severe as to cause the loss of a portion of the coronary cushion at the point injured, in which case the hoof will be permanently deformed.

As to the cause, indifferent shoeing may have something to do with it. For instance, unlevel hoofs for shoes that do not suit may throw a horse off his balance and in that way contribute to the accident; but the most frequent cause is carelessness or inexperience on the part of the rider or driver. In the driving horse it usually happens from the horse being driven to a break, or it may result from getting a shoe caught in a car track, or from being compelled to pull the horse up too short to avoid a collision. Sometimes it happens from recklessly turning a corner too short at a high rate of speed. In the saddle horse, the causes of over-reaching are much the same, i. e.—riding too fast, then pulling up too quickly, or with spur and bridle changing the gait at a fast pace, which often results in a general mix-up, in which the accident happens. It is a very common accident in England to horses used for fox hunting, and it usually happens in the horse landing over a fence or ditch, and being unable to recover himself quickly enough to get the front feet out of the way of the hind ones. Doubtless everyone has noticed some horses stopping suddenly after developing speed. The bridle acts as a break on the fore limbs, but its influence is not so readily exerted on the hind ones, and hence when pulling up too short the hind feet slip up on the front ones. In fact on smooth pavements it is common to see a horse slip up on his haunches, so it is needless to say that an accident which happens as a result of the carelessness or inexperience of the rider can not be remedied by the horse shoer.

In many cases the treatment requires the professional skill of the veterinary surgeon to heal a very ugly wound. As to preventative measures, it will invariably be found that all that is necessary is horse sense on the part of the rider or driver. The shoer should see that the feet are properly balanced and use shoes as light as are compatible with the work for which the horse is being used. On the hind feet use a low sharp heel calk as an anti-slipping measure. Make the toe of the hind shoe half round and smooth, so that in the event of an over-reach, the injury will be less severe than it would be if done with the square sharp edge of an ordinary shoe. For the front feet the best preventative is a properly fitting boot made especially for that purpose.

The Gas Engine For Smith Shops.

Prize Article.

WILLIAM MURPHY.

Six years ago we put in a gasoline engine, which was at that time the first and only one in our vicinity. Now we can stand in our shop door and hear the exhausts of eleven other gas engines, furnishing power for blacksmith shops, wagon shops, newspaper plants and grain elevators.

As to which is the best engine for the blacksmith to buy, we would be inclined to say any one of the various makes and styles. We have had to repair a great variety of gas engines, and have invariably found some good points in all of them. When we put in our engine we assure you that it was a very mysterious affair, that is, at first, but gradually we began to realize the simplicity of it, and as it whirled along day after day we felt like the owner of some pet animal after some especially fine performance.

Trouble? Of course we had trouble at first, until we began to look for cause and effect. Our advice to the possessor of a gas engine would be to study the machine, note the working of valves, and see that the compression is good. Without compression the gas engine is useless. The manufacturers of engines send with them books of information which covers all the principal points or causes of trouble so fully that the novice soon becomes proficient in the successful operation of the machine. This information, coupled with his own observations, very quickly puts him in shape to make all necessary repairs.

As to whether it pays to have power in the shop, we say that if your shop is small or large, employs a force of men or only yourself, you can not afford to be without a gasoline engine. It is so far ahead of steam that there is no comparison. You can start up and sharpen one plow lay on your trip-hammer and polish it and still make a profit. That is something that could not be done with steam. We have in our shop a five-horsepower engine which has been in constant use six years. Our repairs on it amounted to 80 cents in all that time.

We operate two emery stands, a

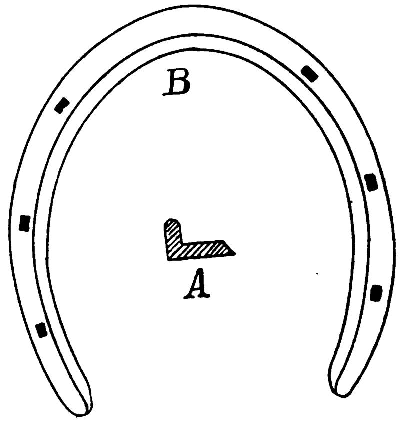

FIG. 16.—A, SECTION OF RIMMED STEEL SHOE B.

power, blower for three fires, a large iron lathe, trip-hammer, disc sharpener, drill, grindstone, and a pump to furnish water for engine and grindstone; all these machines at work at the same time when necessary. Ours is a throttling engine and the speed can be increased or dimished at will.

We first paid 9 cents per gallon for gasoline, costing about 45 cents per day to operate. We now pay 15 cents per gallon, costing 75 cents per day. The engine is started and the person starting it goes about his other work. We have run our engine 12 hours a day for months without a single stop.

These are some of the reasons why every blacksmith and woodworker can add greatly to his pleasure and prosperity by putting in a gas engine. Any one having used a steam engine knows the annoyance of leaky boiler tubes, the expense, time, and trouble of refluing boilers, and the constant care and attention necessary to their operation, taking almost the entire time of one man in the shop, the constant worry demoralizing him for the little time he attempts to attend to anything else. In the time necessary to fire up a boiler and get up steam enough to commence with, he would have sharpened or polished a plow lay, ground a

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couple of scythes, sharpened a couple of discs, or any one of a great many small jobs could be done that would bring in 25 to 50 cents simply by the unequalled co-operation of the gas engine.

After your work is done and you stop to shoe a horse, or any job where power is not necessary, there is no fuel going to waste; shut off the gasoline, turn off the water, and that is all. Where the shop is supplied with a well or hydrant it is much more convenient to connect the engine direct to well or hydrant than to use a water tank. You save the space and annoyance of sudden freeze-ups. It is much better not to have the water continually in the jacket, to soak the packing and finally to leak in the cylinder and cause trouble.

There are many reasons that might be given for the general use of the gas engine by blacksmiths and woodworkers, but the principal ones are their moderate cost; the certainty of your soon getting to understand your machine, so that the expense of operation depends on the price of gasoline; five times the amount of work turned out, your income increased accordingly, and the increase of patronage caused by running an up-to-date shop whether large or small. The foregoing has been truly our experience, and if any blacksmith is induced to put in power we can not praise too highly any good make of gas engines.

Gas Engine Power.

Prize Article.

W. M. TANNER.

I will give my reasons why a gasoline or explosive engine is better than a steam engine. I have a five-horsepower Fairbanks Morse gasoline engine (Fairbanks Morse Co., Chicago.) It runs all the machinery in an "Up-to-Date" blacksmith and repair shop.

If it were not for the gasoline engine I would have no power at all for the simple reason that there is no small shop that can afford to use steam as it is so expensive in attention and fuel. My engine requires little or no attention to run it, and the fuel is scarcely nothing compared with that of a steam engine. I can start or stop my engine in a minute's time. I have no steam to raise, no time to waste, and all the machinery is running at once.

I run my engine on three and a half gallons of gasoline for every ten hours, which costs me only about forty-six cents. It requires less space than a steam engine, which is a great advantage in many instances. It is much easier to keep clean than a steam engine, because there is no steam, no water, and no heat to corrode the gasoline engine. It makes but little noise, which is a great advantage over the steam engine, especially in shoeing nervous horses. There are two coal-operators in this city that are using gasoline engines for pumping water from their mines, at the cost of twenty-five or thirty cents per day. If they were using the steam engine, it would cost them fifty dollars at the union scale price per month for an engineer, beside their fuel and extra care.

A thirty horsepower gasoline engine and larger can be run 33% cheaper than a steam engine. This is in fuel alone. They create less heat in warm weather and last but not the least there is much less danger of their explosion.

Why the Gas Engine Pays.

Prize Article.

B. T. MCCHESNEY.

In the early days the smith could not get the improved tools and labor-saving machinery that one can now purchase for small sums, and hence while my father was a splendid mechanic, he could not turn out the amount and the different kind of jobs that I am able to do.—This is his own statement.—It is true there are smiths today who think it does not pay to invest much in tools and machinery in a small country town. Let me say that the day is at hand when the smith must get out of the rut. To do this one must have tools and machinery to help him do the work quickly and neatly. If you have a certain kind of work to do that you could get turned out better and in less time by having a machine to help you, then buy the machine. Such is the case with the gas engine.

I have used all kinds of power from hand power and horse power to steam power, and for two years past the gasoline engine has filled the bill and proved, first, the cheapest and best; second, always ready to start; third, requires no attention when not in use and very little when running; fourth, is no expense when not running; fifth, requires little room; sixth, the expense for repairs is very small, I not having paid out one cent for this purpose; seventh, you save time and this means money; eighth, many times you need power for a few minutes only and if you were to hitch a horse to a power or steam up a boiler the time spent or fuel used would be worth more than the job would come to.

I think I have given you a few of the best and most honest reasons why the gas engine pays. Following is a list of machines I run with my five-horsepower gasoline engine:

A screw cutting lathe,
A plow polishing outfit,
A drill machine,
A large disc sharpener,
A trip hammer,
A band saw,

and I intend putting in power blower. I can run any one at a time or all at the same time and have plenty of power to spare. I am going to close by saying to those who are contemplating the addition of power to their shop, be sure and get a good gas engine, take good care of it and you will say as I do that the gas engine is without a doubt the best known power for the blacksmith and wagon shop. I consider my engine will have paid for itself by the time I use it three years.

Does It Pay the Blacksmith to Put in a Gas Engine?

Prize Article.

BY G. F. S.

It does pay the blacksmith, and where there is a wood shop in connection it pays doubly. Last August we put a Palmer 3-horse power gasoline engine (Palmer Bros., Co's. Cob, Conn.) in our shop, which is a small general jobbing and carriage shop. We put up new work in winter to fill in time.

In the first place our trade has increased a lot, because we can get our work out quicker, and every blacksmith knows that customers like to get their work done as soon as possible. And then we have a lot of work that we could not do before, such as sawing, planing, etc. We have already done more than double enough of this kind of work to pay the running expenses of our engine for all the while we had it.

With our engine we run a circular saw, band saw, buzz planer, boring machine, sander, emery and drill. The drill is an ordinary handpower one. I took off the balance wheel and crank and put a pulley on in their place, which answers very well. Now I can drill more in one hour than I could before in four hours, and feel as fresh as when I commenced. I use twist drills and have not yet broken one. Another advantage is, they don't drill so quickly as when run slowly.

Smoothing up work now is a pleasure compared with the old way of filing. I think I can do more on the emery wheel in one hour than I could with a file in a half day and it is done in better shape too.

Knowing what I do now about gas

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engines I would have one if for no other purpose than for drilling, as it pays good interest even for that alone,it costing so little to run it.

Our engine consumes about three gallons of gasoline in ten hours. It has not cost a cent for repairs, and never refused to go.

The only care it needs is to see that it gets oil in the cylinder. It takes about five seconds to start and the same to stop and when it is not running there is no expense. Then again, I think it a good advertisement to draw customers.

Last, but not least, power in the shop puts new life in the men. We all go about our work with a quicker movement and a lighter heart. What before was the hardest and most monotonous work is now the lightest and liveliest.

The Treatment of Knuckling.

W. B. ALLEN.

Knuckling, otherwise termed cocked ankles, may be described as a partial dislocation of the fetlock joint, in which the pastern becomes more nearly perpendicular, the lower end of the cannon bone resting behind the center line of the suffraginis. Knuckling is dangerous, because it makes the animal liable to stumble and to fracture of the pastern.

When cases of knuckling are met with in young foals, they will mostly be found temporary, disappearing as the foal becomes used to sustaining its weight. In older horses, erect pasterns, especially in the hind legs, predispose to knuckling. A club-footed horse with short, straight toe and high heel is very prone to it. In normal horses, it is often due to heavy work in hilly country or fast work on hard roads. Knuckling is also caused by diseases of the fetlock joint, the flexor tendons or the suspensory ligaments.

The treatment should consider the cause and remove it if possible. In the case of normal young foals nothing need be done. Where knuckling is a result of some other disease, this of course must be attended to. The tendons and ligaments should be relieved by proper shoeing. The following is recommended for knuckling: The toe should be shortened as much as possible, with the heels left high. If the hoof is prepared for the shoe in the usual way then the shoe should be thin in front with high heels or calks. A long-heeled shoe with calks gives the best results for hind feet. The horseshoer can thus often relieve the trouble, though not infrequently the veterinary must be called to effect a cure.

QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

Bar Shoes.—Will some reader of these columns tell me the easiest way to make a bar shoe? JACK.

Erratum.—On page 149 of the May issue, the last word in the third line of the third paragraph should read "hub" instead of nut.

Rolling Colter.—Will some brother blacksmith kindly tell how to draw out a rolling colter so it would get a straight and nice edge? CARL PRESTBAK.

Shoeing a Club-foot.—Can some one through these columns, give me advice on shoeing a club-footed horse, as I am young in the work? BROTHER SMITH.

Plow Lays.—Will some other plow workman through the columns of THE AMERICAN BLACKSMITH, tell me how to prevent plow lays from warping while hardening? L. L. R.

Tempering Drills.—Will some one tell me a good way to temper a drill for limestone and granite? I do quite a bit of that work and would like to know a good method of tempering. W. A. CRAIG.

Tempering Sleigh Shoes.—In answer to the question of Mr. A. H. Blum, as to drawing the temper on sleigh shoes, would say, heat red and cover with sulphur. Let cool and then drill. ALEX BLACK.

With Regard to the Anvil.—I give the following, feeling sure that some smiths would be glad to know about the same. In order to deaden the sound of the anvil, as some anvils ring very loudly, hang a weight on the horn of the anvil. CARL BEREUTER.

A Number of Questions.—I would like to know how springs are treated at the factories. Are they really tempered, and if so how is it done? Also are spring drag teeth hardened, too? How are plow lays hardened, just on the face or outside? Can someone tell me? PETER LIMA.

Drawing Temper on Sleigh Shoe.—In answer to Brother A. H. Blum, as to drawing a sleigh shoe temper, heat the shoe to a bright red and just where you want to bore your hole, lay a piece of brimstone, and let it burn. This will soften it so that you can bore it nicely. Turpentine is good to use for boring hard steel or castings. Try it and see. C. R. C.

A Lame Horse.—I have a horse which has become lame owing to the bad roads in the spring. I think he has strained his leg, as the cords seem very sore. He is especially lame in going down hill. As he has to be on the road only every second day, he feels better after a day's rest. Can any smith give me information as how to shoe him to help him? W. A. CRAIG.

Removing Boxes from Hub.—As I used to have a great deal of trouble in removing old boxes from the hub without breaking them, I give the following method, which I find very successful. I take an old stub of an axle, heat it, slip it into the box and let it stand for a few minutes. Next I turn the wheel over, put a stick of wood on the box, hit with a light hammer and out comes the box. M. H.

Cold Tire Setters.—In answer to the question of Mr. William Darling, with regard to cold tire setters, would say that I consider the S. N. House machine to be the best. It will shrink a tire without damaging the wheel, and is all that is claimed for it. As I am somewhat acquainted with most all of the machines, I am prompted to give my experience for the benefit of brother smiths. J. S. MAYSE.

Shoeing.—I would like to have some brother smith tell me how to shoe a horse so as to make him pace. I have a large shoeing trade, and do nice work too, but I am having some trouble with a pacer. He trots sometimes and doesn't seem to travel square. He strikes the ground very heavily with his front feet. Also would like to know the best way to soften dry, hard feet in the summer. C. R. C.

Upsetting Steel.—I would like to ask H. L. Kibler, if it ruins steel to upset it. How would he make a 6-inch well drill out of 2-inch steel or a 2-inch rock drill out of $\frac{5}{8}$-inch steel. When I started to work here I had no hand hammer. I made a 3-pound hammer out of inch square steel and it is as good as the first day I made it. I took a piece 15 inches long and upset it to $3\frac{1}{2}$ inches. FRED RICKERT.

Knife Warping.—In answer to Samuel Krebbs, as to how to prevent knife warping, would say, heat your knife to the proper heat, plunge it perpendicularly into the water. Draw the temper on a hot iron. If you should put your knife in slanting it will contract on one side faster than on the other, and in this way warp. In tempering any thin piece of steel, cool it quickly by plunging it entirely in water. If you only cool the edge where it is thin, it will contract so quickly as far as it is cooled, the thick part retaining the heat and not contracting at the same time, that the part cooled will crack. M. HUBBARD.

Tempering Shovels.—In answer to Mr. Schuetz's tempering question in the May number, I would say, let him try the following method for soft center shovels:

2 parts cyanide of potassium.
1 " carbonate of potash.
1 " bicarbonate of soda.

Pulverize the above as finely as possible and mix thoroughly. Take an empty baking powder can and perforate the lid. Lay your shovel into the fire, face down, and heat until it shows a bright orange red, turn the face upward, and sprinkle the powder evenly over the surface. Hold at an even heat, until the powder begins to flux over the surface of the shovel, and then plunge in clear water. L. L. R.

One-heat Welding.—Touching again on the matter of welding axles, I wish to say a few words for the general good of young smiths, and to warn them against the time-devouring country practice of taking "sticking" heats, when the same heat would be sufficient to finish the weld if handled by an experienced smith.

As to Mr. Bridwell, by his own admission, he is inexperienced and seems to have never gotten the idea that an axle weld can be done in less than two or more heats and get a "good job." When he writes, advising us how to save time, and then illustrates by taking two or more heats, where one should do, I protest that, instead of being offended at a just criticism, he ought, like other young smiths, who "don't know much about it," begin trying the one-heat

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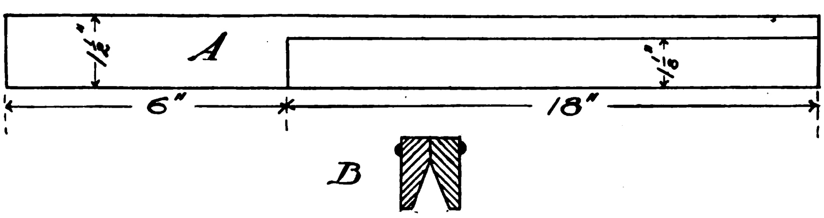
method and keep at it until in a very short time there will be no such thing as two heats on buggy axles, springs or other pieces that can be welded in one heat. The trouble is that those who still follow the "sticking" practice, never having worked in a factory or under a good, fast man, can hardly be persuaded that a weld on anything can be made in one heat.

He criticises my work on a Sarven wheel, but misquotes me or misreads me, in that I am accused of doing the work by beating on the flange and rivets. I advised driving the whole band down with a sledge, then plugging the open joint, setting tire and tightening rivets. I confirmed my remarks to a Sarven wheel, as my article stated, but Mr. B., after rejecting my advise on axles and wheels, asks me what I would do to a shell band wheel under like circumstances. I would tell him, but I fear my efforts would be misconstrued.

One can't make a new wheel of an old one, but it is a great help to a weak Sarven wheel to drive the whole band down and tighten the rivets. R. O'Hearn.

Plow Clamp.—In answer to Jack, this is the clamp I use to hold plow lays while tempering. Take iron ⅜ by 1¼ inches, and long enough to cover face of 18-inch lay, leaving 6 inches for handle at heel of lay. Scarf to a thin edge on one side, full length, except the last 6 inches, leaving ⅜-inch unscarfed, as the sectional view shows. Make pieces like this, rivet together with six or eight rivets. This gives opening for lay edge to enter, as shown. Now bend front end edgeways to conform to lay throat. Drive this on lay before putting in bath. I use a plate 4 by 12 inches, with four upright posts to set lay in to hold its edge up while driving on. This clamp holds lay straight to edge, and also cools one inch on thin edge before getting in bath. The reason they crack in the throat is owing to being worked over, a cold shut forming. Work them for two inches in the throat with a good heat to relieve strain there. I have had the same luck with Star No. 1, and find the Ideal the best lay for high tempering.



DEVICE FOR HOLDING PLOW LAYS WHILE TEMPERING.

Change your bath compound to salt and you will have fewer cracks in steel. I use it in preference to potassium cyanide, sal ammoniac, or any other compound, after 12 years' experience in a soil very hard to scour. Alex. Black.

Axles and Skeins.—I would like to see published in your column of "Queries, Answers, Notes," a table showing the sizes of axles used on wagons with the different sizes of skeins according to the latest design, having wood axles. I believe the above would be of interest to wagon builders in general. W. H.

In reply, will state we doubt whether any table could be gotten up along the line suggested that would be of general value, as there are no two concerns who use exactly the same dimension axle stock, almost every manufacturer having his own patterns and shape, and special skeins are made to conform to same. Studebaker Bros.

From Far Australia.—I have been taking your journal for two years and should be able to judge its worth in that time—I think it is one of the best that has ever been published for the benefit of blacksmiths and any man who cannot learn anything from it should throw down the hammer and take to the plow. I have thus far succeeded in getting four smiths to take your paper, and for my part shall continue taking it as long as ever I am spared to lift a hammer. At some later date I will let you know the conditions of trade in Australia generally. R. C. Leonard.

Cutting Spokes.—With regard to cutting a spoke below the surface of the rim, it would seem to me that any one who has had any experience would know the result of this. Mr. O'Hearn says shallow the end of your spoke, letting the tire rest on the rim and the latter to settle sungly on the shoulder of the spoke. Now on such roads as we have, every time the wheel strikes a hard substance it will settle more snugly on the shoulder of the spoke until the end of the spoke reaches the tire and the rim is split and the spoke will rattle. If one is unable to make a joint, the spoke will settle into the rim and will look all right from the outside, but a little hard work will make it loose, and it is sure death to the wheel. Let some one make a wheel with one short spoke and the rest to reach the tire and use the wheel for a short time, and see how easily you can tell where the short spoke is. Phineas Jones & Co. say on their order blanks that they will not warrant a wheel where the spokes are cut below the surface of the rim. M. Hubbard.

The Apprentice.—I have read all the articles of Mr. Foster, also of Mr. Hubbard, on low prices and poor mechanics. I have studied that question a good many times, and have come to the conclusion that neither lien law, cash basis, nor examining board, will help us very much; by "us," I mean our generation. But it is up to us to do something for those that'll come after us. I should consider it a good scheme of every master mechanic, who takes apprentices, to first make a good and solid written contract with the father or guardian of the apprentice, to the effect that the boy shall stay for three or four years with the master mechanic and learn his trade. Let the boss blacksmith or wheelwright see to it that the apprentice does learn something. I mean give him a chance, try to raise the boy's ambition, but do not get everything out of the apprentice that is in him, and not have the boy every evening worked to death, and ready to drop. If we older people will do something like I have outlined, we will have pretty good mechanics all around us. The poor scab won't have a chance, and the good men may raise the prices and they'll get 'em without the least trouble. Franz Wenke.

Prices and Price Cutting.—Noticing prices quoted from many localities, I will give some of ours and if you will compare them with Mr. McElroy's, you will see they vary some here in Georgia:

Setting tires	$ .50
Hounds, per pair	3.50
Wagon tongues	3.50
Bolsters	3.00
Coupling poles	1.50
Setting axles	1.00
Rims	1.50
Spokes	15c and 20c.
Horseshoes	1.00
Scrape Work	10c to 20c.

There are three negro shops here, with prices not much more than half what I charge, yet I do more work than all three of them. I have a good equipment of tools and material. I believe in labor-saving tools and have just ordered a House Tire-Setter. I find the best solution of the price problem is to do your work well and charge what it is worth. A few cheap Johns won't patronize you, but you have lost absolutely nothing when you have lost their patronage. I have one customer who was never known to pay what a thing was worth until he came to me. He first tried jewing me down, and I referred him to the negro shop, telling him that I did things right and charged what it was worth, and asking him if he wanted me to give him anything. I lost the first three jobs, but he came to me with the fourth, saying to do it right whatever the charge. He added that he had to have it fixed so it would stay fixed. I fixed it, charging what it was worth. It stayed fixed, and he was pleased, so that he now gives me the work from his 20-horse farm, and doesn't kick, for he has learned I have only one price. W. D. Scott

Examination Law and Schedule of Prices.—A great deal has been said recently with regard to an examination law in order to compel poor workmen to leave the craft. I understand that this examination law would require us to go before a board of examiners and there answer certain questions. Will the fact that a man has been before this board and stood an examination be proof that he is a workman? I say emphatically, no. For instance, the smith for whom I am working has worked at the craft for the past six years, and today he cannot sharpen a plow properly, although he can answer almost any question you might ask him with regard to how a piece of work should be done. Again there is the man who has worked in the shop all his life, has always been a "botch," and will always be one. He in all probability knows how it should be done, but simply cannot do it.

I am strongly in favor of organization, and think the only remedy for low prices is for the smiths all over the country to organize and control the prices.

The following are some of my prices:

Shoeing, new, four shoes	$1.00
" old, " "	.80
Sharpening turning plow, 7 and 12-in.	.10
" " " 12 and 16-in.	.15
Sharpening sweeps, 8 and 16-in.	.10
" " 16 and 20 "	.15
" " 20 and 30 "	.20 and .25
Setting tires, cold process	.40
" " hot process	.50
Buggy shafts, each	1.25
" cross bar	1.00
" singletree	.60

Jack.

Gather of Axles.—In the May issue, Mr. O'Hearn states that I must stand corrected. This may be, but it will take more evidence than has as yet been produced. I have worked in six different States, and now hold a position that requires an experienced workman to fill, and this is the first time I have ever heard this subject disputed. We give the axle forward gather for the same purpose that we give it pitch. Pitch is given to obtain a plumb spoke, so as to have an even bearing on the axle arm and boxing. If your axle has no gather in the front, the wheels are inclined to run out, and the axle arm will wear be-

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hind at the collar and in the front at the nut. We must therefore give it gather to overcome this. In order to do this we must use our judgment, as a certain fixed amount of gather will not do for all axles and wheels. We must gather them according to the taper of the spindle and the height of the wheels. A great many smiths have an erroneous idea as to why a wheel is given gather, believing that it will slip on the ground in proportion to the gather given. This is not true, however, unless you give it too much gather. If too much gather is given, the wheel will run to the shoulder and cause friction. If not any gather, it will run to the nut and cause friction also. Now we must overcome these two points by giving the proper amount of gather, so that the wheel will run easily between the shoulder and the nut. Unless this is done we have not reduced the friction to the least possible amount.

M. A. Foster.

Making Solid Eye.—In reply to Mr. A. W. Harvey, would say a good way to make a solid eye is to upset iron as in Fig. 1, according to the size of ring required. Bend and scarf like dotted lines as shown. Form ring and all is ready to weld.

To make rudder irons, take iron and bend to shapes A and B, Fig. 2. Forge two pieces like C and D. Fit together and weld one side from the center of the hole in one

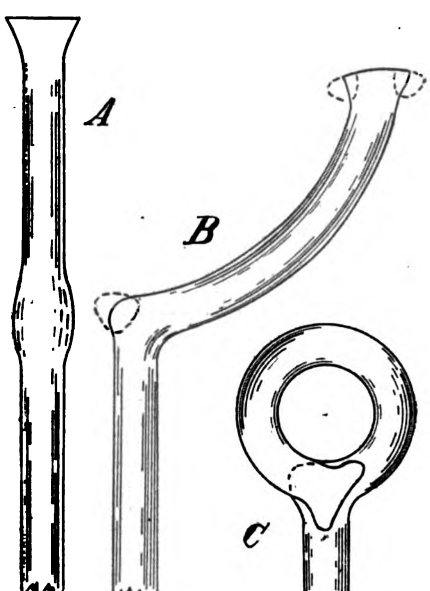


FIG. 1. METHOD OF MAKING SOLID EYE.

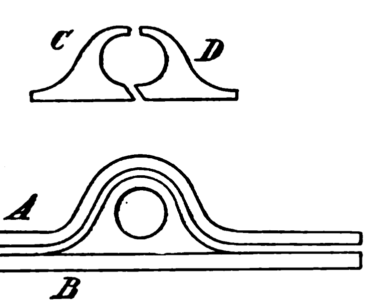


FIG. 2. RUDDER IRON FORGING.

heat. Then weld other side and drive in mandrel, so as to have the hole the right size. You then weld out to desired length and bend to size required. The same applies to the part with the pin, with the exception that pin and parts C and D must be solid.

P. Lambert.

Competing With Botches.—But you see how it is, Brother J. W. Buettner (in the May number). The little thing can't be done. If we had a law to protect the good smith, there would be a number of snides, the same as there are snide doctors, and many others that have to stand an examination. What are you going to do with the cross roads, smith? If we had a law, as you say, you could not stop them. They and the farmers both would be allowed to buy and own tools and if their friend and neighbor wanted to trust a job to them to do and was satisfied with his work, what can the law do? I can give my neighbor a dose of medicine if he wants it, though I can't collect a bill for it, but if he offers to pay me, that is our business. You can call them botches, self-made or home-made, or shop-made, just as you please, but they have come to stay. The longest pole gets the persimmon, and the smith who attends strictly to his shop, keeps it clean and neat, keeps good tools in good shape, above all, does good work, treats everybody kindly and everybody alike; charges everybody the same price for jobs of the same kind, who advertises and keeps abreast of the times by reading a good journal on his trade; this man will get there, botch or no botch. If one of them comes to me for material, or for advice, I give it to him and sell him material cheap. Then when he strikes a job he can't handle, he sends it to me. I give him my prices and tell him to charge no less, for his work is as honest as any one's, and he should have pay for his work. You will find the more you have to say about his work and the more you bar him out from your shop, the harder he will make it for you.

Cotton Valley.

An Interesting Letter.—Having been a reader of The American Blacksmith for a short time, I have come to the conclusion that it is an indispensable article from a blacksmith's point of view; as essential as his anvil, or at least I find it so, as I'm young at the business and find a great many helps by reading the experience of others.

There are two other shops in this place besides mine. I have no power in my shop at present, but expect to put in an engine next spring. I have an emery wheel, drill, disc lathe and tenoning machine which I have been running by hand, but I find as my trade increases I must have help in some way and have concluded that the gas engine is the cheapest. The prize articles on "Power in the Shop" are excellent, I think. I would like to ask the following question:

A few days ago I shod a driving horse with shoes about twice as heavy as the plates he was wearing. The next day he was brought back. I found that he struck his right hoof about half way up on inside quarter with his right foot. Heel or toe, I could not tell. The shoes had small mud calks on. He would go a rod or so then rear up and try to shake them off, first one and then the other. I shod him as level as I could. Will some one explain?

In welding axle stubs, would it be advisable to butt weld or is lap welding the proper way?

A. R. Stowe.

A New York Letter.—Enclosed find one dollar for my renewal subscription. I think the paper is all right and am interested in reading it and look forward to it every month. With regard to different methods for doing the same job, would say that in my opinion it does not matter as to the method used as long as it is O. K. when finished. We have had a very good winter, with a great deal of work, and good, fair prices and the outlook for the future is very bright. I have been in my present shop for fourteen years. At one time we had four blacksmith shops in the place, but the other three cut the prices until they were obliged to go out of business, so that now I have the entire trade. I believe in good prices for work, and in doing good work, and then no cheap man can do you any harm.

As to the Lien Law, about which I have read so much, this may be all right in some counties, but as I have not lost ten dollars in the last fourteen years from bad debts, it would not benefit me much. If a smith loses on bills, I think it is his own fault, for if he thinks a man's credit is no good, why he should tell him so and not trust him. That is the way I do business.

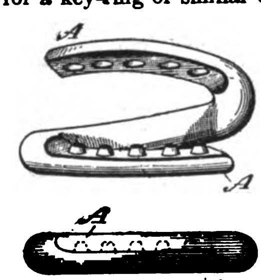
I have quite a handy shop, 20 by 46 feet, two rooms, with a stock-room overhead. I do all kinds of work, with the exception of painting. I build a good many new wagons, having built three the past winter, but prefer repairing and shoeing, as there is more money in it. The following is a list of prices in this part of Eastern New York:

Shoeing, per horse, No. 3 and under	$ 1.00
Shoeing, per horse, No. 4 and No. 5	1.25
Shoeing, per horse, No. 6 and No. 7	1.50
Setting shoes, per horse, No. 4 and under	.60
Setting shoes, per horse, No. 5, No. 6 and No. 7	.80
Sharpening shoes, No. 5 and under	.75
" " No. 6 and 7	1.00
Setting tires, per set	2.00
" " " " 3 in	4.00
New buggy tires, per set	5.00
New wagon tires, " "	
1½ inches	8.00
1¾ "	10.00
2 "	12.00
Rimming wheels—	
1¼ and under, per set	5.00
1½ per set	6.00
2 " "	8.00
New spokes, each—	
1⅜-inch and under	.15
1¾ and two inches	.18
2¼ inches	.20
New shafts	$1.00 to 1.50
Wooden axles	3.00 " 4.00
Wagon pole	2.50 " 4.00

William Smalley.

A Patent Lap Ring.—Mr. Franz Wenke, Fort Wingate, N. M., is the inventor of a recently patented lap ring, shown by the attached figure.

The lap-ring may be formed of any desired material, for instance, wrought or malleable iron or steel, brass, or copper, when the ring is not intended to be opened for removal and replacement, and in the latter instance it should be made of spring-steel and properly tempered when desired for a key-ring or similar object adapted to be sprung open. The opposite free ends (A) of the ring are disposed parallel to each other and provided with abutting faces, which when the ring is opened and closed are adapted to move directly toward and from each other. The lateral projection upon one end enter the recesses upon the coöperating end, thus firmly resisting any longitudinal movement of the ends, which frequently occurs in this character of rings when tension is placed thereon. It also provides a ring which, when desirable, may be opened by a movement of the free ends directly from each other and closed in a similar manner, thus obviating the necessity



A NEW LAP RING.

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of welding the rings, which cannot be successfully accomplished in many instances, such as in field work where the proper heat is not readily obtainable.

Shovel Tempering.—In the May issue I saw an inquiry from Mr. A. Schuetz on shovel tempering. For twelve years I have used salt in shovel and plow lay tempering, with good results. Take oil barrel or bath vat and fill with rain water with 75 or 100 pounds of salt (chloride of sodium) for tempering bath. Heat down the back of the shovel first to get the casting warm, then turn over on the face and bring up to a good heat. Now turn again and cover the face with salt. (I use a tin can with perforated bottom on handle.) Turn again and heat until white smoke rises well off salt and dip in brine bath. I might say that I have used prussiate of potash, cyanide of pottassium and others, but have found salt to be the best for shovel work.

ALEXANDER BLACK.

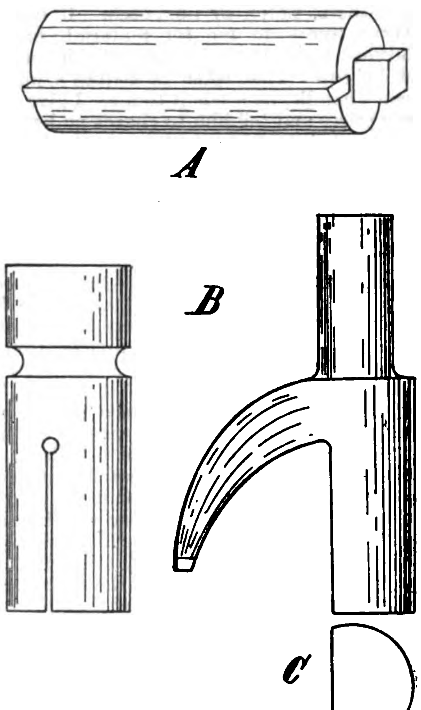
An Unusual Shoe.—Can anyone tell me where the following shoe is made? I have asked a number of blacksmiths and agents, but no one knows. The shoe is split from the heel to about the middle of the shoe and the inside of it bent up so that it springs when the horse puts his weight on it, and yet it is fixed so at the heel that when the horse puts his weight on it the inside does not go down in the hoof. There is an extra flange right at the heel to prevent that. I am very anxious to get this information, because a customer of mine wishes his horse shod with no other, as his horse travels so well in them. The smith who shod the horse before could not give me the desired information. Perhaps some other brother can. MARTIN KAFFITZ.

A Criticism.—In the May issue I noticed an article by Billy Buntz, to which I wish to take exception. I don't see any reason why one should use unfair means to get a customer to "bite." We will admit a contract is a good thing, but is it fair to our customer when we agree to "little or nothing?" Can we expect to build up a trade by lies and dishonesty? In the case of the horse owner in the said article, who was charged $5.00 where $2.50 was too much and then not done any good, and when he came back was charged $5 more, I should say the man would be a fool for taking his horse to such a smith in the first place. Billy Buntz would have us believe that we must resort to dishonesty, or at any event to underhand dealing in order to be a shrewd business man. I am in for good prices and good work, but let us maintain our reputation and honesty by all means. A. W. DUBOIS.

To Tin Cast Iron.—Referring to the inquiry of Mr. McDonald in the April issue, as to tinning malleable iron castings, I recently came across the following, which will probably help him.

To be successful in coating with tin the castings must be absolutely clean and free from sand and oxide. They are usually freed from imbedded sand in a rattler or tumbling box, which also tends to close the surface grain and give the article a smooth metallic face. The articles are then placed in a hot pickle of one part of hydrocloric acid to four parts of water, in which they are allowed to remain from one to two hours, or until the recesses are free from scale and sand. Spots may be removed by a scraper or wire brush. The castings are then washed in hot water and kept in clean hot water until ready to dip. For a flux, dip in a mixture composed of four parts of a saturated solution of sal ammoniac in water and one part of hydrochloric acid, hot. Then dry the castings and dip them in the tin pot. The tin should be hot enough to quickly bring the castings to its own temperature when perfectly fluid, but not hot enough to quickly oxidize the surface of the tin. A sprinkling of pulverized sal ammoniac may be made on the surface of the tin, or a little tallow or palm oil may be used to clear the surface and make the tinned work come out clear. Some operators again dip in a pot of hot palm oil or tallow at a temperature above that of the melted tin, for the purpose of draining the excess of tin and imparting a smooth, bright surface to the castings. As soon as the tin on the castings has chilled or set, they should be washed in hot sal soda water and dried in sawdust. B. B.

Cylinder Boring.—In answer to Mr. Hugginbotham's question in the May issue, if he wants to bore his cylinder out rough and ready by hand, he can take a piece of hard wood and turn it off to the size of the bore of the cylinder and somewhat larger. Be sure to make a fit. Then cut a ½-inch groove in the block lengthwise and insert a piece of hard steel in the groove. Leave a tennon on one end of the block to turn it by. Cut $\frac{1}{16}$-inch, then draw out and put



A, CYLINDER BORING TOOL. B, TOOL FOR ENLARGING HOLES. C, BOTTOM VIEW OF END.

a piece of paper under the cutter and proceed to cut again until you get a smooth surface. Then take emery flour and polish by putting it on the roller, with grease.

The tool shown at B, will be found very useful to any mechanic in case he has to make a small hole larger. The left hand view indicates the way the tool is made, the upper part being drawn down to fit the drill press, the lower part fitting hole to be enlarged. J. VESTAL.

Some Nebraska Prices.—All the smiths here in Saunders County are in an organization, the following prices holding all over the county:

BLACKSMITH WORK.

Horseshoeing—
Setting shoes, each 25c
New shoes, each 50c
Hand-made shoes .... 75c and up
Neverslip, per team $5.00
Stable horses .... 50c to $1.00
Neverslip calks, each 5c
Polishing plows .... $1.50 and up
New lay on plows, 14-inch $4.00
New lay on plows, 16-in., $4.50; 18 in., 5.00
Pointing plow 1.00
Sharpening " 14-inch 35c
" " 16-inch 40c
" " 18-inch 50c
Lister lay, new $4.50
Sharpening lister 50c
Pointing lister $1.00
Sharpening subsoiler .... 15c and up
New subsoiler, bottom .... $1.00 and up
" " complete ..... 2.00 and up
Sharpening Stk. cutter knives, each 25c
" " " disc, per knife . 25c-30c
" cutaway " " 50c-55c-60c
Pointing cultivator shovels, per set of four $2.25
Sharpening cultivator shovels, per set of four 75c
Sharpening grader blades ..... $2.50 and up
Axle stubs, per set .... 8.00 and up
Setting axles .... 1.00 and up
Welding axles .... 1.50 and up
Setting buggy tires, per set $3.00
" wagon " " 2.00
Wide tires, 3-inch 75c
" " 4-inch $1.00
Clip king bolt 1.00
Welding buggy spring .... 75c and up
" sickle 75c
Filling " .... 50c and up
Putting on ledger plates .... 7½c each
Welding pitman 75c
Fork on " 75c
Wagon wrenches 50c
Queen bolts 35c
Pole caps 50c
Welding pole braces 50c
" shaft irons 50c
Well augur steel 75c
Miscellaneous work, per hour 50c
Anchor rods, ½-inch 40c
" ⅝-inch 50c
" ¾-inch 75c
T[illegible]one steps, each 9c

WOOD WORK.

Rimming buggy wheels, each $1.50
" " ½ " " 75c
Spokes, full set, each 20c
One spoke 25c
Jump spoke 50c
Felloe wagon, each 25c
Setting box, new wheel 50c
" " old " 25c
Buggy pole 2.75
Circle in pole 75c
Doubletree 75c
Singletree 50c
New shafts, each $1.25
" cross bar 75c
" seats .... $2.00 and up
Axle bed .... 1.00 and up
Spring bar .... 75c and up
Side bar .... $1.50 and up
Reach on buggy .... 75c and up
Head block .... $1.00 and up
New tongues, complete $5.00
" " 2.75
One hound for tongue 75c
Two " " " $1.25
Cross pieces in tongue 50c
Axles, each $3.50
Wagon reach 1.25
Hind hound, each 85c
Wagon bolsters $2.00
Sand board 1.50
Bolster stakes .... 35c and up
Bent hounds $3.00
New bottom in box 3.50
Cross piece in box 50c
End gate for box .... 75c and up
Dump gate, each $2.00
Spring blocks 25c
New skein on axle .... $2.00 and up
Bow socket for buggy top ...... 75c and up
New bow in top .... $1.50 and up
Steel shaft points 75c
Cutting down wagon $9.00

G. H. GILCHRIST.

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THE AMERICAN BLACKSMITH

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The following suggestion may save present and future subscribers to The American Blacksmith from loss through solicitors who falsely represent themselves as agents of this company. In any case where the canvasser is not known to the blacksmith and doubts exist as to his authority to collect money for this company, the smith should give his order for the paper to the canvasser, but should mail the money in to the company direct, mentioning the name of the solicitor. In this way the latter obtains full credit for securing the subscription, and the blacksmith at the same time protects himself from loss, should the solicitor chance to be dishonest.

Change of Address.

It is very important for those whose addresses are changed in any way to let us know promptly of the change. Complaints about non-receipt of the paper are usually caused by failure to do this. When an American Blacksmith subscriber moves to a new location, or when his old postoffice is discontinued because of rural free delivery or other reasons, he should not rely upon the postmaster to forward his mail or advise us of the change, but he should always and at once drop a line to The American Blacksmith direct. Always give both new and old addresses.

Progressiveness a Necessity.

The blacksmith who runs a shop, like any other manufacturer or business man who wishes to keep up in the tide of twentieth century competition, finds it continually necessary to be adding to his shop equipment, and taking advantage of every new device that offers for turning out work better or more cheaply. The smith may often ask himself, using a well-worn term, is it worth while keeping up to date? Does it pay to buy new tools and keep abreast of the times? This is a most important subject, and one calling for careful thought. Many a man, after furnishing his shop with a good stock of tools and building up a nice custom by skill, attention to business and judicious advertising, has thought after a while that no one could take his trade from him. It is easy to understand how such a man would argue that the less money he spends for new improved machinery, the more he will have in his pocket at the year's end, and how he would look upon money spent in advertising as absolutely thrown away. Few men there are nowadays with whom such reasoning is not both false and fatal. Trade a man with you as many years as you please, the moment your competitor offers him the same article at a substantially lower figure than you can supply it, he will at once leave. And so it is that the man who thinks he has an everlasting corner on the custom of his neighborhood, goes to bed some night with the sad knowledge that the trade has gone to the other chap, the man who took advantage of every new tool that came out for cheapening his cost of production, and who took care to advertise the fact that he was in a position to do better work cheaper than it could be done elsewhere. If chap No. 2 is wise he seeks to retain the custom in just the way he obtained it, counting money put into tools and advertising as well spent. Water seeks the lowest level, and trade the lowest prices. In the strife of modern trade, success and even life depends upon the ability to turn out work cheaply, pointing to labor-saving tools and machinery as the solution of the problem. Letters are continually appearing in this journal testifying to the necessity and advantages of progressiveness on the part of the blacksmith who runs a shop, large or small.

Coming Conventions.

The twelfth annual convention of the National Railroad Master Blacksmiths' Association will be held in Indianapolis, Ind., on August 16, 1904, at the Grand Hotel. Arrangements have been completed, and an interesting as well as instructive time is promised to all who attend. Full particulars may be had by addressing Mr. A. L. Woodworth, Lima, Ohio. The following topics are on the program for consideration and preparation of papers:

Tools and Formers for Steam Hammers on General Railroad Work.

Spring Making, Repairing, Tempering, etc.

Tool Steel Forging and Tempering, including High Speed Variety.

Best Method of Testing Material and Selecting the Same for Use Intended.

Best Material and Methods of Forging Motion Work, as Links, Rocker Shafts, Valve Yokes, Eccentric Yokes, etc.

Best Form of Oil Furnace for General Locomotive Shape Work, and Burners for the Same.

Ideal Blacksmith Shop and Equipment for General Railroad Work.

Frame Making; Best Material and Methods of Preparing the Same from the Scrap.

Repairing Locomotive Frames, Iron and Steel; Best Methods and Material.

Formers for Bulldozers, Forging Machines, etc., including Air Presses.

The Carriage Builders' National Association is scheduled to convene in Milwaukee, Wis., for their thirty-second annual meeting during the week commencing Oct. 16. All who are interested

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in vehicle manufacturing will find both welcome and benefit at this convention. For particulars address Henry C. McLear, Secretary, Wilmington, Del.

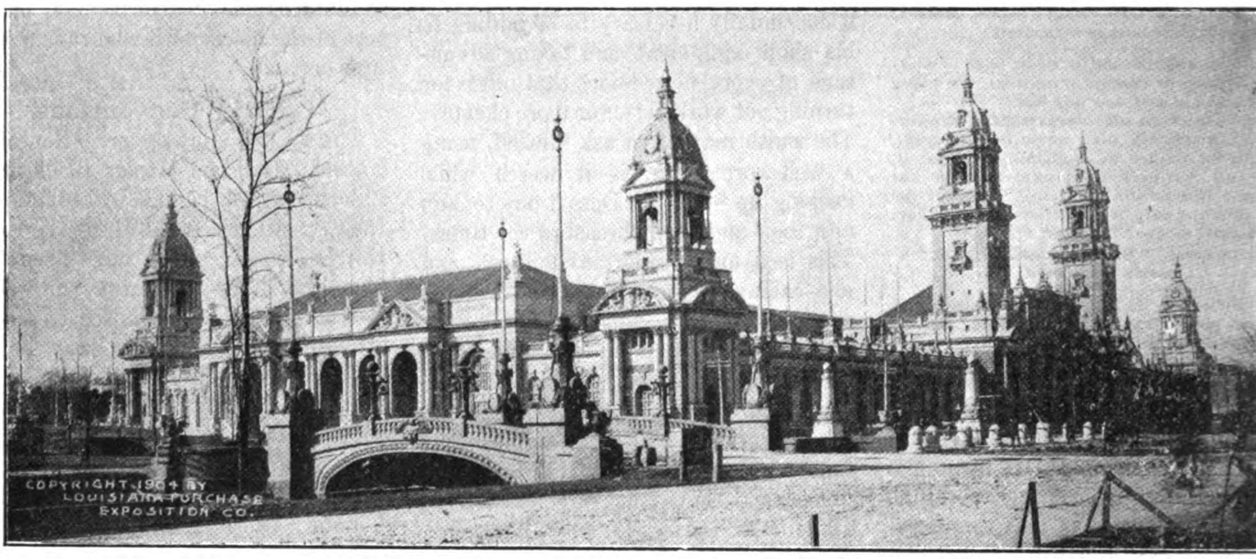
Triumph for Industrial Forces Vies with Artistic Achievement.

World's Fair, both in its Construction and Operation, Demonstrates the Great Power of Labor Scientifically Applied.

JOHN C. SMALL.

Masterful strokes, applied when the iron was hot, have wrought from the artist's dreams the magnificent picture that World's Fair visitors now look upon, and in contemplating the vision of beauty there is as much interest in studying the industrial forces at work as in admiring the artistic features of interest and they are represented not only in the construction, but in the operation of the splendid enterprise. It is here that labor demonstrates the best and most economic methods both by deeds and being done. As everyone is something of a laborer, the industrial becomes as great as the artistic.

American inventive genius still stands far away and ahead in producing new machinery, and perhaps in no line have the Americans made such strides of progress as in machine tools and the equipment of foundries and shops. The American inventor is ever alive to new necessities; in fact, he often foresees them and no sooner are the possibilities of an old device exhausted than he comes forward with a new machine tools and the equipment for a modern machine shop is an attractive feature of the Department of Machinery. For machines working in metal there are those operated by shock, compression, or tension; steam hammers, trip hammers and drop forging; machines for cutting, shearing, punching, stamping, counter-sinking, and shaping; rolls, draw benches, wire drawing machines; machines for stretching and flanging, and for bending, butting and welding and riveting. Other interesting sights are the methods of heating, annealing, tempering, cementing, welding and brazing. There are all the tools used with the forge and with the above named machines, as well as a full display of anvils, vises, hammers, shears, punches



THE PALACE OF MACHINERY.

The Palace of Machinery is 525 feet wide, 1,000 feet long and 265 feet high and cost $496,597. It contains a giant locomotive with wheels turn-at full speed, the monster electric switchboard used to control the lights and hundreds of engines and machines of all descriptions.

the achievement. Before creations of great minds were privileged to be exhibited to public gaze they stood the fire of the forge, and an approving ring of the blacksmith's hammer was necessary to the completion of the framework upon which has been weaved the most delicate fancies of the human mind.

Blooming flowers and verdant landscape are the tributes of nature to this scene of wonderland, but before the flowers could grow and the foliage flourish the pick and shovel made beds for them and the trained hands of labor nursed the plants to maturity. So it was that hammers and saws fashioned into shape the plans of architects, and great steam shovels cut a way for the picturesque lagoons. It is the industrial victories that make this Exposition a thing of such momentous human machine whose applicability is at once so obvious that one often inquires why it was not thought of before.

By this advancement in mechanical operations the milling machine has stolen the work from the planer in the machine shop. The gradual transformation has become so great that machinists today wonder how a shop would look if planers should do all the work that once would have been done on them and which is now done by other means. In many lines of work today it would require ten times as many planers in the shops as are used if the milling machines had never been invented.

These transformations in the machine shop have been fully recognized by the management of the Louisiana Purchase Exposition, and the display of both and dies, and various compounds for metal tempering, welding and cleaning.

There is on exhibit a full line of machines with cutting tools, like machinery for drilling, boxing, reaming and tapping, and machines for planing, milling, slotting and grooving. There are machines for grinding with grit, emery, carborundum and diamond. In the machine and forge-shop equipment are to be seen measuring tools and instruments of precision for testing shapes and dimensions.

Machines for working in wood are in every variety—for sawing, planing, turning, boxing, moulding, mortising, tongueing, grooving, shaping and carving, as well as for polishing and veneering. All appliances for wood-working machinery are displayed.

To AMERICAN BLACKSMITH readers,

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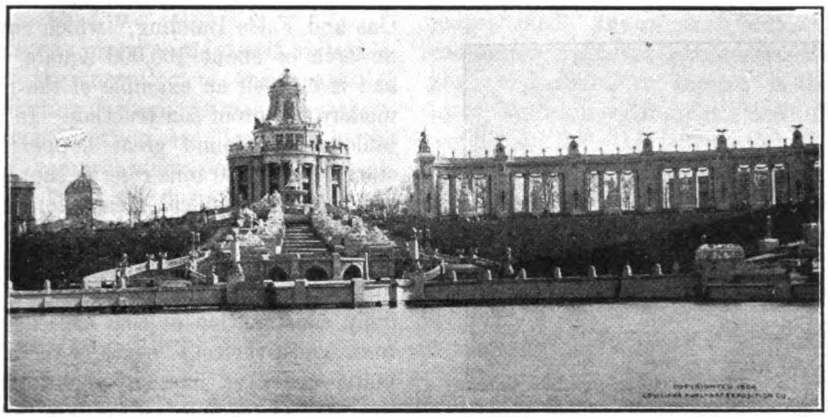
the Palaces of Machinery and Transportation are undoubtedly the important exhibit buildings, for within their walls are housed the best that the world can produce in machine and metal construction.

In the Palace of Machinery, and covering an area of 200,000 square feet, which is about the size of a city block, is the installation of engines, condensers, moving machinery and other accessories making up the power plant of the greatest of all world's fairs. Enter this palace from the North and you will see in front of you slightly to the left, a 5,000 horse-power reciprocating steam engine, which with its base has a total height of 54 feet, 20 of these being below the level and the remaining 34 elevated above the floor. This engine and its generator weigh over 500 tons and their value is approximately $150,000. To appreciate the size of this machine, have in mind a city house, with a street frontage of 25 feet, a depth of 60 feet, three stories above ground, and a basement and sub-cellar beneath. Remove this house and replace within the space the engine and generator that are on view There will barely be room to do so.

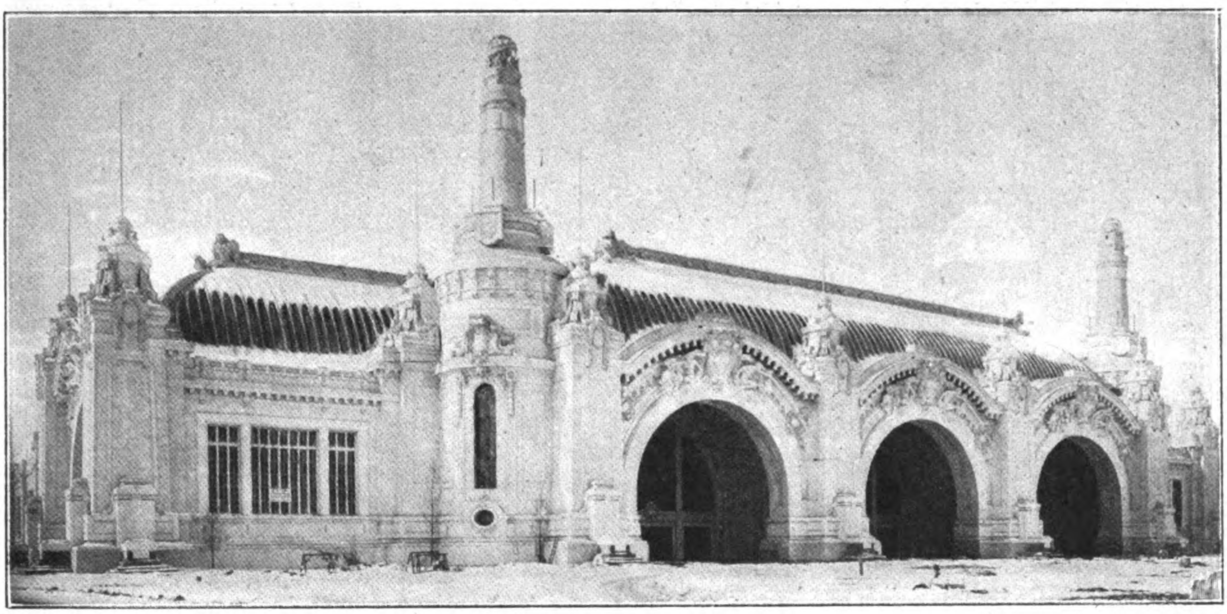


A VIEW OF ONE OF THE COLONNADES WHICH SURMOUNT THE TERRACE OF STATES.

Next in line, proceding west through the central hall of Machinery Palace, you will see a 1,750 horse-power gas engine from Tegel, a manufacturing city near Berlin, Germany. Near by is a 600 horse-power high-speed engine from Harrisburg, Pa., a 750 horse-power medium speed steam engine from Cincinnati, and a 1,000 horse-power slow speed steam engine from Burlington, Ia. A tangential water wheel, from San Francisco, is the next exhibit. A steam pump from Jeanesville, Pa., causes it to operate by forcing water through a pipe and nozzle at the rate of 1,200 gallons per minute, and a pressure of 300 pounds to the square inch; this great volume of water strikes the buckets of the wheel, transmits its energy and falls as quietly as if poured from a basin. This water wheel makes 900 revolutions per minute, is regulated by a speed governor from Boston, and a meter from Providence regulates the flow. A 3,000 horse-power gas engine from Seraing, Belgium, is seen next, then an 8,000 horse-power steam turbine from New York and adjacent is a 5,000 horse-power steam turbine from Pittsburg, Pa. Near the western end of the central bay are four 3,000 horse-power reciprocating steam engines and three 80 horse-power exciter sets.

Such a line of prime movers has never been seen in the world's history, yet this is but one of the three lines installed in the western half of Machinery Hall. The line to the North consists of steam engines largely of European build, and drawn from the greatest works in England, France, Sweden and Germany. The line to the South, for the main part, is made up of gas and oil engines, the products of the great machine shops of the world. All types, speed and sizes are shown, from the little one-half horsepower gas engine for domestic use, to the great 8,000 horse-power steam turbine for the operation of lighting plants and trolley railroads.

It is much easier to talk of a steam turbine of 8,000 horse-power than it is



THE PALACE OF TRANSPORTATION.

An immense building 525 feet wide, 1,300 feet long, covering fifteen acres. Fourteen permanent railroad tracks extend the entire length of the building and over four miles of tracks are used for exhibits.

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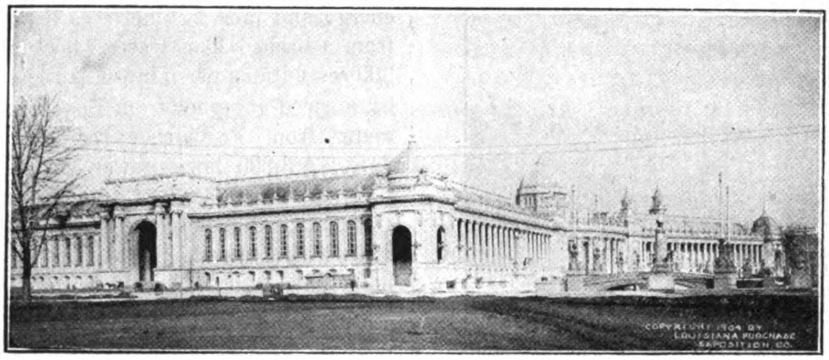
to understand what this enormous output of power means, and the difficulties which have been surmounted in the construction of the engine. For generations the rotary engine (which a



PALACE OF VARIED INDUSTRIES BY DAY.

steam turbine is), has admittedly been the ideal, but failure after failure relegated the rotary engine to the immediate vicinity of the perpetual motion proposition. Failure has finally been changed to success, and there is shown here in operation a rotary steam engine with its electric generator de-

THE PALACE OF VARIED INDUSTRIES BY NIGHT.

All the Fair buildings are beautifully illuminated at night and this scene gives but a faint idea of the grand and imposing spectacle presented by the illumination of the entire grounds.

veloping and transmitting 8,000 horse-power, and having a guaranteed capacity to deliver 12,000 horse-power. Twelve thousand horsepower means the combined average energy of 12,000 horses working in perfect unison, or a string of horses, harnessed tandem, and as close as they could comfortably work, over 18 miles long.

The Belgium gas engine is also a very wonderful achievement. No one has ever seen a gas engine of anything like 3,000 horse-power. The same builders exhibited a gas engine of 600 horse-power at the Paris Exposition of 1900, which excited more interest and comment than any other individual item at that Exposition. Here we have one with five times the capacity of the Paris engine. The unit installed in this Exposition covers a floor space about eighty-five feet long by forty-five feet wide. Its fly-wheel weighs 34 tons, has a diameter of 28 feet, and its rim travels at the rate of nearly a mile and three-quarters per minute. A medium size horse can be driven through its cylinders, and its two pistons each travel 10 feet at every complete stroke, making 100 strokes per minute each. The shipping weight of this engine is approximately 300 tons. About 30 tons of coal every day are consumed in the generation of the gas to operate it.

One hundred feet to the west of Machinery Hall is found the "Steam, Gas and Fuels Building," which covers an area of about 100,000 square feet, and is in itself an example of the most modern fire-proof construction. In this building are found great hoppers for storing the 4,000 tons reserve supply of coal, and mechanical means for automatically conveying this coal from the cars to the bunkers and from the bunkers to the furnaces and gas plants. The daily consumption of coal exceeds 400 tons, whilst the total length of the automatic conveyer lines is about three-quarters of a mile. Here are found boilers to furnish steam, and the gas producers to supply the gas for the operation of the engines in Machinery Hall. Briquette making, various types of mechanical stokers, forced draft apparatus, water purifiers, and exhibits of items directly related to the subject of steam generation and control are installed in this building.

In its entirety, the power plant of the Exposition exemplifies and demonstrates the most modern practice as it prevails in this country and in Europe; it must engage the attention of the public by its manifest size and might; it commands the study of engineers, as showing practice with which they are not familiar and it demands consideration

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by all who are financially or otherwise interested in the development and transmission of power. The lessons to be learned here open up new fields and possibilities and point to the accomplishment of new economies.

All equipments of steam railroads, from the inception of this means of locomotion down to the modern methods of transportation, are illustrated in the most comprehensive display ever attempted in the history of universal fairs. Not only is the progress of steam railways in this country demonstrated, but there is shown the present status of steam railroad transportation in all the countries of the world.

In the Transportation Building are to be found models of the most up-to-date wagons, carriages and automobiles, showing the latest improvements in all branches of vehicle manufacture.

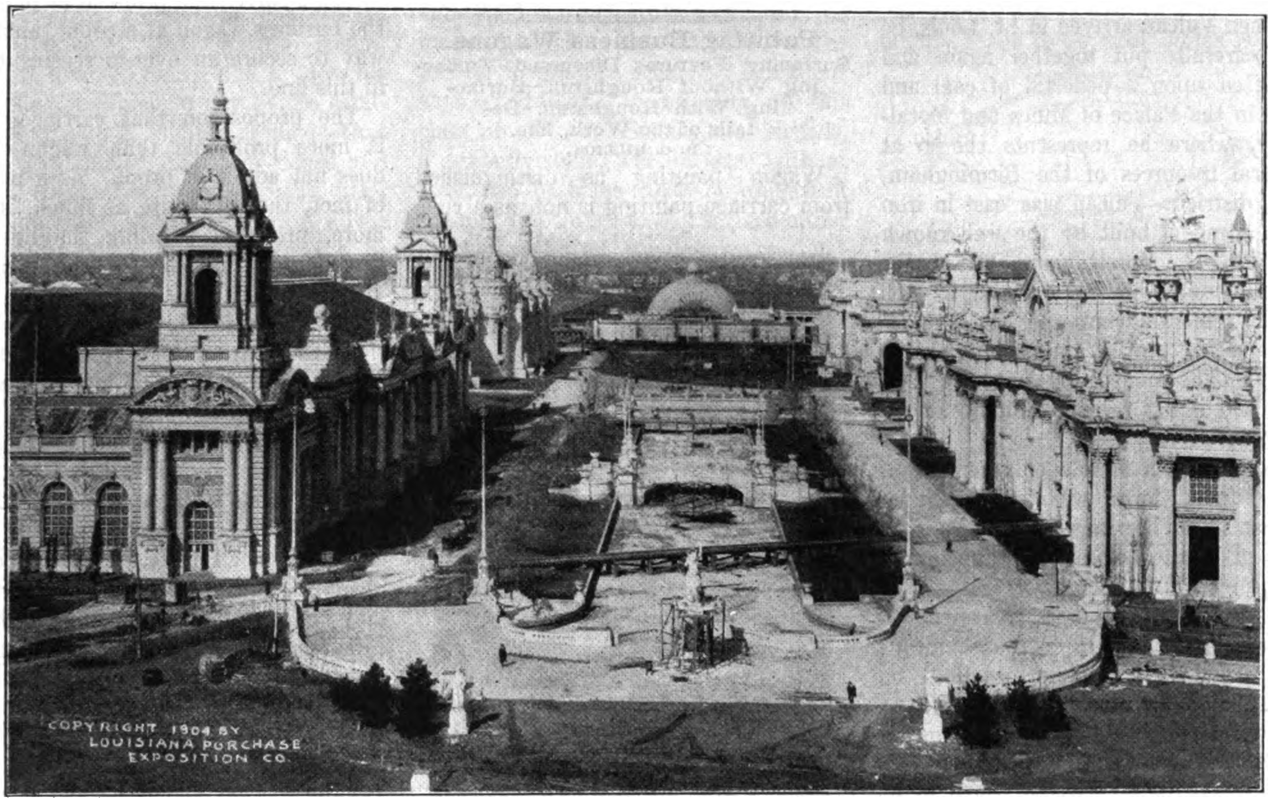
The railway exhibit, in the Palace of Transportation, is one of the largest at the Fair. The principal attraction of this exhibit is an immense locomotive, weighing over 200,000 pounds, running at full speed, on a steel turntable. The wheels of this giant turn at a rate which, were the locomotive on an ordinary track, would give it a speed of 80 miles an hour. While the wheels of the locomotive revolve at this great speed, the turntable moves more slowly by electric power and carries the engine round and round constantly.

One of the new and unique Exposition features is a series of laboratory tests of locomotives, with the findings of the judges made known each day. The comparative efficiency of modern European and American engines is tested by the leading mechanical engineers of the world. In fact, this is an international competition. During these tests a locomotive is run, or its wheels turned while the engine is still, at the rate of 80 miles an hour. The locomotive laboratory is a part of the exhibit made by the Pennsylvania Railroad system.

In the "still" exhibits are to be seen switches and crossings, transfer tables, turntables, models of bridges, and signal systems and other apparatus for securing the safety of traffic, and a display of track repairers' tools. There are also illustrated car heating and lighting; snow plows; shops for construction and repairs; engine houses; dynamometers and self-registering apparatus; time tables; cleaning and disinfection; tickets and ticket cases, posters, tariffs; methods and equipment for checking and handling baggage and freight, and, in fact, every detail that has brought modern railway transportation to the point of sending a passenger without mishap from Chicago to New York in 20 hours.

The Palace of Agriculture is the largest building on the grounds. It is 1,600 feet long and 500 feet wide, covers 18 acres and contains the cultivated products of the earth. Some idea of its size may be had when you think that this one building contains more exhibit space than all the exhibit buildings at the Pan American Exposition at Buffalo in 1901.

In summing up the great St. Louis World's Fair, you describe it to the letter when you say it is in almost every particular the largest ever held, as it contains the largest hotel, the largest watch, the largest locomotive, the largest gas engine and many other giants of their classes, in addition to covering a greater area than any other exposition.



THE COURT OF ST. ANTHONY LOOKING NORTH

Shows the Palace of Machinery and the Transportation Building on the left, and the Palace of Electricity and the Palace of Varied Industries on the right.

Seven Freight Cars Bring Vulcan.

Birmingham's Immense Iron Man Requires Almost Entire Train for Trip to World's Fair.

JOHN C. SMALL.

While St. Louis offers hotel accommodations in abundance, there is one visitor at the World's Fair who is unable to find a place anywhere in the Exposition City where he can lay his head. This stranger who is destined to stand upon his feet from the time the Fair opens until it is closed is Mr. Vulcan, of Birmingham, Ala., who tips

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the scale at 100,000 pounds and stands 56 feet high in his new stockings.

Sleeping cars were not made with berths for Brobdignagians and Vulcan had to suffer several very serious surgical operations before his ponderous frame could be put aboard the cars for the trip to St. Louis. With his 15,000 pound head occupying one car near the engine and his feet, each six feet long, in a car to themselves near the end of the train, this giant sprawled out over seven freight cars looks very much like Gulliver strapped down by Lilliputians in Dean Swift's nursery stories.

When Vulcan arrived in St. Louis, he was carefully put together again and mounted upon a pedestal of coal and coke in the Palace of Mines and Metallurgy, where he represents the great mineral resources of the Birmingham, Ala., district. Vulcan was cast in iron from a model built by the well-known sculptor, G. Moretti, and all of the metal used in his construction, as well as the minerals composing the foundation for the statue, are from Alabama mines. The monster exhibit cost $20,000, and it has required almost a year to complete it.

More than a simple enlargement of the human form was required, for Vulcan's head is exaggerated by 2½ feet. This gives the colossus an appearance of symmetry from the levels from which he is viewed. Such a treatment of proportions is a part of the sculptor's study, but it is seldom practiced on such a large scale as in this instance.

Moretti designed the model in an old church building at Passaic, N. J., where a high roof permitted the frame to be reared, but the improvised studio was not properly heated and shortly after completion the plaster was frozen and the head began to crumble. The sculptor quickly loaded the structure upon cars and in the milder climate of Birmingham completed the model.

Then the casting of the parts began and such a feat as the foundrymen have performed was never before equalled. The figure was modelled in 15 pieces, dimensions of some of the sections being given as follows: Head, 7½ feet high, 7 feet across, weighs 15,000 pounds; circumference of neck, 11 feet 6 inches; circumference of chest, 22¾ feet; width across shoulders, 10 feet; length of arms, 10 feet; circumference of waist, 18 feet 3 inches; diameter of calf of legs, 4 feet 3 inches; diameter of ankle, 2½ feet; weight of spear head, held in right hand, 250 pounds; weight of hammer in left hand, 300 pounds; weight of anvil block, 6,000 pounds. The strap over the left shoulder and the apron worn by Vulcan are separate pieces and are used to strengthen the sectional joints.

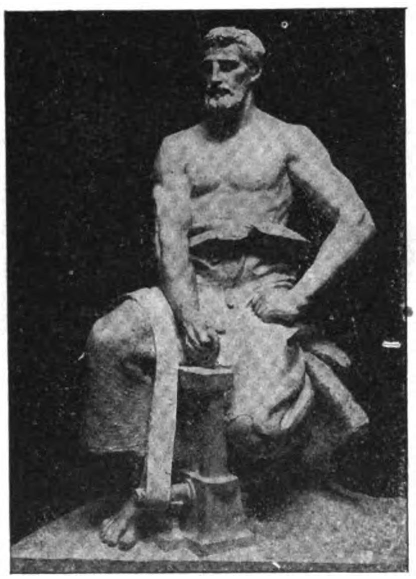
The idea of having a giant statue made of iron to represent the vast mineral wealth of Alabama was conceived by Mr. J. A. McKnight. The cost of the statue was defrayed by contributions from Alabama people. Around the base of the big figure are displayed mineral exhibits from the State and miniature reproductions of Vulcan may be procured by visitors.

Painting Business Wagons.

Surfacing Features Discussed.—Surfacing Without Roughstuff.—Surfacing With Roughstuff.—Details of the Work, Etc.

M. C. HILLICK.

Wagon painting as distinguished from carriage painting is not, as a rule,



STATUE REPRESENTING POWER.

given the attention by the jobbing shop painter that it deserves. This is no doubt due in part to the scarcity of the strictly business wagon in the smaller towns and villages, and to the larger profits which carriage work appears to offer.

To the first proposition, it may be said that however small the proportion of business wagons, the work is quite worth while both as a matter of profit and as furnishing a variety of work not met with in carriage painting alone.

Painting the business wagon calls for the ability of the colorist, along with an uncommon degree of skill as a brush hand. The choice and harmonious combination of colors is indeed an all important consideration in wagon painting, and while at the present time a good grade of surfacing is demanded, it may fairly be said that surfacing remains subordinate to smart and effective color combinations.

To procure neat and inexpensive surfaces—surfaces fairly level and smooth —without the expense of applying and rubbing out the roughstuff as used in carriage painting, is a requirement connected with the painting of the business wagon of supreme concern to the jobbing shop painter, because if he is able to produce a good quality of surfacing at a moderate expense along with artistic and rich color effects, he has in large measure solved the problem of painting the business wagon at a profit, and in a way to secure an ever-increasing trade in this line.

The proposition that carriage work is more profitable than wagon work does not admit of proof. As a matter of fact, there is quite as much, if not more, profit in painting the business wagon than in painting the pleasure vehicle.

However, with this phase of the situation the reader of THE AMERCAN BLACKSMITH is able to inform himself outside these columns. It is more particularly with the surfacing question that we have to deal in this issue.

Surfacing Without Roughstuff.

The ribbed body wagon, with its succession of small panels, if returned for repainting over the old paint surface, may be treated after this fashion: First sandpaper with No. 1½ sandpaper, to clean off any possible scaly paint, and to cut the surface up somewhat into small furrows. Then mix and apply a coat of lead made up of one-sixth part raw linseed oil and five-sixth part of turpentine, adding a gill of coach japan to each quart of the mixture. Make the lead a light slate color by adding lampblack. Lay this coat on with a camel's hair brush, wiping out dry and smooth, and brush the pigment well into the furrows made by the sandpaper, thus giving the paint a foothold. This coat, under ordinary drying conditions, should dry out and harden sufficiently to sandpaper and glaze over in 48 hours. In damp or cool quarters not conducive to rapid drying, another 24 hours at least will be necessary to insure safe drying.

Next, take a keg of white lead and mix with turpentine and let stand over night. The turps will draw the oil from the lead and it may then be poured off. After eliminating the oil from the lead in this way, mix the lead in two parts coach japan and 1 part quick

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drying rubbing varnish, adding a bit of turpentine to free the mixture from becoming salvy or gummy. Mix to a stiff paste, and with dry color, or with a japan ground color, color the glazing to a shade approximating the color to be used. Apply with a comparatively stiff brush. Let the pigment remain until it dries out flat, or without any gloss, and then with a broad blade putty knife go over the surface pressing the putty glazing into all the cracks and fissures that may exist in the surface. Work the glazing out clean and smooth, leaving but comparatively little of the glazing upon the surface. This will save a great amount of unnecessary sandpapering. This glazing should have at least 36 hours, and if possible 48 hours, in which to dry before sandpapering, and if rightly applied—that is to say, applied free from ridges and rough edges—but comparatively little sandpapering will be needed. This work may be made very expensive, or only moderately so, just as the skill of the workman has been exercised in putting the glazing on smooth and clean. The minimum sandpapering counts both in favor of the appearance of the surface, and in the economy of it. When the glazing has been applied and dried for, say 24 hours, mix up a putty made of dry white lead and coach japan, equal parts, and putty all gouges and deep abrasions of the surface. Do this puttying as smooth and as level with the surface as possible, in order that the minimum sandpapering may suffice. Directly upon this surface, when sandpapered, apply the color and bring to a finish in the usual way, choosing, however, a heavy body finishing varnish to finish with.

Surfacing With Roughstuff.

In case the surface is so badly broken and furrowed with cracks and fissures that a simple glazing is insufficient to bring it out intact and solid, proceed with the glazing as above detailed and then apply a single coat of roughstuff prepared as follows: Add to 3 lbs. of Keystone or other good American filler, 1 lb. of keg white lead. Reduce to a thick paste with japan and rubbing varnish, equal parts, and thin to a rather heavy brushing consistency with turpentine. Apply one coat of this roughstuff, and permit it to stand 44 hours before rubbing. Then in rubbing use a block of Eureka, or some other good composition rubbing brick, and employ raw linseed oil instead of water to dip the brick in. This will aid to avoid getting moisture into the cracks and fissures, causing them to enlarge and reassert their presence in the surface. When water is used, the fissures are apt to gather enough moisture to enlarge and exaggerate them, in which case it is next to impossible to again effectively conceal them under any ordinary structure of pigment. The surface having been rubbed, it should be wiped off with a soft piece of cloth, and set aside until the following day, before coating up with color.

With roughstuff costing close to $2.25 a gallon, if bought ground and ready prepared, and very close to that if mixed in the shop of first class ingredients—and a roughstuff should not be made of anything else—it behooves the painter to practice economy, consistent with good work, in bringing up this class of surface. Glazing the surface, if properly done, will dispense with at least two or three coats of roughstuff without detriment to the surface either in the matter of appearance or durability.

The business wagon with large panel wood top should, of course, receive different treatment. This, in addition to the regular coat of lead, carrying enough oil to fasten it securely to the surface, will require from 3 to 5 coats of roughstuff. To secure better density of surface, with greater uniformity in the depth of pigment, the coats should be applied at right angles in laying off. In other words, lay the first coat off with horizontal strokes of the brush, and the second with vertical strokes. So continue, thus building up a very solid and even coat of stuff. Surfaces of this class require very careful and clean rubbing with rubbing brick and water, and when finished they should compare favorably with the finish applied to pleasure carriages of the heavy build. Roughstuff for this class of wagons should be mixed of keg white lead and filler, equal parts, by weight, and equal parts, by measure, of coach japan and rubbing varnish.

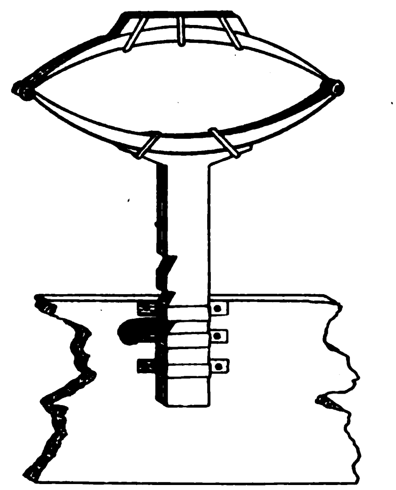
A Few Pointers on Wagon Work.

G. NABLO.

I will endeavor to give some pointers about wagon work, which I hope may be useful to some of the craft. As a light running vehicle is desired by all users, I will first talk on axle setting.

We often see many rigs, both light and heavy, which are noted for their hard running. The usual cause for this is that the axle has not the proper setting, being narrow in its track, although it has the proper length. The wheels are usually drawn in too much at the point where they meet terra firma, and therefore run in a cramped position, wearing the spindle on the top near the nut and the shoulder on the bottom. In the opposite extreme the same trouble is caused, the spindles being worn on the bottom near the nut and on top of the shoulder, this being common with wheels that are much dished. A vehicle suffering with any of the defects mentioned will run hard, and no matter how well lubricated, will always be one of heavy draught.

Again another defect might be the cause, and that is, that the vehicle has too much gather, and can be seen in muddy roads to do work which is only



AN ADJUSTABLE SEAT POST.

intended for the disc harrow, plowing and tearing up its track.

The only proper remedy for any of the above cases is to reset the axle, so as to have the wheel perpendicular under the spindle, or what is usually called a plumb spoke. In a dodged hub the front spokes should be in a perpendicular or plumb line, and only a slight gather of not more than 3-4 of an inch, which is sufficient. The vehicle, no matter if heavy or light, will then run much easier than before.

Now a few words as to a comfortable wagon seat. It is often necessary when bulky articles are to be transported, to have a spring seat for the driver that is above the load and yet still firmly fastened to the body or box. I have made many such, and will attempt to describe the same. Take a bar 1 1-2 by 5-8 and 20 inches in length, and weld on a cross piece of the same width six inches in length. Bend and shape to conform with the seat spring. Now, with a hack saw, cut three notches in the stem. Next, bolt or clip on the spring and put the stem on the proper place for the seat, about twenty inches from the dashboard. Make three clips that fit over post and bolt them at certain intervals apart on the body or box, so that the stem can be easily moved up or down. Next make a dog to catch in these notches, resting in the middle clip, and the seat can be raised sufficiently high to allow many bulky articles, such as grain bags, boxes, etc., to be placed under it, and when the box is empty, the seat can at once be lowered to its usual place.

Another convenient arrangement is a gate for the dashboard, *i. e.*, a board fastened with hinges and held by two springs. An opener for these springs is made by bending an iron, 7-16 of an inch round, as shown in figure, fastened by four eye staples and with projecting ends that lie under the springs. When crank in center is pulled outwards it at once lifts both springs and the tail board can be easily pulled open by one movement.

A Little Talk on Wagon Repairing.

E. B. MERCER.

We have a wagon wheel brought to our shop for repairs that is dished till the spokes are badly out of plumb, although the material is good. We want to repair this wheel and use the same material. Now, to do it we must have the tools to work with, so we shall make them first.

We take a piece of $\frac{3}{4}$-inch gas pipe 5 inches long, and weld up a ring out of $\frac{1}{2}$-inch square iron just large enough to admit of inserting the pipe, and weld it fast on one end of the pipe. Now, take a piece of $\frac{7}{8}$-inch mild steel, forge one end down so it will go into the old end of pipe 3-4 of an inch. Forge with a fuller so as to have a square shoulder to fit against the end of the pipe. Insert into the pipe and weld. Cut off steel so as to leave two inches projecting from the pipe, and we have a splendid hollow driver, as shown.

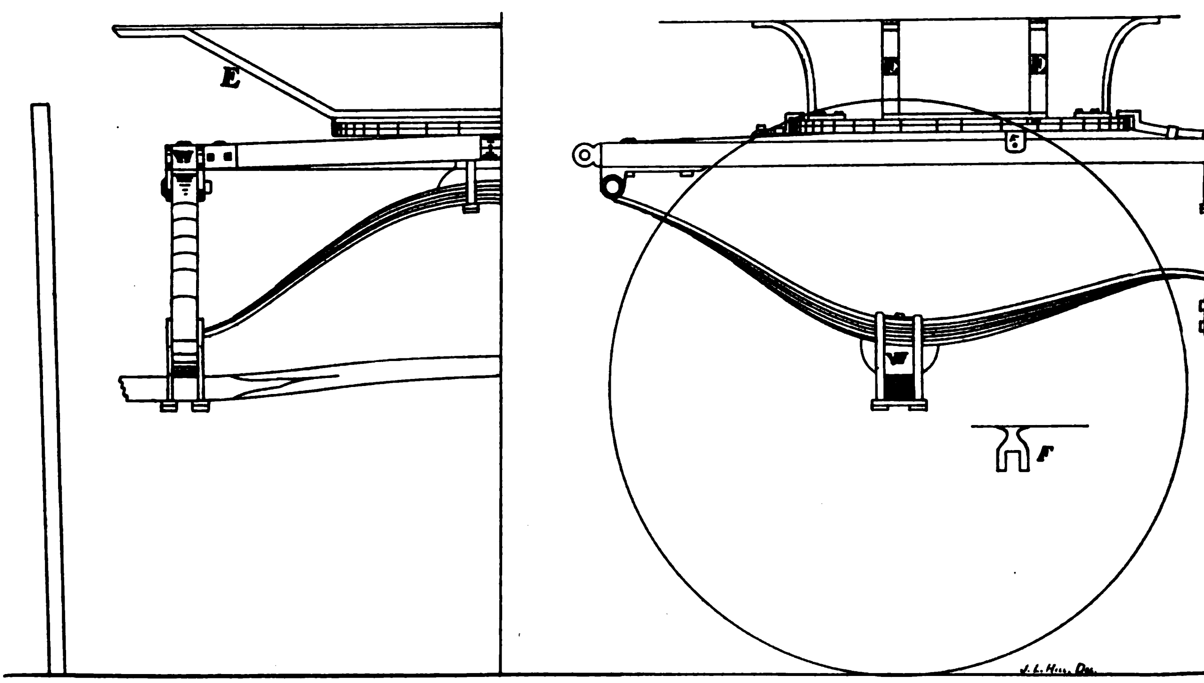
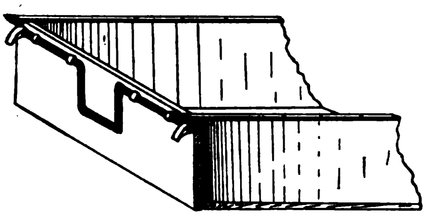


Fig. 2. HALF FRONT ELEVATION. Fig. 1. SIDE ELEVATION OF AN IRON WAGON FORE CARRIAGE.
(SCALE, ONE INCH EQUALS ONE FOOT.)

Now, we take a piece of 1-4 by 1-inch iron, 10 inches long, bend and weld it up into a ring and then draw one side so it is 3-8 of an inch larger in diameter. Next bring it to an oval shape. Get an old spike, and saw 6 inches off from the small end, and bevel one end, so as to make a wedge.

Having the extra tools required for this job, we take the wheel, mark tire and felloe, just as we would for setting tires, take the tire off and place the wheel on the wheel rack outside up. (When we speak of the top of wheel, remember it is the outside.) Mark one spoke (1), and felloe opposite (1). Now, mark all the felloes, so that they can be replaced, as they are taken off. Remove the felloes and place them out of the way. Put ring on a spoke with the large side next to the hub, insert wedge on the top of the spoke and with a few good taps with a hammer on the wedge the spoke is out. Now, we find the tenon at the bottom is bent towards the top. We dress off the tenon so it is straight, being careful not to dress any at the outer end at tenon. When we have the spoke brought to its original shape on top side of tenon, we place the spoke in the vise, tenon up and with the rip saw split it the whole length of tenon, 3-8 inch from the bottom of the spoke. Make a wedge the full length of the tenon and as thick at the point as saw kerf, and 1-16 inch thicker at the butt than what we dressed off, plus the width of the saw kerf, and 1-8 inch longer than the tenon. Insert the wedge in the spoke and take out of the vise (see illustration). Insert the spoke into the hub and take the hollow driver,



DEVICE FOR OPENING TAIL BOARD.

place it on the tenon of spoke in place of felloe, and about three good blows with a 4-pound hammer should send the spoke home. We want to know that the spoke is driven as far in the hub as it will go. Now for another spoke, and when we have all the spokes redriven, we find the shoulder of the felloe tenon is a trifle longer on the bottom of the wheel. We take the spoke auger and square up the shoulder. Now replace the felloes as they come off. We may find them from 1 inch to $1\frac{1}{2}$ inches too short. We won't put in a longer felloe, but bore the spoke shoulders off till the felloes are the right length, and as they come together we find they are

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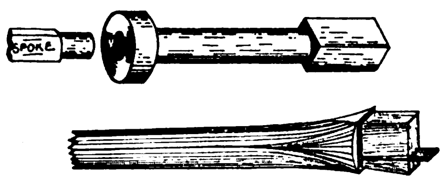
longer on the lower side. Run the saw through the joints so that they will fit up square. Now, we will wedge the felloes on, and we want them to fit tight on the shoulder of the spoke, and square and tight at each end.



HOLLOW DRIVER FOR SPOKES AND METHOD OF WEDGING TENONS.

We are now ready to dowel pin. Put a wood clamp over the joint to hold the ends of the felloes and bore dowel pin hole, using 1-2-inch bit. We want the pins to fit. (In case there are some other smiths like the one who was in my shop a short time ago and saw my boy making pins, and who remarked that my boy could make more pins in a half-hour than he could in a day and better, I will tell how I do it). Take a piece of iron 3-4 by 2 inches, punch a hole in it a little over 1-2-inch on one side and 5-8 inch on the other. Get some straight-grained ash or hickory,

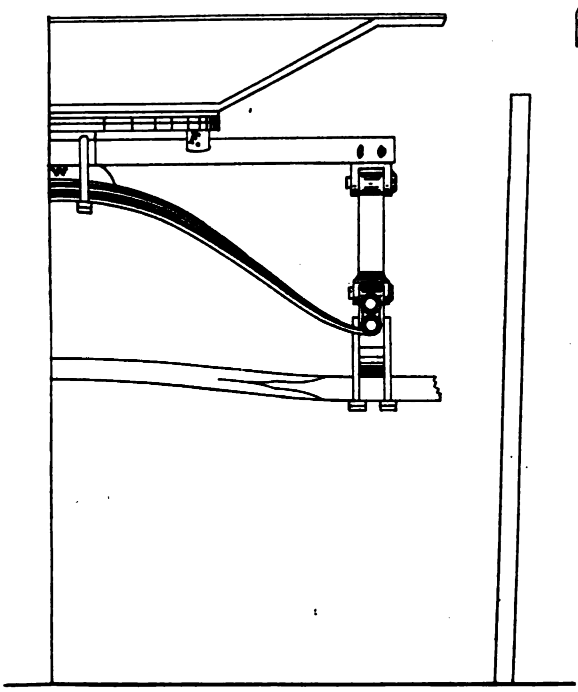


Fig. 3. HALF BACK ELEVATION.

saw in lengths of 6 to 8 inches, and split them up to about 1-2 inch. Lay the dowel pin iron on the anvil with small side of hole up and over the hardy hole; drive the pieces of wood through the hole in the iron and they will come out dowel pins as fast as you drive them in. Now, when we have all the pins in, saw off any wedges or pins, so that the rim of the felloes is smooth for the tire. In measuring for the tire, allow 1-8 inch cold for draw, and if we have been careful to have good fitting joints, we have a wheel as good as it can be made.

Iron Fore-Carriage for Wagons.

J. LAWRENCE HILL.

The illustrations presented for the readers' thoughtful consideration this month are somewhat in the nature of a novelty; not because they are impracticable, for those the writer has seen have stood the most severe strains, but because their use is uncommon; to many the idea may be entirely new.

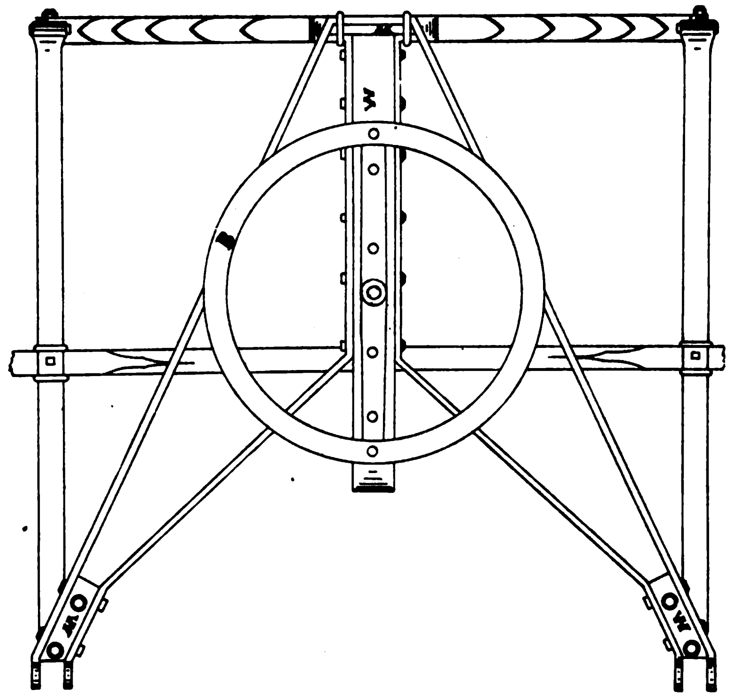


Fig. 4. PLAN VIEW OF IRON FORE-CARRIAGE.

The special features which commend themselves are simplicity of construction,—such that the man doing the smallest business with the minimum amount of tools can make,—easily repaired, and combine a lightness with strength that can not be obtained with a wood gear.

The only timber employed is marked W, and consists of three spring blocks, center piece, two pieces over the front end of the springs to which are bolted the scroll iron, and a filling in piece on the top of the cross spring.

Fig. 1 shows the side elevation; Figs. 2 and 3, the half front and back, giving the general appearance; Figs. 4 and 5 are more in the nature of detail drawings. B, C and D, Fig. 5, is a section at A; B, the lower portion of the fifth wheel; C, the upper, and D, the cross piece. On top of D is riveted the body support, E, Figs. 1 and 2. The scale for all drawings is the same; one inch equals one foot.

F, Figs. 1 and 3, is welded to the underside of the bottom part of the fifth wheel and riveted to the brace. An enlarged end view is shown in Fig. 1 to give a better idea of its shape. The braces are 1 3-8 by 1-2-inch iron, bent as shown in Fig. 4. Body supports 1 by 1-2 with 1-8 inch iron connecting each end to prevent spreading, fastened

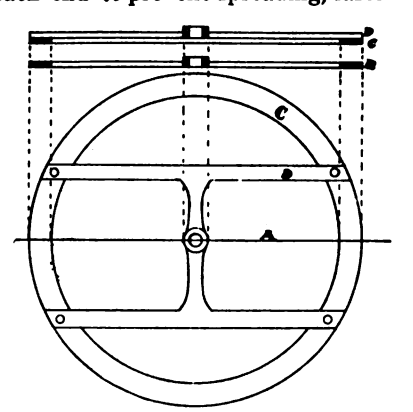


Fig. 5. PLAN AND SECTION OF FIFTH WHEEL.

at the top. Fifth wheel, 1-2 by 3-8 by 20 inches in diameter. Axle, 1 3-8. Springs, side, 38 by 1 1-2 by 7 inches; cross, 40 by 1 1-2 by 6. Wheels, 36; spokes, 1 1-4 inches. Bottom of body, 41 inches from the ground.

These can be altered to suit any requirements, although "taken from life."

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The Blacksmith's Dinner.

"I have brought your dinner, father,"
The blacksmith's daughter said,
As she took from her arm a kettle,
And lifted its shining lid.
"I haven't any pie or pudding,
So I will give you this;"
And upon his toil-worn forehead,
She laid a childish kiss.

The blacksmith tore off his apron,
And dined in happy mood,
Wondering much at the savor
Hid in his humble food.
While all about were visions,
Full of prophetic bliss,
But he never thought of the magic,
In his little daughter's kiss.

While she, with the kettle swinging
Merrily trudged away,
Stopped at the sight of a squirrel,
Catching some wild bird's lay.
And I thought of many a shadow,
In life and fate we would miss,
If all our frugal dinners,
Were seasoned with a kiss.

HEATS SPARKS WELDS

August.

Month number eight.

Have you been to the Fair?

Now what do you think of power in the shop?

Never too late to mend,—also, never too early.

"A friend in need is a friend indeed,"—buy a gas engine.

Don't forget about our premiums and prizes given for new subscriptions.

Does the horse go lame now? What did you do to cure him? Send it in.

"A rolling stone gathers no moss"—but think of the pleasure it has in traveling.

That photo of your shop—have your sent it in yet to be reproduced in these columns?

Your trade is just what you make it. Advertise low prices and you will never get anything else.

The biggest horses are not always the best travelers; the loudest talkers are not always the best workers.

How much wood would a wooden saw saw? Choose or make your tools for the precise work they are to do.

Fly time now. A good pair of horse stocks will hold bad ones for the shoer, even when the little pests are at their worst.

That reminds me—perhaps you don't need a reminder about that job left undone, or that new comer unsolicited for custom. Perhaps you do.

Organization—what do the craftsmen in your locality think about this subject and higher prices? Some one has to start the ball rolling—why not you?

One smith we know of adds a neat sum yearly to his profits by making butcher and other kinds of knives. What extras have you?

Send it in. Every craftsman doesn't do things as you do them. If you employ any tool or method not generally known, let us hear from you.

Every man is the better off for a hobby, or some interesting pursuit outside his regular work that takes him away from his daily routine occasionally.

Buy, sell or rent a shop through an ad in our Wanted and For Sale columns. Many smiths use the same means for obtaining help or employment, also.

Your sign,—have you looked at it lately? We have seen several signs in the past month "crying" for paint. Is yours one of them? Call on the painter *now*.

Fools can find faults that wise men can't mend, but don't let that keep you from sending in a just criticism of any statements you find in this journal.

Coming are the days that make the perspiring craftsman wonder if after all he has not chosen the wrong vocation in becoming a blacksmith rather than an ice man.

The United States is the largest apple growing nation in the world. Over a hundred million barrels every year. Some smiths run cider mills in connection with their shops.

To prevent rust from forming on steel articles, place a lump of freshly burnt lime in the drawer or case with them. The lime absorbs a great deal of the moisture which causes rust.

"**Delighted**—best paper I ever saw!" That is what American Blacksmith subscribers say. When the time comes to renew, don't forget the special subscription rates for two or more years.

A hoof knife is one of the most popular articles on our premium list. Do you need one? Get some brother smith to subscribe to The American Blacksmith, and the knife is yours, free, postpaid.

A giant as far as screws are concerned, was completed some weeks ago in England. This screw, which weighs over 17 tons, is 85 feet long and was made from one bar of steel. It is the largest in the world.

"A welcome visitor to my shop." So writes many an enthusiastic craftsman about The American Blacksmith. Why not introduce this visitor to your neighbor? Send in his name and we will send him a sample copy for inspection.

Your competitor—did you allow him to get ahead of you in soliciting for new business? Of course, it's not going to happen again,—you know the value of the present, and how can he get ahead of a person always doing things *now?*

Spare time—many have climbed above the common-place by employing it profitably. *Time* is money, but *spare-time* is the money invested at 50 per cent., and paying a daily dividend. What do you do with your spare-time? Is it profit or loss?

Your brother craftsmen.—did they hear from you last month? Did you tell them of your convenient shop, your side-line, good prices, the systematic way you have of doing work? Let them know you are alive and willing to tell them anything not generally known about the craft.

A place for everything—a common enough saying, but one that means time and money to the methodical man who follows it. Of course, reader, your tools are always where you can put your hands right on them in the dark, your stock piles neat and in order, so this doesn't apply to you.

Advertising—what do you do in this line? It isn't a side-line, but is *one rail* of the main track. If you don't use it, your train of business will be "ditched." There are such things as one-rail roads, also business without advertising, but they are out of the ordinary,—they are not substantial. Get out a neat circular or hand-bill,—it need not be elaborate, but don't have it suggest rags and scrap-iron. Have it call out before one reads a word, *Work neatly done.*

A sad look covered Tom Tardy s face the other day when we dropped in to see our friend. It seems he had been doing some figuring, and that, not counting some items he carried in his head and wasn't sure about, he found he had over five hundred dollars that had been due him over three years. "What have I done about collecting? Well, I sent statements to most of 'em last November, but they didn't pay no attention. They owe it, and they ought to come in and pay."

The queerest horses in the world, as far as feeding is concerned, are probably those on a ranch in Western Australia. The ranch borders on a river, which widens into a pool, where the horses drink. During a drought five or six years ago, every bit of feed having been burned or scorched, an old mare discovered that there was plenty of luscious feed at the bottom of the pool which she could procure by wading and diving for. The succeeding generations of foals which she reared have all followed her example and appear to prefer it to the land feed.

A stream of water, having such a pressure and flowing at such a high rate of speed that an axe, no matter how heavy a blow is struck, cannot cut it, is operating a Pelton water wheel for a Nevada mining company. The axe will rebound just as it would from a steel rod traveling at high speed. The capacity of the wheel is over 100 horse-power, though it is but three feet in diameter. The head of water under which it operates is 2100 feet, equal to a pressure of 911 pounds per square inch, the outer circumference traveling at a speed of more than two miles a minute.

A despatch to the New York Times from St. Petersburg, under date of July 10, reads:

"At 10 o'clock, under heavy pressure our rear guard retired on our position at Makhuntsguiga and Yoalintas, three miles north of the Shuanlunsa Pass. The rear guard held this position under a heavy fire until 2 o'clock in the afternoon, when, in accordance with instructions, it retired slowly and in perfect order on the third position at Tchjoutzziandiandza, just as our main body was concentrating at Datchapu and on the position at Makhuntsguiga."

Our heartfelt condolences to all future Russo-Japanese war historians.

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American Association of Blacksmiths and Horseshoers.

What have you done about getting the shops in your vicinity organized? Have you spoken to any of your brother craftsmen to find out what they thought of it? There must be some one to start the movement, and why should you not be the one?

Only about four months more remain now before cold weather and brisk business, giving ample time, if taken up at once, to get all the shops solidly organized into a harmonious body and prices raised to the level they should be.

Some one must undertake to get things going in your locality, and why not you? Send to us for the plans that we furnish free to any who think that their labor is not netting them what it should. Talk up the matter with brother smiths. Try it, and see if your county isn't really ripe and waiting for an opportunity of "getting together," to the splendid benefit of all concerned. Write us for plans today.

A meeting of the blacksmiths of Nemaha County, Kansas, was held on July 4 at Seneca, and was well attended in spite of the bad condition of the roads and uncertainty of the train service. A rousing meeting was held and two committees appointed, one on "By-Laws," and one on "Prices," to report at the next meeting of the Association, which is to be held at Seneca on August 7.

A meeting of the Seneca County Branch Association, New York State, was held at Ovid on July 9. After the usual business of the meeting was attended to, it was voted to divide the county into a north and south branch, and for the latter the following officers were elected: President, A. D. Marsh, Ovid; Vice-President, S. A. Darrow, Farmer; Secretary, Fred Griswold, Ovid; Treasurer, Ellis Crane, Kendaia.

Welding Locomotive Frames While Under Engine.

W. B. REID.

A correspondent asks: "Do you approve welding locomotive frames while frames are under engine?" The question is somewhat invidious, and one which most blacksmith foremen seek to evade from the conviction that the practice is of far less value and utility than is apparent to the minds of mechanics other than those familiar with the principles of sound blacksmithing.

However that may be, the subject is an important one. It is very evident that the requirements of modern railroad service demand some method of repairing frame breakage other than the delaying and expensive alternative of dismantling a whole locomotive to take the frame to the blacksmith shop; the more especially as the facilities in the average repair shop for handling such

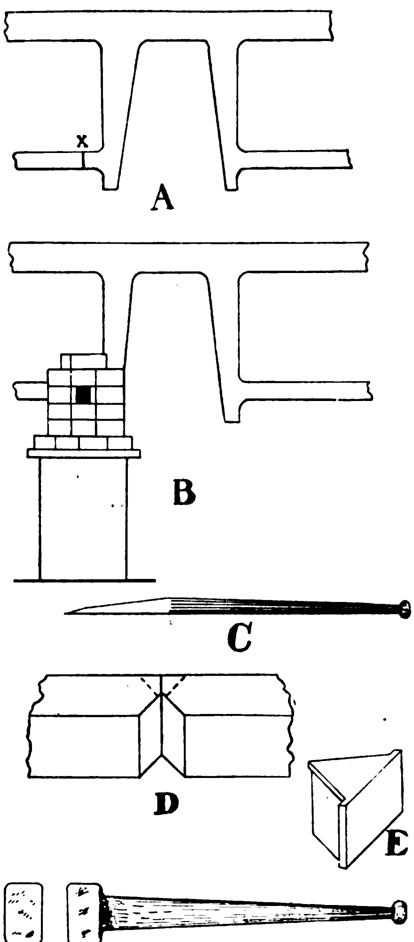

Fig. 1.—TOOLS USED IN WELDING LOCOMOTIVE FRAMES.

frames have not kept pace with the ever increasing weight of same.

At the present time the welding of frames, in place, is followed to a limited extent on many roads, and without a doubt, by means of electrical and chem-

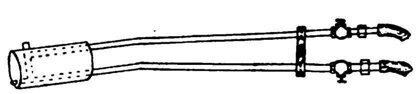

Fig. 2.—OIL BURNER FOR HEATING FRAME.

ical processes now being experimented with, the method will be so perfected at no very distant date, as to become generally practicable.

While the writer has had no personal experience in the matter, he is familiar with the method of welding frames on engines as practiced by several large shops, whose foremen have no objection to having a description given here for the readers of the AMERICAN BLACKSMITH.

Fig. 1, A, shows section of locomotive frame, the bottom rail of which is broken at X. First it is necessary to remove the wheels, and other fittings in the way of the smith, giving free access to both sides of the frame.

The rail is then securely braced to the opposite frame to keep it firm and immobile during the scarfing and welding operations to follow. A simple, improvised furnace of common firebrick and clay is then built around the broken part, Fig. 1, B, closely and compactly, to confine the heat as much as possible at the point to be welded.. The furnace is closed up at back, leaving an open space of one or two inches at top to permit the circulation of the air and flame. The side from which the frame is to be first welded is left entirely open for the insertion of the oil burner, and for the scarfing and welding operations which are all done without breaking down the furnace.

The frame is first welded from the inside so as to have the slight bulge, likely to result, upon the outside for easier manipulation with second heat.

The scarfing is done with a long chisel bar, Fig. 1, C, reaching across from opposite side of engine, cutting out a small V-shaped piece, Fig. 1, D; when this has again been brought to a good white heat, the cavity is cleaned out and a V wedge, Fig. 1, E, inserted cold. This wedge, it will be observed, is made with a cap or flange all around which enables it to be hung up neatly in the cavity of the rail and overlapping slightly the outer edge of the scarfed rail.

When the mass has again been brought to a good welding heat, it is welded with a long steel bar used as a ram, Fig. 1, F, shaped on end like a round-edged, narrow set-hammer. When one side has been welded in this way, that end of the furnace is closed up, the other end opened and operations repeated. To allow for shrinkage, the broken parts must be pulled apart, at least 3-16 of an inch at the very outset before beginning operations.

Crude oil is the fuel used. The burner is of very simple construction, consisting of a piece of 2½-inch round brass into which two 5-32-inch holes are drilled as shown by dotted lines, Fig. 2. The air and oil pipes fitted into one end of it are fully five feet in length, to allow its manipulation at a safe distance from the flame. These pipes are also bent as shown, to allow the free use of the welding bar while still using the burner. The burner is connected to a 30-gallon tank with suitable lengths of hose. The

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tank, made from an old air cylinder, is conveniently mounted on wheels for moving around. The air enters the oil tank, thereby ensuring an equal pressure upon the oil and the burner. In operation the burner is held from 6 to 8 inches away from the metal, according to the way the oil burns. From four to five hours are required to weld and finish frame in this manner. Owing to the difficulty in the way of effective manipulation, as good and well finished a job cannot be secured as at the anvil, and the result on the whole cannot be considered of the most reliable and satisfactory kind, from the standpoint of good blacksmithing.

A method sometimes practiced is shown in Fig. 3, which consists in inserting a piece of iron between the fracture and welding together. This is the worst kind of practice, and a reliable weld is impossible under the circumstances.

By the method first described, fairly good results have been obtained, justifying its continuance in the attempt to overcome this constant source of annoying inconvenience in railroad service—the broken frame.

The Progressive Smith as a Business Man.—10.

How to Accumulate or Procure Money to Buy a Smith Shop.

BILLY BUNTZ.

The progressive smith knows that he but needs to step out among the people to notice how thoughtlessly or carelessly folk in general spend money, in contradistinction to the way he had to do in saving or accumulating to buy his smithshop.

Indeed, having a capacity for earning money is quite a different thing from having the ability to save it. Oftentimes a workman who makes three or four dollars a day is heard to say, "I can't save anything!" Should he be pitied or censured? True, some men have large families, a great deal of sickness, or meet with unfortunate reverses, so that at times they are unable to save, but many men are naturally careless or wasteful in handling money, not knowing how to live without emptying their pocket every time it feels a little heavy.

The principle of true saving is not so much a matter of *hoarding dollars*, as it is the *practicing of self-restraint*, or spending only when it is considered absolutely necessary or essentially judicious. A parsimonious man, who is always thinking about the "mighty dollar," or continually endeavoring to hoard thousands of them like a miser, is seldom liked by anybody, as his greed causes him to not only deny himself many good things that he could well afford, but to refuse to spend for worthy causes.

On the other hand, there is the frugal man, who suppresses expense on himself or his indulgences, whilst likely being liberal with others.

Then there is the economical man, with more or less ability as a manager—especially in handling money—by regulating his expenses according to his circumstances or adapting his expenses to his means. Economy cuts off wasteful expenditures, extravagance, or the spending of money superfluously or lavishly, hence this kind of saving merits approval, as the money can be invested or put to good uses; while the man who hoards money for money's sake, or the man who spends it thoughtlessly or carelessly, seldom reaps any real benefit. Perhaps worse still is the man who spends recklessly or uses his money as though it were a weapon. It is the bad uses to which money is put that makes it "the root of all evil."

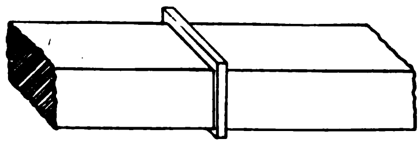

Fig. 3.—AN UNRELIABLE METHOD.

So intense is the desire of the average man to spend money as soon as it is dropped into his fist, that it has been said that were all the money in the universe to be equally distributed among the people, few of them would be able to hang on to any of it, thereby allowing it to get back into the same hands whence it came. For this reason, as well as other obvious ones, rich folk are loath to aid poor people, knowing if a man can't become self-reliant while he is working or earning money, that nobody can do much to help him, beyond trying to make an impression on him by giving him "a barrel of advice" on how to better his condition. However, it often happens that a poor man will buy things that are little needed, simply because he can't get the habit of saving.

Then there is the man who insists upon living in a trust-to-luck fashion, spending and having a "good time" with every dollar he gets. Were he censured, he would say, "Guess it's my business, not yours!" However, very few people care how he gets along. If he himself can't see any good in saving, he may as well be allowed to dwaddle, spending it quickly for fear it might burn holes in his pocket.

The habit of saving is best acquired at an early age, although there is no good reason why even an old man can't learn it. Many a progressive smith of today not only became expert in smithing while serving his apprenticeship, but by being watchful, careful and economical in handling his earnings he acquired the *habit of saving*, as well.

Our friend Jones, whose success as an advertiser was given in the August, 1903, number of THE AMERICAN BLACKSMITH (page 215), saved money during his apprenticeship by following the advice of his parents, relatives, employer and others who were interested in his welfare.

"Although your income will at first be small," his father told him, "yet if you hope to save to buy a shop you must deny yourself from going to every circus or the foolishness of spending money on 'goodies;' rather, you should save what little you can and invest it as opportunity presents itself. It'll make a man of you; it's for your own good."

His uncle next took him in hand.

"The habit of saving," the uncle said, "is seldom acquired instinctively, else most folk might become well-to-do, although sometimes it does seem that some men had inherited a bit of thrift from their ancestors, but it is more likely they received a lesson from their early surroundings or bringing up that gave them the incentive which at once started them in the path of 'a penny saved is a penny earned.' However, the habit of saving is acquired more generally through the *practice of economy*, and is something with which a novice must for a while grope in the dark, as he would in learning an art or serving an apprenticeship at a trade. It is not always so much the *amount* that is saved, as it is to get the habit of practicing economy thoroughly instilled into a man's make-up. Here's our banker; ask him about it."

"The habit of saving, young man," said the banker, "is an art unto itself. It brings self-reliance, independence. The man who doesn't save has no security or visible assets, and is so treated in the business world, therefore nobody is willing to trust him beyond a small loan, dependent upon the size of his job, his character and reputation, and the worthiness of his friends. By saving money you can make business investments, buy a home or a work-

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shop, or aid good causes, while by spending all your earnings you're like a ship without a rudder—you don't just know where you will land, if you succeed in landing at all. The theoretical idea that the man who makes the most money ought to be able to save the most, seldom 'pans out' practically, for the reason that all folk do not live alike; many are extravagant; quite a few are careless, while some, on account of their recklessness or inclination to spend every cent, are known as 'spendthrifts.' Nobody can save if he doesn't try. The man who would save must watch his expense account,—particularly the personal items. It has been said that a dollar requires more watching than a thief."

Having been thus advised, young Jones signed a contract with an expert smith to serve an apprenticeship.

"Your regular duties," said the smith, "are to keep the shop clean, the tools in place, and help me. You can begin on that old buggy out there, taking it apart and saving all the good bolts, nuts and trimmings."

While he was working he watched him and told him how to handle the job. "I paid only a dollar for it," he said, "and expect to run a couple of the wheels in on repairs."

Likewise young Jones handed him tools and watched him shoe until one day when no one was around he let him try his hand, correcting him as he worked.

"I'll let you do some wagon work next year, but first I want to get you well started on shoeing. In the meantime you might buy So-So's book on shoeing; it'll give you some good ideas in connection with your practice.

THE AMERICAN BLACKSMITH advertises a number of good books for the apprentice or smith. They cost only a dollar or two, while the practical instruction they contain brings a craftsman to perfection. "He who empties his purse into his head, nobody can take it away from him." Nothing earns money so fast as *human energy*. Hence the better the workman or the greater his capacity for work, the more money earned. A thousand dollars at interest brings at most only a hundred dollars a year in interest. The smith who increases his ability and capacity for smithing by reading practical books and using up-to-date tools, increases his income the same as he who has money at interest becomes more progressive and *saves money*. Expenditures which bring profitable returns are *economical*.

"I completed my apprenticeship in about three and a half years," Jones would say, were he asked. "The first year I saved only $10, although I bought several trades books and a set of tools. The second year I saved $50, the third year $100; the fourth year I got smithing wages and saved $200. Some apprentices might have a hard time doing as well were they to have any drawbacks, while others might easily do better, but the fact that I acquired the habit of being economical had much to do with my future success. With this $350 I made my first payment down in buying a smithshop. It was my stepping-stone, otherwise I might now be working for somebody else. I also found to be true the saying, "Success makes success as money makes money." Having succeeded in some ways, I continued to follow the same principles that first helped me, spending my dollars as I thought they would bring me profit, or banking them when I was undecided."

The accompanying table shows what per cent. of his wages the smith pays who is a renter. The progressive smith knows that the brother who does not or will not save is hopelessly chained to the landlord, because, being without money, he has little or no credit, therefore can't buy; whereas, if he would begin *now* to save a little he would soon become self-reliant and independent. The smith who has saved from $200 to $500 can invest it in real property, or use it in part payment, giving the present owner a mortgage on the shop as security for the balance; or he can borrow the balance from the bank or loan company and give them the mortgage. The following table shows—

The Cost of a $1,000 Loan.

To Run	At 6 Per Cent.	At 5 Per Cent.
3 years	$1,180	$1,150
5 years	1,300	1,250
6 years	1,360	1,300
8 years	1,480	1,400
10 years	1,600	1,500

No smith should pay more than 5% or 6% for a loan. Almost any smith can pay off a loan of $1,000 in five or six years; in which time he would have paid less interest on the loan than his rent would have amounted to had he continued paying out money toward the support of a landlord. Where the home bank does not do a general loan business, the smith can readily obtain money of a Building and Loan Association. The latter may give him the privilege of paying off the loan in monthly payments of $10 or $15 a month, as well as of decreasing the loan by a lump payment at any set time.

No smith would like to hear his landlord say, "You paid for this shop, my good friend, during the ten years you have rented it, although I had to borrow the money in the start, the same as you could have done; but the difference is, I own the shop,—you don't own a stick in it."

Smiths, *become your own landlords*.

The next issue of THE AMERICAN BLACKSMITH will contain "How to Buy a Smithshop."

Per Cent. of Wages Paid For Rent.

	WAGES.		
Rent Per Month	$2.00 Per Day	$2.50 Per Day	$3.00 Per Day
$10	20%	....	....
12	24%	18½%	....
15	30%	23%	20%
18	....	28%	24%
20	....	....	26½%

The averages of above table are: Wages, per month, $63.33; rent, $15; percentage of wages paid for rent, 23¾.

These figures presuppose that the smith is a renter; that he works 26 days every month, and earns the maximum amount of wages. The loss of only one day during the month decreases his income and increases the ratio of his rent to wages earned; the rent goes on whether he works or not.

The smith who makes wages as above, after having deducted his incidental expenses, can readily see what a large percentage of his earnings goes for rent. The same table applies to renting a home. However, the salaries quoted are not intended as standard for any smith, being used merely to show him where his money goes should he be earning wages and pay rent as above mentioned.

A Treatise on Horseshoeing.—7.

JOHN W. ADAMS.

Shoeing in Connection with "Interfering," etc.

A shoe to prevent interfering is shown in Fig. 12. It is a narrow right fore hoof of the base-wide (toe-wide) standing position, shod with a plain "dropped crease" shoe. The dotted line at the inner toe indicates the edge of the wall which was rasped away in order to narrow the hoof along the striking section. Note the inward bevel of the shoe at this point, the dropped crease, the distribution of the nails, the long,

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full inner branch, and the short, close outer branch.

Fig. 13 is the hoof surface of a right hind shoe to prevent interfering. The inner branch has no nail holes and is fitted and beveled under the hoof. Note the number and position of the nail holes, the clip in the outer side-

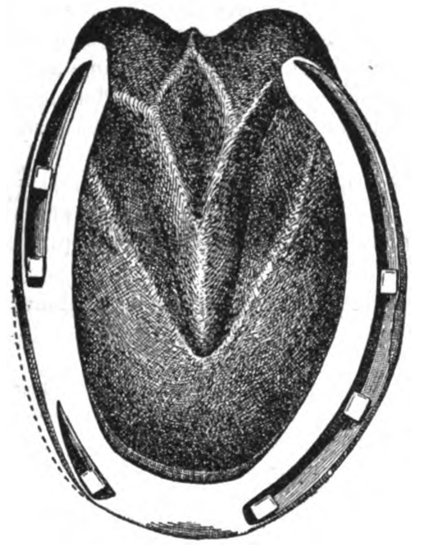

Fig. 12.—A SHOE TO PREVENT INTERFERING.

wall, and the narrowness and bend of the inner branch. The inner nailless branch has the thickness of the outer branch plus its calk, so that the inner and outer quarters of the hoof are equidistant from the ground. The ground surface of this shoe is shown in Fig. 14.

Fig. 15 is the side view of a fore hoof

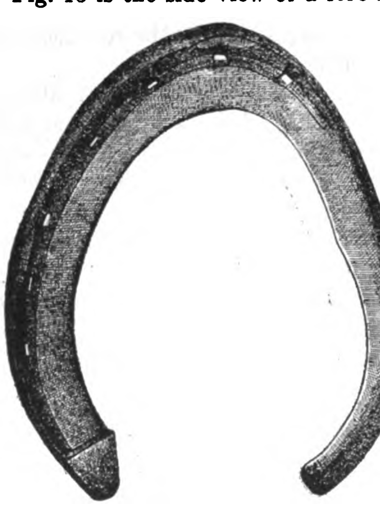

Fig. 13.—A RIGHT HIND SHOE TO PREVENT INTERFERING.

shod so as to quicken the breaking over (quicken the action), in a forger. Note the short shoe, heel calks inclined forward and the rolled toe.

Fig. 16 is the side view of a short-toed hind hoof of a forger, shod to slow the action and to prevent injury to the fore heels by the toe of the hind shoe. Note the elevation of the short toe by means of a toe calk and the projection of the toe beyond the shoe. When such a hoof has grown more toe, the toe calk can be dispensed with and the shoe set further forward.

Fig. 17 represents a toe-weight shoe to increase the length of stride of fore-feet. The nails should be placed farther forward than they are in the illustration, which shows them too far back, although the weight is properly placed.

In Fig. 18 is shown the most common form of punched heel-weight shoe to induce high action in fore feet. The profile at the right of the shoe shows a roll at the toe and swelled heels. The weight is well placed, but rolling the toe and raising the heels lower action. The shoe would be much more effective if of uniform thickness and with no roll at the toe.

Fig. 19 is shown to illustrate an ice shoe for a roadster. It is a right fore shoe. The toe and outer-heel calks cut at right angles, and the inner calk is slender and blunt. The back surface of the toe calk should be perpendicular.

The Making of a Plow Share.

BARRY BUSH.

The following is my method for making a plow share with short landside. The first step is to make the landside point. Use 3 by 5-8 inch iron or mild steel. Cut off piece about twelve inches long and split diagonally from end to end, making two points. Split as though making for left-hand share. This leaves the right hand side high. Forge the high edge over until the scarf is formed, say 3-8 of an inch wide. Now fit the point to the frog of the plow bottom. If the bottom is worn, let the landside point extend below the bottom from 1-4 to 1-2 inch and straight or parallel with the bottom. Also straight on the side. If the frog of plow bottom is sharp where the landside scarf fits on, chisel off enough to let it fit up closely. Now clamp the landside on the plow bottom and be sure it is the right shape.

I now build up a good fire with green coal and by the time I have my shape fitted, I have a good fire to weld up. I fit any shape so that it will project over the edge of the landside point about 1-8 of an inch at the heel and flush at the point, and just a little straighter than the bend in the top of the landside point. When properly fitted drive on clamp so that the shape will fit tight all along. Take the share off the plow bottom and stand straight up in the fire flat on landside. Do not turn the share in the fire. I take the first heat at the point, but this is at the discretion of the operator. Do not get it too hot. I borax both sides. When taking from the fire be careful and not break down your fire and the first few

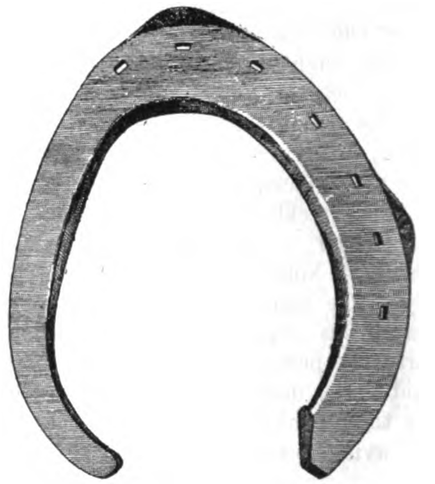

Fig. 14.—GROUND SURFACE OF SHOE IN FIG. 13.

blows; do not strike too hard, but rather slow and pressing blows until you see that the parts are stuck, then quick smart blows until the heat is gone. Then put back into the fire, after taking off the clamp and cover deep. Stand the share up straight and do not uncover or turn over to borax, as the borax will run down all right. You can watch your heat without moving the

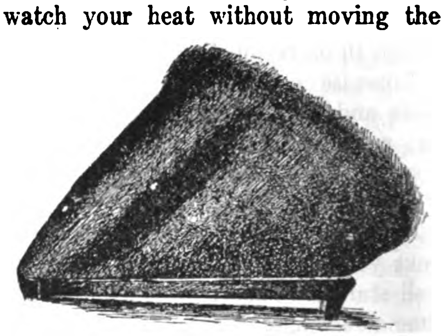

Fig. 15.—FORE HOOF SHOD TO QUICKEN ACTION.

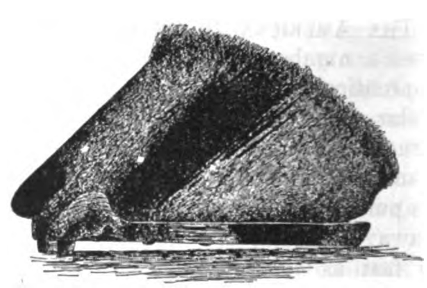

Fig. 16.—HIND HOOF SHOD TO PREVENT FORGING.

share in the fire and when ready, take out on the anvil and proceed as with the first heat by sticking the top first, then turning over and welding scarf. For welding, I have a hammer with a cross pein long enough to reach over the widest part of the landside with which I weld scarf on the under side. Then hammer back the part that pro-

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jects over the landside point and this gives you a nice high edge. I think the scarf a good thing, as it gives a weld fully an inch wide. Now see that the share fits and is true all around and double under your point and finish.

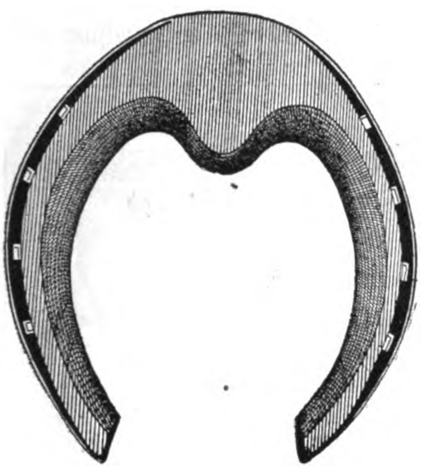

Fig. 17—A SHOE TO INCREASE STRIDE OF FORE FEET.

On new plows the edge of the share should be square with the landside plate the whole length.

I have been making nearly all the plow shares for twenty miles around Oberon, Kas., for the last twenty years as well as keeping them sharpened,

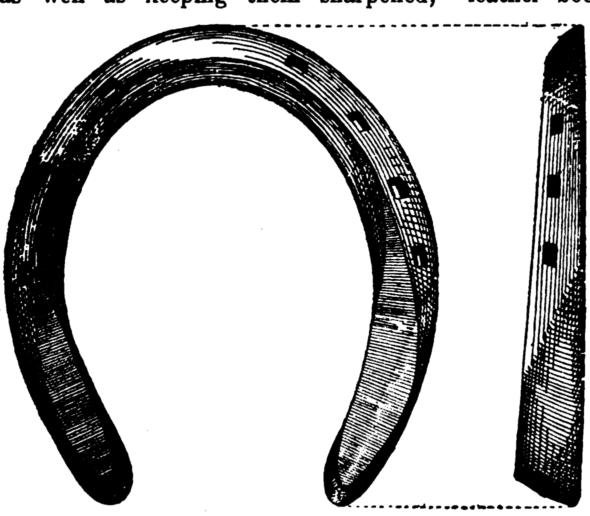

Fig. 18.—A HEEL-WEIGHT SHOE TO INDUCE HIGH ACTION.

so that I think you can find some information in the above article.

Some Prices From Montana.

W. T. GILMER.

Horseshoeing, set of four, new	$2.00
Setting four old shoes	1.50
Neverslips, new, four	2.50
Buggy tire, set of four	4.00
Wagon spokes, each ($1.00 extra for setting tire.)	.40
Felloes, each ($1.00 extra for setting tire.)	.45
Wagon bolsters	4.50
Wagon sand bolsters	4.00
Wagon tongues	$3.00 to $5.00
Wagon axles	$7.00 to $7.50
Wagon reaches	$3.00
Plow sharpening	.50
Plow pointing	1.50

Treating a Badly Torn Hoof.

FRANZE WENKE.

Last month a very fine wheel-mule of a six-mule government team, got her shoe caught in the railroad track. The shoe having been on about 3 weeks, was very tight. Disengaging the foot, the mule fell, wrenching the shoe off, and also the wall of the hoof, from the third nail hole on the inside, to between the second and third nail hole on the outside. The hoof was torn clear off the sensitive laminæ, exposing the coffin bone, as much of it as a silver half dollar, but, remarkably, left the whole sole up to the white line. The mule had to march 17 miles the same day, before coming to the post.

The next morning I took hold of her, and with a hose and cold water reduced the inflammation. I then packed the sore with oakum and a solution of corrosive sublimate, 1-1000, and put on a leather boot. I noticed at the same time that the mule sprained her leg from the knee down to the fetlock, and especially the suspensory ligament was swollen the whole length. After continuing the above treatment twice daily for three days, I put on a bar-shoe with Neverslip caulks, but let it bear only from the heels to the fourth nail hole. I put a heavy piece of felt under the shoe next to the hoof. In front of the shoe I put a three-inch high clip, made out of a piece of stovepipe, fastened with three small screws to the shoe. I then packed the sore again with oakum, but used pine tar in place of corrosive sublimate. On the sprain I used a liniment, composed of 8 oz. Olive oil, 4 oz. turpentine, 4 oz. ammonia, 2 oz. tincture of opium and 1 oz. of gum camphor. For the first three days I had to water the mule with the bucket, but after that could lead her out to the trough. In about two weeks I expect to take the felt out and substitute only a thin layer of leather. During the first three days, I had the mule fed nothing but bran mashes and her drinking water had a tablespoonful of nitrate of potassium (saltpeter) to the bucket of water, so as to keep her bowels open. This feeding and watering, I do now every third day. The lameness almost disappeared altogether, ani in two months she'll be ready for duty again. The mule weighs 1,600 pounds. I believe cleanliness, not too much interference, and open bowels, to be the most essential treatments in such cases.

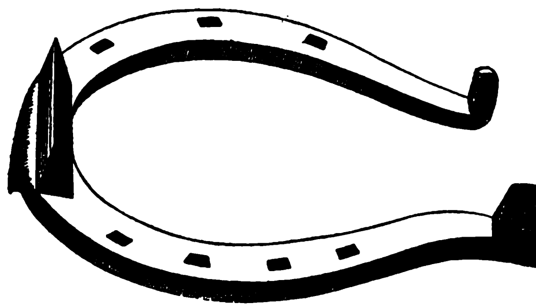

Fig. 19.—AN ICE SHOE FOR A ROADSTER.

Forging Gaffs For Game Cocks.

THOMAS J. GOOGERTY.

I will try and explain how to forge a set of gaffs for game cocks. Of course, there are many kinds, so I will confine my explanation to one kind only.

The first thing in order is to get some good tool steel, as it does not pay to use anything that is poor. Avoid overheating and use a slow blast so you get a uniform heat. See that your fire is free from sulphur and use plenty of coke on it. Harden at as low a heat as it will stand; results will be better. Take a piece of Jessop's tool steel, 3-4 inch square or octagon; take a heat on the end of a piece and fuller it on three sides about 3-4 of an inch from the end (note A of Fig. 1). Now, draw it back from fullers and square it up to about 1-2 inch; take a heat on the end and set on outside corner of anvil and work it up round and high, say about 1 inch high and 5-8 of an inch round, and draw the shank out small and round close to socket and cut it off so it will look like Fig. 1, B.

Now, anneal the piece and take it to the drill press and drill a ⅞-inch hole, or any size you may desire, through the socket. It should now be ground or filed down to a scant 1-16 of an inch around the hole.

You may now take a flat file with the edge 1-16 of an inch thick and file a slot crosswise 1-4 inch deep and draw the shank out as shown in Fig. 1, C. Next, heat this slotted end of socket and, with a small bail hammer, pein it over the point of horn so it looks like D.

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Now, we will heat it by placing this turned lip in fire; when hot set it on anvil with lip up. We will now take a punch with an end ground short like a center punch and set it in hole of socket, and with a light hammer strike the tool with quick rebounding blows, turning tool as you strike; also strike the lip with

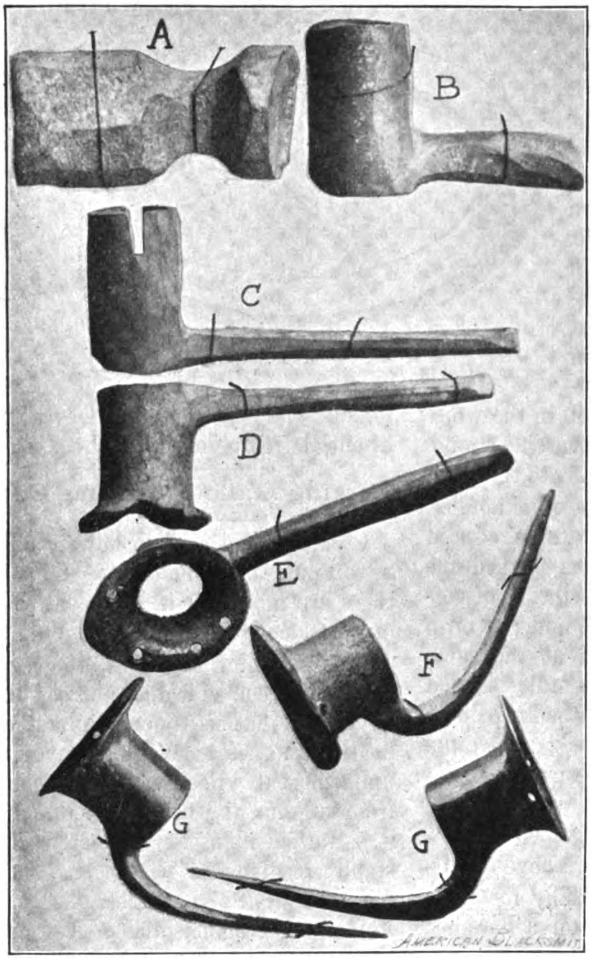

Fig. 1.—METHOD OF FORGING GAFFS.

hammer once in a while so as to get lip wide and flat. In doing this, care must be taken so as to have heat on lip (note Fig. 3).

When this is done, the socket will be about 1-2 inch high instead of 1 inch, as we started with. You may now take a file and dress up edge of lip, and also drill 6 small holes in it to sew the leather on and it will now look like Fig. 1, E. Now, draw the spur out and shape it up so it will look like F, or any shape and length you desire to make. It may now be filed to right size and all finished up except point, which ought not to be sharpened until it is tempered. Give the spur a graceful taper from socket to point, without any kinks, and when it is finished it will look like GG, in Fig. 1.

To temper them, I will say to have a good charcoal or well burned coal fire, so that the sulphur is well burned out. Take the well burned pieces and tap them down in center of fire till you have a nice bed of coke with an even heat all around the center of fire. Take hold of spur by socket with a small pair of tongs, and without blowing, have fire very little hotter than you want to make spur. Move it around and coax

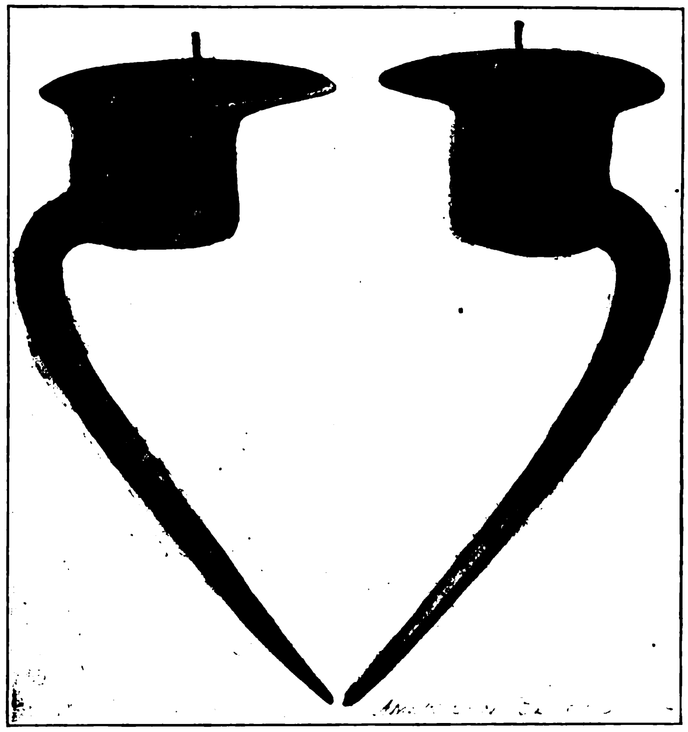

Fig. 2.—THE FINISHED GAFFS.

heat into spur slow; as low a heat as it will harden is right—a low red. Have a cup of oil on edge of fire and dip spur into it until cold.

Now brighten it off. The brighter the better (see Fig. 2). Take a little oily waste and rub on spur and draw it on a hot iron or hot sand until it is about a dark brown color and lay it away to cool. No fixed rule applies to this. It is a matter of skill which comes by use. The spur may now be ground to a point and polished and the leathers sewed on, and they are ready for execution.

An Axle Tram for the Repair Shop.

C. S. S.

The accompanying sketches show my kind of an axle tram for the average repair shop. It is very handy, easily made, and inexpensive. First make a trestle so as to stand about three feet high, of a length to take the longest axle used. The left hand end of the axle (B) rests in the crotch (C), the crotch sliding in the arbor (D) for different lengths of axles. The crotch has a nut on the under side to hold it in place. The right hand end of the axle rests on a gage (E), the left hand end of which works on a hinge, so as to raise and lower the other end, to suit the set as desired. The right end is adjusted by a screw bolt passing up through the end of trestle under the gage. The end of the trestle has a slot for the end of gage to work in. There is a ½-inch pin (G) at the collar upright in the trestle, and also a movable post (H) in same at the point

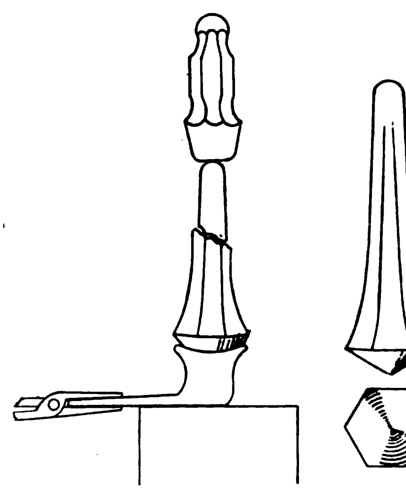

Fig. 3.—TOOL USED IN SHAPING GAFFS.

of the spindle to give the gather. To set the tram for use, stretch a line from crotch to gage and adjust the set bolt (F) to suit the set desired. Then move post (H) to or from the axle point to

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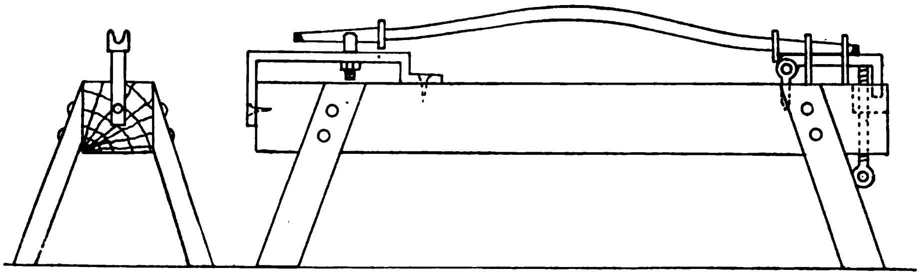
suit the gather and you have it, the set and gather both at one time.

This device will be found very handy and for the general repair shop is the thing for setting axles quickly and easily.



AN AXLE TRAM FOR A REPAIR SHOP.

Advertising the Smith Shop.

Advertising is, today, one of the chief elements of business. Every business, large or small, must either advertise or fall behind. Blacksmiths will derive benefit from a neat card or circular, or, better still, something with their name on it which the receiver will retain. The first of the year (not far away) is the best time to get out such a souvenir. For instance, an attractive calendar, with your name printed on it, given to your best customers and those you wish to have as customers, will help you and your trade wonderfully.

QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

A Case for a Veterinarian.—In answer to Inquirer, Canada, will say, you can't cure your horse by shoeing. Better send him to a competent veterinarian. W. B.

Screw Bit and Elliptic Spring.—Will some brother craftsman tell me how to put a screw bit on a $\frac{5}{8}$-inch auger that has been broken off? Also how to make the joint of an elliptic spring. S. A. CARTER.

Welding Landside Bars.—Will some brother blacksmith tell me how to weld landside bars to plow points successfully? I have trouble with mine. JACOB VARNER.

Mixing Clay.—Will some brother smith let me know through these columns how to mix clay for the forge so it will not burn out every few days? Something to which the cinders will not stick. A. H.

A Criticism.—I think prize article on "Wagon Building" in the May number is not quite right on axle setting. This says that the wheels are to be a half inch wider on top when loaded than on the bottom. I wonder where he gets his plumb spoke? The grease would run out at the back of the axle. A. H.

A Shoeing Question.—I would like to ask some brother smith through these columns how to shoe a horse to keep him from dragging his left hind foot. Can I shoe to prevent it? FRANK KUMMER.

Water Wheel to Drive Blower.—Otis Geding asks if a six-inch wheel will run a blower for one fire. Will say that your wheel is plenty large enough judging from the power you get from your 17-inch wheel. O. B.

Drilling Moldboards.—In answer to Mr. J. B. Jex as to how to drill moldboards, would say, heat the moldboard to a cherry red, cover with sulphur and bury in the forge, then drill. M. F. RABY.

A Compound for Welding Shovel Points.—I find that by mixing five pounds of Cherry Heat with about two pounds of borax you can secure a very fine compound for making a perfect weld on shovel points, leaving the shovel clean. MUELLER & Co.

Hanging of Bellows.—I would like some brother smith to give me an idea on how to hang up a bellows overhead with the best results, and the easiest way to work them, as I have changed mine from the forge to overhead, but they do not work as well as they did. WILLIAM LANE.

Tempering Rock Drills.—Answering Mr. Craig's question as to tempering rock drills will say, when you are ready to harden your drill, heat to a cherry red, cool in water, not too cold, and watch for temper. When it is yellow, cool it off, but not entirely, by taking it out of the water before it is quite cold and allow to cool slowly—this will make drills tough and hard. W. O. B.

Prices from Mississippi.—The following are some of my prices, as I have not seen any as yet from Mississippi:

Horseshoeing, per pair	$0.75
Resetting shoes, per pair	.50
Setting wagon tires, up to $1\frac{1}{2}$ inches, a set	2.50
Setting buggy tires, up to 1 inch, a set	3.00
Wagon axle thimble skeins, up to $2\frac{1}{4}$	2.50
Filling wagon wheels, spokes, up to 2 inches	3.50
Wagon tongue, up to 4 inches	2.00
Sharpening steel plow points . $0.10 to	.15
Sweeps, up to 12 inches	.10

My shop is 22 by 64 feet, and have almost every hand tool that I need; a good drill, spoke tenoning machine, and tire setter and bender. I am in a good farming district and have a good business. I would like to see more smiths write on every-day repair work in the columns of THE AMERICAN BLACKSMITH. M. M. DENDY.

A Few Questions.—Will some one tell me how long a galvanized pipe will stand in the ground without any water or steam passing through it before being rusted away? Which will rust the faster, mild steel or iron? Also, which is better for artistic iron work? Will the mild steel stand the wear from the weather better than the iron?

I would also like to have some brother smith give plans as to how to make a four horse evener for a sulky plow and what material to use, etc. HANS HANSON.

A Useful Board.—I find the following very convenient in my work, and perhaps some brother blacksmith may care to make one also. Take a small scrap of good plank and bore holes with good, clean cutting bits from 3-8 of an inch up, numbering each hole accordingly. Hang this up handy to your wheel repair rack and by using it you will save time in determining what size bit to use in boring felloes. Use the board on the old spokes. M. A. SHARP.

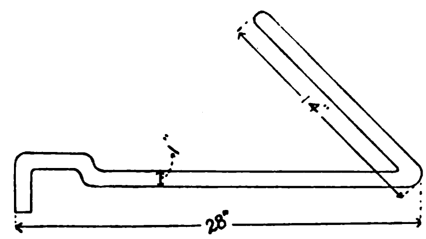
A Hardening Compound.—Will some one tell me, through these columns, of a compound which will harden plow lays? Perhaps some brother knows. H. STROTTMAN.

In reply, will say take 15 lbs. of saltpetre, 2 lbs. of colophony, 7 lbs. of ferrocyanide of potash and mix well in a mortar. The steel to be hardened is heated to a dull red and sprinkled with enough of the powder to make a sort of glaze and then heated to the hardening temperature and cooled in water. W. O. B.

Shoeing Crooked Feet.—Answering Mr. McKeever's question on how to shoe crooked feet, will say, when preparing the hoof for the shoe do not touch the knife to the steep wall, but cut only the oblique or long wall away. A bar shoe is of advantage. O. B.

Hardening Concave Shell.—In answer to Mr. Emig's question how to case-harden a concave shell made of malleable iron, would say a thin film of surface hardening may be obtained by heating the iron red hot, rolling in powdered yellow prussiate of potash and quenching in water. W.O.B.

A Little Anvil Kink.—Bend a piece of iron to the shape and dimensions shown on the accompanying figure and shape the shank to fit the hardy hole, and you will have a handy little device to attach to your anvil, which may help you some day to hold your iron for swaging purposes. C. C. HENDERSON.



A HANDY DEVICE FOR THE ANVIL.

Tire Setting Over Steel Wheels.—In answer to the question as how to set tires over steel wheels, I must say that I have done a great deal of this class of work and for my part would rather tire a wooden wheel than draw a new tire around a steel wheel. A month ago I was called upon to draw a 10-inch over a six-inch, as the tires on the stone puller, on which they were to be used, were too narrow. Of course, such a tire I could not bend, so I ordered them from the wheel factory rounded and welded; 10 inches by 1-2 inch and 49 inches in diameter, each tire weighing 175 pounds. After I had the tires on the wheels, each wheel weighed 433 pounds. I advise all smiths when work of this kind is to be done to do it very quickly, as the outside tire will heat the inside one, causing

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it to expand while the outside one is shrinking from the cold air striking it.

H. STROTTMAN.

Shoeing a Forger.—In answer to Mr. Stowe, who asks how to shoe a horse that forges, would say, shoe in front with shoes having a short rolled toe and with heel calks inclined forward; see that the shoes are no longer and no wider than the hoof.

On the hind feet put shoes with a toe calk only and see that the toe of the hoof projects slightly beyond the shoe.

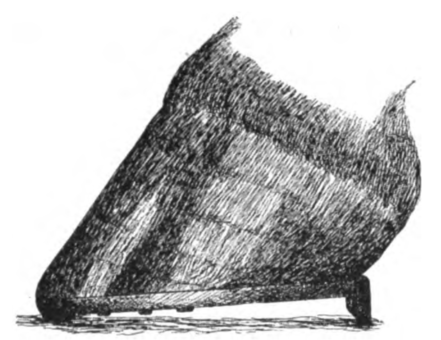
In welding axle stubs the best way is to lap weld and if the ends have been upset enough you will have enough stock to draw down on and have axle of proper length; if properly done, you will be unable to tell where the stub is welded. O. B.

An Appreciative Letter.—Some time ago the question was asked by the editor "How can we make THE AMERICAN BLACKSMITH better?" It is good enough for the money, but if we could get more interesting information, enlarge the paper and pay more for it, I think it would be more profitable for all. I have taken mechanical papers that cost double and were not half so good. I could not do without THE AMERICAN BLACKSMITH at double the price, for I think I get my dollar's worth from each copy. Here are some prices from Brown Co., Kansas:

Horseshoeing, new shoes, per span	$3.00
Resetting shoes, per span	1.60
Sharpening plows	.25
Sharpening discs, per blade	15 and 20c.
Wagon tongues	2.00
Buggy and carriage tongues	2.25
Buggy shafts, each	1.00
Filling wheels	$3.00 and 3.50

Terms on credit. M. A. FOSTER.

A Lame Horse.—In reply to Mr. W. A. Craig's question as to how to shoe a horse that is lame (apparently in the cords), would say, it has been my experience for



SHOE TO RELIEVE STRAIN ON CORDS.

over 20 years to fit a shoe without toe calks, making the heel calk about ¾ of an inch long and only sharpening one-half of it. The figure shows the shoe and the calk and how it is to be sharpened. Sharpening the calk in this way will let the foot down easy, raise the heel high and take the strain off the cords, and relief will soon be apparent. The trouble is, the toe has not been pared off properly; this raises the toe and lowers the heel and brings a strain on the cords. I would like to hear from Mr. Craig after he tries this. C. W. METCALF.

Stake Straps.—The young craftsman will find the following hint on making stake straps to be cheaper than cast straps, especially if he has many to make. I can make one at two heats and punch hot, or at one heat and punch cold. I use steel ¼-inch by 2½-inch and cut my stock nine inches long, heating a good steel heat. I next lay it on the square part of anvil and turn down with good square corners, turning over on the face of the anvil to shape up the end and punch for bolts. That gives a good shape for your stakes. I set mine up square 1½ inches by 3½ inches inside. W. L. CAWTHON.

Hardening Plow Shares.—We noticed in a recent issue of THE AMERICAN BLACKSMITH an inquiry from one subscriber, "Jack," asking how to harden plow shares and obtain good results. We believe if the following method is carefully carried out, the result will be found entirely satisfactory:

It is necessary to have a bath of clear soft water with sufficient salt to make a very strong brine. First heat the landside point from the under side, until a good bright red heat is obtained, then put in and heat entire share, heating up very slowly and be sure to heat evenly (success will depend largely upon this). Then bring to good dark red color and plunge in your bath, moldboard edge first.

We think that this treatment, if carefully followed out, will bring good results and we trust "Jack" will give it a test. STAR MANUFACTURING CO.

Removing Dish from Wheels.—With regard to taking dish out of wheels, would say that I made a tire frame out of ½ by 2-inch stock. I cut the tire iron for this 9½ feet long, bent it perfectly round, level welded it nicely, and put four holes in it at equal distances. Next put on four legs 14 inches long, with strong cross bars at the bottom. Make the bolt long enough to go through this frame and the hub of a wheel. I take the tire and rim off. After getting off all of the paint I can, I sandpaper the spokes and soak the wheel for about 36 hours in good, clean water. I then put the wheel on the rim stand and screw it down to a little below straight and dry it out by the fire. You can build a small fire under the wheel as the frame is all iron. This will not hurt the frame, but you must be sure not to scorch the spokes. I can take the dish out of the spokes, put the rim and tire on and warrant it to stand as good or better than a new wheel. I always repaint them. As I do my woodwork and iron work I know exactly where all the faults are and can always make a success of it. I am of the opinion that all smiths should know something about woodwork, having some knowledge of the strength of wood, its nature, etc. JOHN H. HILL.

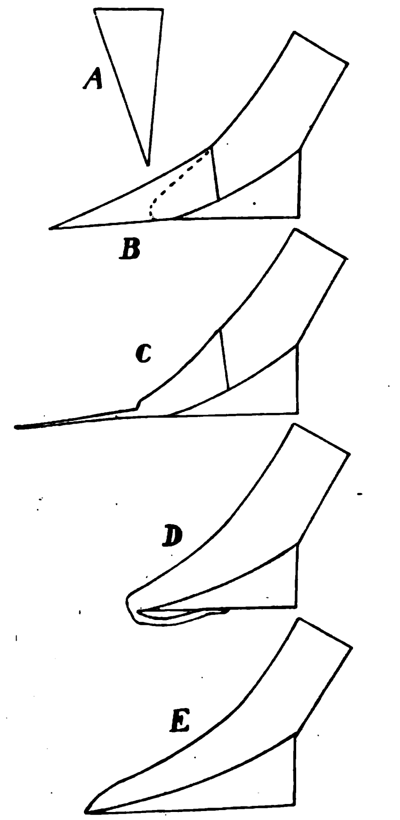
A Letter from New Mexico.—I have been in the blacksmith business out West for 19 years, where our only customers are cattle men. As a rule, we have to keep running accounts until the manager comes to town when the bill is paid in full, sometimes amounting to $100. The following are some of our prices:

Four new shoes	$1.50
Resetting old shoes	1.25
Setting buggy tires, each	1.00
Setting wagon tires, each	.75
Wagon axle	4.50
Tongue	4.00
Sharpening 12-inch plow	.25
Stamp irons for branding stock, per each letter or figure	$1.00 to $1.50

Piedmont coal costs us $29.00 a ton laid down here, iron five cents per pound, while a helper charges $1.50 per day. I have a good shop with two forges, being the first in this part of New Mexico. W. F. TIPTON.

Spring Welding.—I would not advise any one to split a spring for welding. If it is split once there are four laps to be welded down, not to mention welding the split. A long experience has taught me that the welding heat should be taken with the ends separate in the fire, and taken out and welded up in one heat. There are two or more good reasons for not riveting or splitting a spring leaf, one of which is that when the ends which are riveted or splits lapped are placed in the fire for welding heat, there are two thicknesses of steel to be heated where the lap is, while there is only one thickness at the ends of laps. You can therefore see that the single thickness will suffer while the double one is acquiring a welding heat. It is therefore important to try the separate heat process and as there is no appreciable waste of steel in welding, it is unnecessary to put a piece in it. RICHARD O'HEARN.

How to Repoint a Plow.—As I have not seen anything on plow work, I will give my method of pointing a plow, as this work is in season now. In the illustration herewith, A represents the lay, which, when cut out, should be long enough to draw out the bar, according to the size of the point which is to be laid. Draw the top of the lay to a



METHOD OF REPOINTING PLOWS.

feather edge. B represents lay welded on top of point; C, the bar of lay drawn out; D, the bar turned under ready to weld; E, the job when complete. I find this the most successful way to point a plow. If some brother smith, however, has a better one, let us have it. E. P. KILLGORE.

A Minnesota Letter.—The following will give an idea of the prices in this part of Minnesota:

Plow lays, 14-inch	$3.50
16-inch	4.00
18-inch	4.50
Sharpening plow lays	.25
Hardening plow lays	.25
Polishing plow lays	.20
Painting plow lays	.50
Horseshoeing, per shoe	.20 and .40
Horseshoeing, steel plugged	.10 extra
New wagon poles	$2.00 to $2.50
Buggy poles	2.50
Tire setting	.50
Rims, per wheel	1.30
Spokes	.15 to .25
Machine work and lathe work, per hour,	.50

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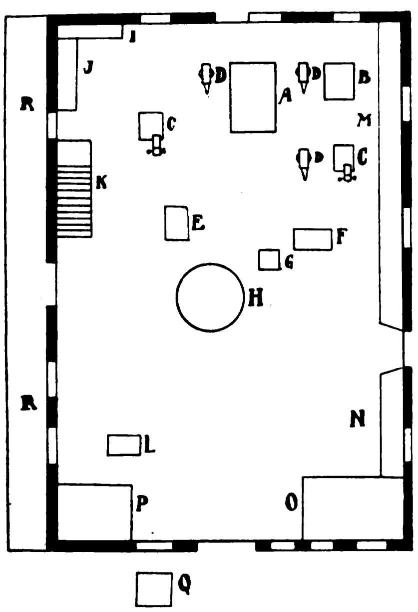
I have a four horsepower White gasoline engine, a Little Giant trip hammer, a blower, emery stand for grinding and polishing, drilling machine and turning lathe, a shear for cutting iron bars, a tire bender and a tire shrinker. I made, for myself, a band saw with 30-inch wheel, also a two-spindle shaper and a boring machine for boring wood and cutting tenons on spokes, etc. I bought a Reynolds tire bolter a few days ago, which I am well satisfied with.

The following is the way in which I made my band saw. The frame is of 6 by 8 inch pine; oak is better, however. I took new buggy wheels and cut them down to the size I wanted the wheel and put on a 1 3-4 by 2-inch bent rim and turned it down until true. I lined it with rubber belting and babbitted the wheel in the hub for the shaft.

I made the frame of the shaper out of 6 by 6 lumber and took an old shaft and made the spindles. My spindle is two inches and at the collar it is 1 1-2 inches thick. I then obtained different sized knives up to six inches long for planing planks, etc.

My shop is 24 by 52 feet, with three fires. I have two helpers. ALBERT MELLUM.

Shop Lay-Out—The diagram shows the shop of Dillard Bros., Bartlett, Texas, the dimensions of the building being sixty feet



PLAN OF A TEXAS SHOP.

long, forty feet wide, and one story and a half high. There are double doors in front, with a roller door on each side and in the back.

A. Indicates double forge run by power blower.
B. Hand forge with blower.
C. Large iron vises.
D. Anvils.
E. Punch and shears.
F. Surface and face emery stones.
G. Power drill press.
H. Henderson tire setter machine.
I. Bolt case.
J. Rivet case and small bolts.
L. Large grindstone.
M. Large rod and bar rack.
N. Wood bench.
O. Engine room with 5 H. P. Foos Gasoline Engine.
P. Coal bin.
Q. Rip and cut-off saw.
R. Full length shed for horseshoeing. Also other tools. D. W. MURPHREE.

A Sick Horse.—I have a horse that has a lump on his throat caused by using a breast collar. I cannot now use any collar on him, unless so large that it will not touch his neck. He has also a cough, and nausea. He is in good condition otherwise. I have put him to pasture, but he is not gaining. The lump is where the collar strikes the wind pipe. I would like to get the horse cured before harvest, so would like to hear of a remedy. JESSE HANSON.

In reply. Would say apply a warm poultice of linseed meal or wheat bran to the lump on the throat, renewing it daily until the center of the boil is soft, when it should be lanced or cut, and the matter pressed out. Be careful to keep the wound clean and free from irritation. Then bind the wound with cotton wool or lint saturated with carbolic acid and water, ½ oz. of carbolic acid to one pint of water.

The cough and nausea you speak of are very likely symptoms of sore throat. Place the horse in light airy stall, give plenty of fresh air and blanket the body. Hold the horse's head over a bucket of boiling water so that the animal must inhale the steam. Stirring the water with a whisp of hay will cause the vapor to rise in great abundance. Put a tablespoonful of turpentine in each bucket of water you use.

Feed only soft food, such as bran mash, linseed gruel, scalded oats and, best of all, fresh grass. See that the animal has plenty of fresh water at all times and keep out of drafts. WALT.

Spokes and Tenons.—Replying briefly to Mr. Wenke and others, I wish to be thoroughly understood in the matter of dressing off the end of a spoke tenon. When I say "shallow gouge" my meaning certainly should be plain enough. To shallow gouge is to trim off with a flat gouge any of the tenon that may protrude above the surface of the rim. The gouge is better than a chisel because it will remove the center of protruding part and bring it slightly below the surface, but not enough to permit the tire to rest wholly on the rim without also resting on the spoke. Between the extremes of allowing any part of a spoke to protrude above the rim and of cutting away too much, there is a certain proper point at which to stop and any carriage smith should know that point.

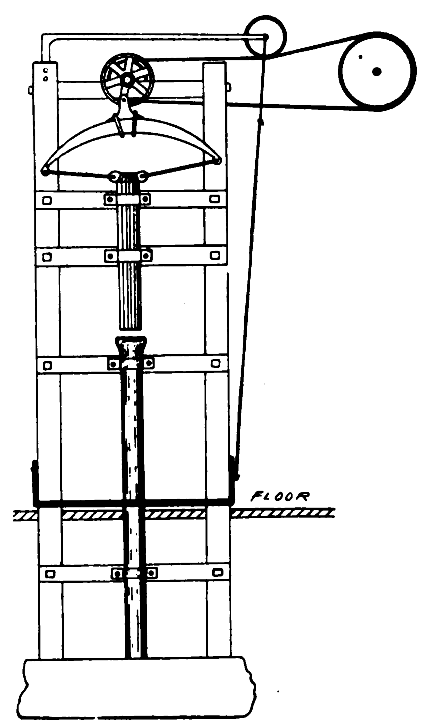
In order that no young smith who reads this may doubt my experience, whatever doubts he may have of my skill, I wish to state that I have been 30 years at the trade, serving three years as an apprentice in a shop where we forged all our irons and received from $300 to $350 for our buggies. We built the old-fashioned high wheel sulkies,—built them to fit the horse,—some of them not weighing over 42 pounds when painted. Some 22 years ago, when working for Warden & Wright, of Cleveland, we stopped giving gather to our axles. Gather was then considered an "old fogy" idea for city vehicles, although for the country ⅛ of an inch gather was considered good. To Mr. Foster, who recently said that he had worked in six different States and this was the first time he had heard this subject disputed, I would reply that I have worked in 16 different States, in Canada and in the Old Country, and have been foreman in a number of shops.

Don't wedge spokes in rims with nails. Use factory wedges. There is not much required of a wedge and the average factory wedge is as good as you can make at home in the winter. R. O'HEARN.

Home-made Power Hammer. — Herewith is an illustration of a home-made power hammer, as some brother smiths have been inquiring about one. I made one for myself and it works satisfactorily.

First, I took lumber, two pieces, 8 feet long, 4 by 6 inches, four pieces of 2 by 2 by 20 inches, and one piece 2 by 6 by 12 inches, which I use on top to hold the boxes and shaft for a Pitman wheel. After I had the frame ready I bolted on the shaft—an engine shaft weighing 70 pounds. This I use for an anvil, and the hammer I have is 3 by 3 by 24 inches.

Next I attached the spring, using a four-leaf buggy spring, two inches wide and 20 inches long. Then I took a Pitman wheel from a harvester, 6-inch stroke. I put this



A HOME-MADE POWER HAMMER.

in place, and on the drive pulley I put rims, so that the belt could not slip off. Then I made the Pitman rod the right length, so that when raised it would not catch the cross braces, and when lowered there would be a space of about one inch or less between the anvil and the hammer. Then I fitted on a belt tightener and ran a rod down to the floor, for a foot lever, when setting it. I used heavy rock for a foundation and braced it to the ceiling or walls. I can set it in the ground to have it the right height to be easy to operate. It should not be too high.

I used to work with a power hammer before I made this one for myself. A person can do fast work with them, especially on plow lays or cultivator shovels. The pin or hammer, a blacksmith can sharpen to suit himself. About the spring—after it is made, couple it with the hammer. Straps ½ by one inch are strong enough. I punch the holes in the hammer, close to the edge and use ½-inch bolts in spring and hammer.

I have something to say about THE AMERICAN BLACKSMITH. It is a great help to any blacksmith, for it illustrates anything good for the craft's help, and I would not be without it as long as I stay at blacksmithing. JOS. VANEK.

Cold Tire Setters.—With regard to William Darling's question as to cold tire setting machines, would say that my experience has been as follows:

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When you put the wheel in the tire setter and apply the pressure, it is so great that it presses the wheel up in the middle and grips the tire on the bottom edge only. Some tire setters have a rod to hold the wheel down. You must drive the spokes in the hub and felloe far enough to fill up the tire, because it will spring back considerably after the pressure is taken off. A brother smith recently told me that when he set a tire he gave it ⅛-inch dish, then took off the tire from the wheel and measured both tire and wheel, finding the tire ¼-inch larger than the wheel.

Cold tire setting works all right on the old wheels that are lying behind the shop. I tried cold setting on some wheels and in two days the wheels were back and rather than lose a good customer, I set the tires again.

Now the edge grip tire setter is different. It pulls the tire thin in two places and makes it thick in another. The edge grip tire setter also is hard on the welded places.

Of course, I do not condemn all tire setters, but my advice is that you buy a good hot tire setter and hold on until the tires are invented that set themselves. Old wheels nearly always need wedging up, and after you have the tire off you had better heat it right, and that is hot. I believe in machinery and improvements if they are the right kind. AUGUST RUNGE.

Some Illinois Prices.—A great deal has been said about organizing and advancing prices. As we are getting fairly good prices, we do not feel the necessity of it, but for the benefit of all in the trade, I am in favor of it. If smiths are shoeing for 15 and 25 cents and sharpening plow shares for 15 cents, as given in a price schedule from Indiana in the May issue, it is certainly time for something to be done. Without doubt, a man must be the best smith in the town in order to be able to obtain better prices than his neighbor craftsmen. When I came to my present location there was but one old shop and some old tools. The former smith said it was impossible to make it pay, because the custom all went to a shop four miles away, which had been established twenty-five years. Upon starting, I raised the prices to that of my competitor's and took my chances. The first year I made $625, and the past or fourth year, $1,400. Now I employ a helper and have work enough for both. This will show what honest work and fair treatment can do. I make new wagons, water tanks, repaint wagons, clip horses and do general work and never cut a price for any one, but warrant all of my work. The following are some of my prices:

Shoeing	$0.20 and $0.40
Tire setting	.50
New buggy tires, a set	5.50
" " rims	3.50
New wagon tires, 1½ x ½, a set	7.00
" " rims, 1½ x 2	5.00
New plow shares, 14-inch	3.50
" " " 16-inch	4.00
Sharpening plow shares, 14 & 16-inch, $0.40 and	.45
Sharpening pulverizers, per disc	.15
" cultivator shovels, four to set	.80
Sharpening cultivator shovels, six to set	.90

I harden and polish all shares and shovels. C. J. PETERSEN.

Carriage Work.—In regard to carriage, and wagon work, to make a success of it, first select your timber and when you use a piece of wood be sure that it is dry, if it is not, don't use it. When you cut a mortise, take pains to cut it true, i. e., to have your tools sharp and keen, and dress your timber smoothly and neatly. Five cents worth of sand paper sometimes will make a man dollars, if he will use first-class material and finishes it in workmanlike manner. When a farmer comes in and looks at your work, he will say right away, "That man is a good workman," and will have some work for you at once. If it was rough, he would say, "I don't want any of that man's work," no matter how strong, nor how good material he had used in it. I have found in my work of 22 years past that first class work and good material are what give satisfaction to all. If an old wagon is brought in to be repaired, use the best wood you can get and finish it neatly. The first man who sees it will say, "Who did that work?" "Why, Mr. Smith." Then he will say, "He is a fine workman."

When you do a piece of work be sure everything fits neatly; there is too much putty used now-a-days to fill open joints. He may be ever so good a workman, but he may neglect to file his saw, or maybe it won't run true. To be a good mechanic a man must learn to get his tools in shape. You want your saw so you can lay a fine cambric needle on the teeth at the heel and it will run to the point without jumping off. Then you can saw a perfect joint. When you fill an old wheel, try and make it as near like a new one as possible. Get the tire the right size, so when it is set the wheel is not dished too much. When you paint a new piece of work, use a good filler of white lead and oil. Don't use cheap paint because you want to make all the money you can. Use a good filler and rub it down. Use any color you wish and it will stay. You will find with a little experience that my theory is right. It may cost you a little more at the time, but you will gain it all back afterwards. You may have to employ more men to wait on your customers, but in a short time you can act as foreman, give orders, take orders, and make money by doing so. C. W. METCALF.

An Interesting Letter.—I am operating a shop 40 by 46. My Watkins, two-horsepower gas engine runs a trip hammer, band saw, two emery wheels, forge fan, large enough for six fires, one ventilation fan, and drill press. My trip hammer is the "Easy," made by Mayer Bros., Mankato, Minn., and I would recommend this, together with the Watkins gas engine, to any smith contemplating putting these machines in his shop. I run my shop alone most of the time and find that I can do more work of most any kind with my engine, than I could without it and a helper, and with more satisfaction to my customers.

In putting on new tires, I lay my tire down, run the wheel on it to get the length, allowing two thicknesses to weld. I then cut it off cold and bend it, place in the fire and heat both ends at once. After scarfing, weld at one heat. To punch holes in the tire and rivet them together is all lost time. I have made one tire ⅝ by 1½ inches, for a 3½-foot wheel out of straight bar, welded, put on, drilled four holes and nailed it on in 32 minutes. The same holds good for buggy tires with the exception that when I scarf, I split them on my hardy about ½ inch, open and push together with staver, take heat and weld. You can do this at two heats. While working by the day, I put on four new rims and four new spokes, rounded up the rims and made four new tires, putting them on to drill, buggy wheels and spring rims in five hours. My partner made two ⅞-inch buggy tires and had them on in twenty minutes.

In resetting buggy tires, I use a four-leg wheel trestle, ironed on top, lay my wheel on it, mark at point, and then taking a thin chisel, cut down between the tire and rim and cut off the bolts. Never take them out, as it does not pay. Buy them for $1.40 per thousand. I heat the tire between the holes and stave on a Lancaster staver, reset the tire, place it on wheel stool and bolt down. Drive in the new bolts, using the Green River rim wrench with brace. I keep the crank wrench but the brace is much the quicker. Last season I set four tires in forty-seven minutes. They were bolted in every two spokes. It takes a little longer when full bolted.

Some smiths try to get the two calks together when shoeing a horse. Every time they move they drive the heels together. Now, I try to give the frog room to grow and let the dirt get to it. When I calk the shoe I turn my calk and lean it out the width of it on the outside. Of course, you cannot do this on the inside on account of interfering. That is easy to fix, if you level the foot so that the horse steps straight. It is a wrong idea to turn the calk in on the frog to keep from interfering. Get the foot level and they will not interfere. I have worked at this for thirty years and have no trouble with interfering. This can be prevented by paring the foot. Sometimes you get a short foot which cannot be pared, so that the shoe will have to be fixed, making it thick or light on one side or the other, just as you think best. I do this only when I have no foot to pare. I took off two pairs of shoes recently that only measured 1½ inches between the calks, No. 3 and No. 4 shoes. You can imagine their appearance. A. M. SPEER.

A Louisiana Letter.—I am a strong believer in every blacksmith writing something for his paper occasionally. If everybody sat back and waited for the other fellow to write, the paper would not be nearly so interesting. Everyone should lend a helping hand and tell what he knows, if it is only a little bit. If you don't know something useful to tell from your own experience, tell what you have seen some one else do, and if you never saw anything done, then ask the trade some questions and you are sure of getting some advice. If I know of it all I would not urge others to read journals, buy tools and improved machines and tell me their experience. I love new tools, improved machines and up-to-date shops, and I like to read our journals and look at hardware catalogues.

We have some smiths here who take great interest in other people's affairs, often to the neglect of their own work. They are the kind whose hammers are all hair-lipped, their punches made out of any old thing and scattered all over the benches and floor. If you say anything to them about taking a journal they will tell you they don't need any such thing and have no time to read it. If they get a catalogue they only glance at it and throw it down like a patent medicine circular. You talk to them about power or a new tool and they say it won't pay, or it costs too much, or they can get the job out with their old hand axe while you are getting ready. I say that if a man can't make enough out of his business to keep everything up-to-date, to buy some machinery, take his trade journal, have proper printed matter, and run some ads in his local paper, he had better quit.

I think it all bosh about a man being able to do only one thing and do it properly. You can carry on many different kinds of work. In my shop I do turned work, scroll work, make anything in fact that they call on me for. Am now building a grocery refrigerator, six feet high, four feet wide, and 30 inches deep outside, with 5-inch walls. I get $35.00 for it, which is cheap, but I am simply making it on the side. Rather than take a shop without power in it as a gift, I would work by the day for a man that did have power. That's the way I feel about power in the shop. J. VESTAL.

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THE AMERICAN BLACKSMITH

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An Advertising Opportunity.

The special attention of all readers of THE AMERICAN BLACKSMITH is directed to the announcement on page XIV of this issue. We believe the opportunity there presented will interest all who own or run shops, and who are quick to take advantage of good schemes for advertising their trade. Promptness in acting on the offer is recommended.

The Third Volume.

With this issue ends the third volume of THE AMERICAN BLACKSMITH. A carefully compiled index appears on the last two reading pages, giving in alphabetical order and arranged for easy reference, a list of all articles appearing in volume III, from October, 1903, to and including September, 1904.

Our constant effort has been to make the paper of greater interest and value with each succeeding issue, so that it is very encouraging to read the hundreds upon hundreds of letters that come to us from readers, saying that they like THE AMERICAN BLACKSMITH more than ever and that they would not do without it for many times its cost. Our friends who are readers can do us a service by calling the paper to the attention of their friends who are not readers, and by telling them we are always glad to send a sample copy free to any address upon request.

THE AMERICAN BLACKSMITH furthermore desires to thank its readers for their patronage in the past, and to assure them that it will be more than merited in the future. Arrangements have been made with well-known craft writers of wide experience to furnish articles for the coming volume. Its pages will, we think, be found of considerably greater interest than those of any preceding volume, and some new features are to be added to make them more attractive than ever.

What is Your Outlook?

Indications point to the Presidential election as causing much less disturbance than usual in the business activities of the country, due to the elimination of the money question and also to the fact that the result of the election is pretty much a foregone conclusion. With crop reports as favorable as they are, the prospects are bright for an early return of great activity in all lines of trade.

What is the outlook for the blacksmith and wagon-building craft in your vicinity? Has the past summer been a good one, and do you look for business to pick up this fall and winter? We should like to receive a brief note upon the above questions from our readers in every section of the country.

The Blacksmith and the Gas Engine.

The gas and gasoline engine, its principle and construction, and its utility for the smith shop, have been made the special feature of this issue. Those who have an engine will find in the following pages facts of interest regarding its operation. Those who have no engine are strongly urged to look at the question from the standpoint of those who have already installed power, and who tell of their experience in this issue. All readers are invited to ask questions upon any topic connected with gas or gasoline engines, and in fact anything connected with the shop and we will see that they are answered in future issues.

We are also glad at all times to put our readers into correspondence with reputable manufacturers of gas engines.

The Recent New York Strike of Vehicle Makers.

O. S. POAK, JR.

The remarks in the July AMERICAN BLACKSMITH relative to strikes, "Does the gain equal the loss?" is perhaps as pungent a question as has been placed before the public in many years, as the sequel will set forth in plain undeniable facts and figures. In New York City the locals of the International Union of Carriage and Wagon Makers of North America voted last April to demand an increase of wages and a decrease of hours. Such demand was made by the two English and one German-speaking unions, and the ultimatum was "strike." Before proceeding further, the writer wishes it understood that he is a workman, but has never been connected with any labor organization. He is in favor of trade organizations properly conducted. He simply wishes to give facts as they have occurred. The Association of Employers, composed of the leading vehicle builders of the city, met and adopted the following resolutions:—"We will not grant the demands about to be made by our employees. To insure good faith each concern represented shall deposit with the Association $500 security. Yielding to the union's demands means forfeiture of the deposit." The demand was not granted. The men went out, perhaps 4,000 or more. After a few days two concerns yielded. The remainder were obdurate. Brutality and rioting was on exhibition in a great many localities.

Then the forces of the strikers began to waver. Their savings were gone. The strike fund was soon exhausted. The backbone of the strike had collapsed. In bodies and as union men they made requests to be reinstated. Their request was rejected and this reply made—"Any of our employes wishing to be reinstated must make personal requests." The "requests" were voted down at the union meetings. One

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by one and in pairs they deserted the union and applied on their "own hook." It is safe to say that not more than 60 per cent. have been reinstated. The "black book" system has been adopted by the Employers' Association, which is to be regretted, for the five weeks' loss of time, averaging about $12 per week per capita, was enough penalty to apply to those who had forgotten their own rights and benefits in accepting the edicts of the walking delegates.

In many instances the men had been advanced 10% a year ago. Those who have been reinstated are to go back to the old schedule. The time allowance "half day holiday" on Saturday remains. The trade (in New York) is not promising. One large concern remarked: "We can go on without making a vehicle, unless ordered, until January next and then have a surplus, unless trade makes extraordinary spurts." And there is the end of the strike. Vehicle builders, strikes in the Metropolis, history says, have ever been failures. Some employers say had the demand been for wages only by the men personally, it would have been favorably considered. The men conceded they have acted unwisely and rest the blame where it rightfully belongs, with the clamoring delegates who wanted to earn their wages.

The Gas Engine.—1.

Principle and Construction.

E. W. LONGANECKER.

In kindling his coal fire the blacksmith has many evidences of gas formation, as well as the quick burning or rapid combustion quality of it. Gas, when properly mixed with air, will flash or explode, if confined, when it comes in contact with an igniting spark or heat. This explosive gas may come from either a solid, as gunpowder, a fluid, like gasoline, or a vapor mixture. This classification is used here purely as an illustration. The word gas ordinarily signifies a vapor. But gas may be confined in many solids or liquids, and comes into evidence only when liberated or the solid converted by some chemical process.

The gas generally used for fuel in the gas engine is one of the various hydrocarbons, that is, a gas composed of carbon and hydrogen. Carbon exists as mineral graphite or black lead, and also pure charcoal. It readily unites with various gases, such, for instance, as oxygen. One atom or part of carbon and two of oxygen, represented by the chemical notation CO_2, is the incombustible carbonic acid, the gas you notice in soda water. But when the carbon unites with hydrogen we have a gas known as a hydrocarbon. The atoms of carbon and hydrogen may unite in such proportions as to form either a vapor or a fluid.

Benzine, a fluid hydrocarbon which is closely related to gasoline and produces practically the same results in an engine, is chemically known by the notation C_7H_8. Although gas in a solid combination is not used as a fuel in gas engines, it was the use of gunpowder in firearms which first suggested the idea. The fuels commonly used in this country for gas engines are natural gas, artificial gas, gasoline, naphtha, benzine and kerosene, all of them hydrocarbons. The last four are distilled from crude oil, which is found in many parts of the United States in rock 400 to 2,000 feet below the surface of the ground.

Though many engines sold to blacksmiths are referred to only as gasoline engines because gasoline is the fuel, yet in the real sense the engine is a gas engine because the gasoline fluid in mixing with the air changes to and is exploded as a gas. Many automobile operators refer to their gas engines as hydrocarbon engines. The owners of small pleasure boats call their power naphtha engines. With farmers and rural blacksmiths these machines are commonly known as gasoline engines. In the larger cities nearly all stationary engines of the hydrocarbon type are called gas engines, no matter what fuel they use. Any engine that receives a quantity of air, charged with some hydrocarbon gas, into its cylinder behind the piston, and there explodes it, is properly called a gas engine or hydrocarbon engine. Internal combustion and explosive engines are also names given to the gas engine.

As already hinted, the gas engine gets its power by exploding a charge of gas in the cylinder behind the piston. Exploding it is simply a quick burning of it. Hydrocarbon gas, when properly mixed with air, is highly inflammable and a quick burner, which gives it its explosive property. The intense heat resulting from this quick combustion or explosion causes a heavy pressure or expansion against the piston, which forces it with great energy on its outward movement. The piston is connected to the crank shaft by means of the connecting rod or pitman. The crank shaft carries the flywheels. The energy from the explosion is transmitted through the piston, connecting rod and crank shaft to the flywheels. The power in the gas engine is thus derived directly from heat, and the heat is applied directly to the piston by burning the fuel itself right in the cylinder behind the piston. This is quite different from the principle employed in the steam engine, which also derives its power from heat. Instead of burning its fuel directly in the cylinder, the heat from the burning fuel under the boiler is imparted through the walls and tubes to the water, which is converted into hot steam, which in turn is let into the cylinder behind the piston, and the expansion due to the heat it carries drives the engine. The gas engine draws its fuel right into the cylinder, we might say "in small chunks," burns each little "chunk" or raw charge, the piston deriving almost all the power there is in it, and then gets rid of the burnt gas in one or two revolutions of the flywheel, after which it is then ready to take another charge and repeat the operation. A whole day's running of a gas engine is simply a routine of taking into the cylinder one charge after another, extracting the power from each and applying it in successive impulses to the piston, and through it to the flywheels.

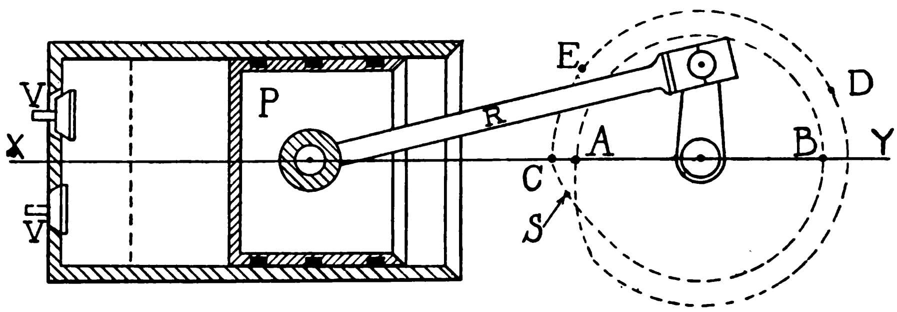

Fig. 1.—SHOWING THE PRINCIPLE OF A FOUR-CYCLE GAS ENGINE. *a* TO *b*, INHALATION; *b* TO *c*, COMPRESSION; *c* TO *d*, IMPULSE; *d* TO *a*, EXHAUST; *x y*, CENTER LINE OF ENGINE.

The gas engine must consequently be so constructed that the suction of the piston can be used to draw in the charge of fuel, or at least a portion of it. The air alone may be drawn in by the piston and after it is compressed the gas or real fuel may be injected or pumped right into this compressed air, the immediate explosion of which causes the

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impulse. By far the most common practice, however, is to so construct the engine as to inhale the charge of gas and air together and to mix them on their way to the inside of the cylinder. No further pumping-in process is then necessary, but the gas is ready for explosion immediately after its compression is complete.

It has been found that the power results are much greater and much more effective if the charges are ignited or exploded under heavy compression. Therefore, after inhaling or drawing a charge into the cylinder, the next step is to compress it or to prepare it, as it were, for explosion. These two acts, the *inhalation* and *compression* of a charge require two movements of the piston, in the four-cycle engine. The inhalation requires the *outward movement* when the fuel and air admission valve is open. The compression of the charge is accomplished by the following *inward movement* with all the valves closed. These two movements represent one complete turn of the flywheels. The wheels, in other words, make one turn without an impulse. This is the *get-ready* turn. Just when the compression movement is completed and the piston is starting out again the explosion occurs, the force of which sends the piston on this outward stroke with great vigor. This is the *third* or *working* stroke of the piston. When the piston gets nearly to the end of this working stroke the exhaust valve opens to let out the burnt products and remains open during the next inward movement of the piston. This completes the process of producing one impulse in the gas engine. It takes four movements of the piston to do it, hence the name *four-cycle*. Hence a four-cycle single cylinder gas engine gets only one power impulse in two turns of the flywheels.

These four movements necessary to get ready and complete an impulse may be designated *four steps* of the piston, and named as follows: First step, inhalation; second step, compression; third step, explosion or impulse; fourth step, exhaust. This explains the principle upon which the four-cycle engine operates. The four-cycle principle is the one embodied in probably 95 per cent. of engines used by American blacksmiths. The illustration, Fig. I, will serve to assist one in getting a full understanding of the four-cycle principle. The dotted circles in the illustration are intended only to represent the first and second revolution which an engine takes to complete one cycle, the inner dotted circle representing the first and the outer the second revolution. The first half of the first revolution, as a point on the crank moves from A to B, represents the suction, take-in or inhalation stroke. The admission valve is open, and as the piston advances outward the charge of air and gas is drawn into the cylinder. At B the valve closes and from B to C, the last half of the first revolution, compression of the charge takes place, the piston receding inward. Just before completing the compression stroke the spark is made at S, and as there is an instant of time before the beginning of expansion, the point on the crank moves from S to E in this instant, through C. This travel of the crank or wrist pin represents the ignition and combustion or partial burning of the charge before effective expansion takes place. The real working stroke then begins about at E and ends at D, at which point the exhaust valve must open and remain so to the point A in order to clear the cylinder of all pressure and burnt gas in preparation for the next charge or cycle. The ignition spark should be made before inner center is reached and and connecting rod must necessarily ride the crank shaft and its bearings. The larger the engine the heavier are these parts, and as the pressure of this weight, as well as that of the explosions, is constantly downward upon the crank shaft and its boxes, rapid wear at these points is difficult to prevent.

Heavy flywheels are noticeable on all gas engines of the single cylinder four-cycle type. These are necessary because only one impulse in every four movements of the piston can be had. The flywheels must have sufficient weight and circumference so that the momentum they gain from the impulse is sufficient to carry the piston through its other three movements necessary to complete the cycle. If there were no flywheels or swing weights of any kind the impulse would simply expend its force in carrying the piston out to its outer center where it would remain because of no inertia or force to reverse its movement and carry it back. The higher the speed of an engine the smaller the wheel and less weight it need carry in its flywheels. Where two, three or four cylinders are so arranged as to act on the same crank shaft,

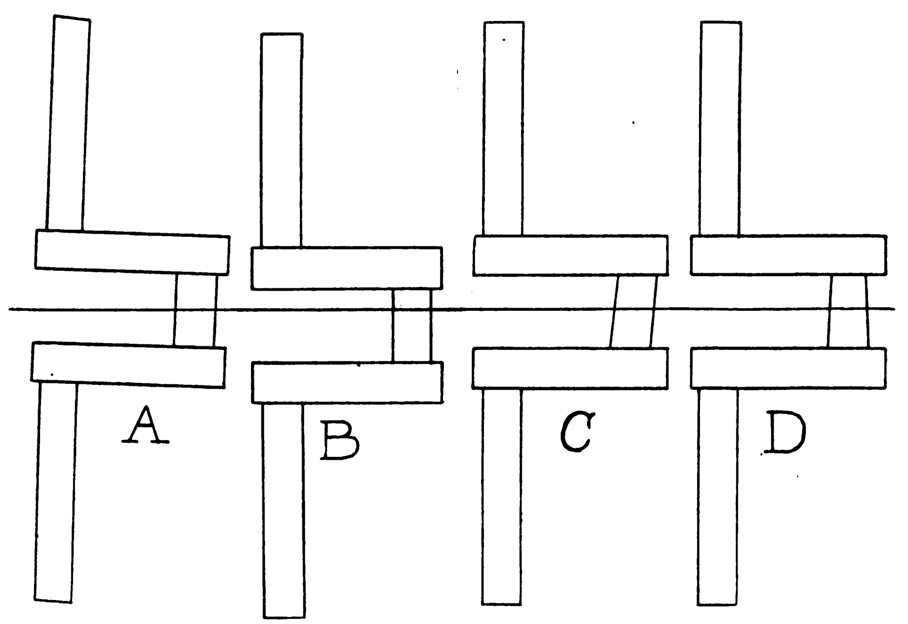

Fig. 2.—FAULTS SOMETIMES FOUND IN CRANK SHAFTS. (Exaggerated in the drawing.)

the exhaust valve should open before outer center is reached.

Four-cycle engines as sold to blacksmiths are either vertical or horizontal in pattern. The horizontal pattern is probably the most common. It will be noticed that very few manufacturers advertise a vertical gas engine larger in size than two or three horse-power. One of the principal reasons why the vertical engine is confined to very small patterns is that the weight of the piston giving an impulse at every half-turn, very light-weight flywheels will serve the purpose.

The heavy flywheels serve another purpose which is a very important one. It is that of holding a steady motion. One impulse at only every second revolution necessarily causes the engine to increase its speed at the instant of the impulse, but the speed will begin to decrease again soon after the exhaust, and very noticeably so when the engine

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is driving a load. If the flywheels were not of sufficient weight, the impulse would greatly increase the speed and for want of weight to gather inertia and maintain it the speed would decrease very rapidly. This would cause great fluctuations in the speed of the engine. Consequently the weight in the wheels serves to hold the speed more constant or steady.

The crank shaft or main shaft in the gas engine is largely of the *center crank* variety, with a bearing or journal box on each side of the crank arms. It is, of course, one of the very important parts of engine mechanism. The crank shaft is made of cast steel, a drop forging or a solid steel billet, any of which, if properly done, makes a very good shaft.

The wrist or crank pin and its construction is the most important part of the shaft, because of its tendency to heating while the engine is in operation. Engineers often puzzle for days over a heated wrist pin, and many a pin and boxing is ruined before the cause of heating is located and removed. This is the point which receives the entire thrust of the explosive force. The entire power exerted or generated by the engine must be transmitted through this wrist box bearing, and the friction in the bearing should be reduced to the minimum, and the pressure equally distributed over the entire bearing surface.

One of the most common causes of persistent heating of the wrist pin or wrist box is improper alignment with the cylinder and shaft. The pin must be at right angles with the center line of the cylinder in all parts of the circle it describes, and the middle point of the crank pin or wrist pin must be exactly in line with the center line of the cylinder (see Fig. 2, A.) If the crank shaft is so placed in the journal boxes as to bring the middle point of the crank pin to one side of the center line of the cylinder it will heat (see Fig. 2, B.) If the crank pin is made out of parallel with the main shaft it will heat (see Fig. 2, C.) If the pin has a greater diameter at one end than the other it will heat, as in Fig. 2, D. A and B represent faults in lining up the crank shaft with the cylinder, and C and D represent faulty *machining up* of the crank pin. The manufacturer is generally to blame for these faults and if the wrist pin on a new engine persists in heating after thorough cleaning and oiling, some of the defects above described may be suspected.

The piston is a very important item or part in gas engine construction. Some manufacturers make extremely long pistons to obviate rapid wear in the cylinder, but the increased friction due to the greater wearing surface and weight probably overbalances any advantage gained by the extremely long piston. The manufacturer who cuts his piston extremely short in order to reduce friction and weight makes a mistake also. He will probably have a badly worn cylinder in a short time. Consequently the medium length piston is the most desirable one. To make the piston about equal in length to its stroke is not a bad rule to follow.

The piston-pin (to which the connecting rod, or pitman, is attached) should be located very near if not quite at the middle point of the piston's length. We notice that some manufacturers locate the pins just as far back in the piston as possible, while others locate it too near the open end. It is best to carry the weight of the connecting rod and pin near the center of the piston. Fig. I shows about the position it should occupy. The trunk piston similar to that shown in Fig. I is the style generally adopted by gas engine builders. Inasmuch as practically all gas engine cylinders and pistons are cast with one open end, the connecting rod connects the crank shaft with the piston without the intervening piston rod crosshead and guides as in the steam engine.

Small pistons, for engines up to and including 10 horse-power, are generally fitted with three piston rings, or, as they are sometimes called, packing rings. The object of these rings, of course, is to prevent the escape of the explosive energy past the piston.

A ring that is properly made is first cut from the ring blank or casting to nearly the size of the cylinder, leaving sufficient stock so that after the ring is cut it may be clamped into a jig with the cut ends practically together and the outside diameter of the ring is turned to a perfect circle of the same diameter as the cylinder. Rings made in this way will make what is known as a "tight piston," which will withstand the high pressures resulting from the explosions, as well as insure a good compression at all times when the valves are holding properly.

The cylinder of the gas engine is commonly cast with double walls, with an intervening water space for cooling purposes. In this space either water or oil may be used. If water is used natural circulation from the tank to the engine may be depended on, but if oil is the cooling fluid, a pump should be connected with the circulating pipes between the radiator and tank and the engine so as to insure a forced circulation. Air cooled engines are not regarded successful for constant and heavy work.

We will not have room within the scope of this article to discuss the general construction of the valves and valve governor and igniting mechanisms, all of which are very important parts in the proper construction of the gas engine. These we hope to take up in some future article. We have here confined ourselves to the discussion of the four-cycle gas engine, its principle and construction, because most engines for general use among blacksmiths are of this type. In the two-cycle engine, there are but two steps to the complete round of operation. During the outward stroke or first half-revolution of the flywheel the explosion or impulse takes place. Then on the return or back stroke of the piston, the exhaust and fuel ports both open, so that while the burnt or spent gases are going out at one end or side of the cylinder the fresh gases are coming in at the other, under pressure, to furnish charge for the next explosion. It will thus be seen that there is an impulse to each revolution of a two-cycle engine.

(To be continued.)

Batteries for Gas Engines.

BILLY BUNTZ.

Either a fluid battery or a dry battery may be used for generating the current necessary for operating the sparking mechanism on a gas engine. The latter is generally preferred, as fluid batteries easily become broken and are apt to freeze during cold weather. Fluid batteries consist of a glass jar, filled with water, to which is added about eight ounces of copper sulphate or blue vitriol, the metals used being zinc and copper. The old-time "Crowfoot" battery is the most common form of fluid battery. Some fluid batteries have a carbon cup containing a cyclindrical zinc, while in others the negative element is a double cylinder of carbon and the positive element a rod of zinc, with a couple of pints of sal-ammoniac solution as the excitant. These batteries serve very well in the country, or where they can be sheltered in winter, as they are easily renewed and save ordering batteries away from home. The carbon zinc, copper, blue vitriol or sal-ammoniac for replenishing them can usu-

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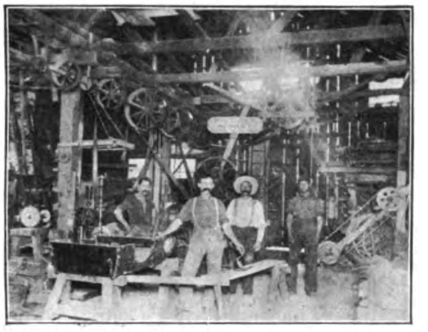
ually be furnished by a drug store or hardware house. Dealers in telegraph instruments and electrical supplies carry them in stock.

Nowadays dry batteries are much used. There are many different kinds of these. Usually they are of the sealed kind, that is, are such that cannot be renewed by the smith when they become exhausted, but as the wasted cells can be replaced by new cells at small cost, the dry battery is really a cheap one to use in supplying electric current to the igniter of a gas engine. It can't be easily broken, nor can it freeze; hence there is no trouble on that score. Usually they have a hollow cylinder and a metal plate, and contain chemicals in a dry or pasty form that become decomposed when the battery is exhausted, rather than being consumed, as in a fluid battery. Certain dry batteries can sometimes be successfully recharged by the smith where the zinc cases have not become pitted from long or heavy service—such pitting making it useless for him to endeavor to recharge them, owing to the solidifying of the battery contents.

A strong electrical current for operating the sparking apparatus of a gas engine may be had from the use of from six to ten cells of dry batteries, each cell being connected to the other and the last one connected to the electrodes on the gas engine, which communicate one with the other when a spark is needed for igniting the gas in the engine cylinder.

In shutting down a gas engine the battery switch should be turned off, else the battery will waste rapidly. When starting up, the switch can be turned on. Where dry batteries are used it is best to have a few new cells on hand, to replace those that become exhausted, thus oviating a shut-down on account of having insufficient battery current. However, where the engine is also equipped with the tube igniter, that igniter may be used pending the renewal of the batteries. As a rule, dry cells become exhausted one at a time, unless the battery switch has been left open while the engine was idle, as over night, or for a day or two, when they might all become worn out at the same time. When a battery is old it is a good plan to short circuit it for a minute or two by bringing the ends of the two wires in contact with each other.

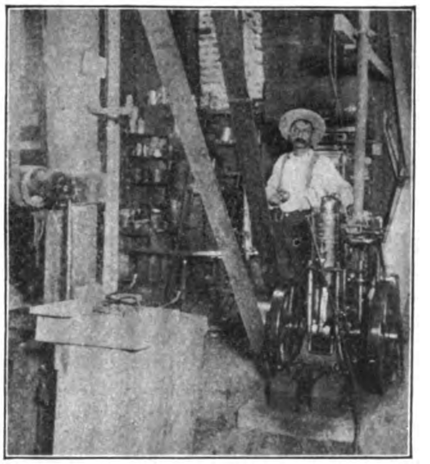
The hot tube igniter is the oldest form of igniting the gas within the cylinder of a gas engine. It is usually a small piece of gas pipe, extending from the top of the engine cylinder near the combustion chamber, the lower end of it being open so as to carry the heat or flame into the cylinder. This tube is heated by a small burner on the side of the cylinder, similar to



INTERIOR OF A CALIFORNIA SHOP.

that on a gasoline stove. Quite a number of smiths use the hot tube, as it is an efficient way of operating a gas engine, although the electric igniter is generally preferred on account of its neatness and to save renewing the tubes once or twice a week, or as they become charred. The tubes cost from five to ten cents each. A plated tube, as one coated with nickel, lasts longer than those made from plain gas pipe.

The electrodes on the engine cylinder should be kept clean in order to make the electric igniter thoroughly efficient, as they might become gummed and fail to work, and this would lead a novice to



ENGINE CORNER IN CALIFORNIA SHOP.

think that his batteries had become exhausted or weak, while in reality they would be perfectly strong.

There are several kinds of magnetos or small dynamos for generating current for operating the electrodes of a gas engine. A number of these are advertised in THE AMERICAN BLACKSMITH. They are very efficient, and any smith can save on batteries by using a generator of this kind.

Whether a dry battery or a fluid one is used, buy the best. It costs a little more at the outset but less in the end. If it is desired to do away with batteries altogether or to the greatest extent, then the auto-sparker, miniature dynamo, etc., are highly recommended.

A Gas Engine in a California Shop.

J. H. PINCKNEY.

The illustrations shown herewith are of my 2½-horsepower Samson Gasoline Engine, made by the Samson Iron Works, Stockton, Cal., and the interior of my shop. The engine runs the following machines: a band saw, a buzz planer, a boring machine, a sand belt, an emery grinder, a drilling machine, a blower for two fires, two grindstones, and also pumps gasoline from the large tank to the engine, and I have power to spare.

Power in the Blacksmith Shop—Does it Pay?

Prize Contest Article.

T. P. MCCANNE.

Speaking from experience, I say yes. I have worked at the trade for fifteen years, eleven and a half years with hand tools and without any form of power and three and a half years with a Fairbanks-Morse, (Chicago, Ill.,) one and a half horsepower gasoline engine. First I will speak of the limit to the capacity of the shop without power. The work that comes to the average shop depends largely upon the energy and capacity of the mechanic.

For instance, if a plow share is to be made, our man without power must first get his steel hot, which necessarily takes him from thirty to forty minutes, working like a trooper, either pumping a bellows or turning a blower crank. He then takes it from the fire and with the helper and cleaver cuts part of the way. It generally takes three heats to cut out and three to draw to shape. I know from experience that it takes the smith and his helper about three and one half hours to make the share, at a cost of twenty cents an hour for the helper, which makes seventy cents, thirty cents an hour for the smith, or $1.05, several pounds of steel at 3½ cents, and twenty-five cents for coal. You will see from the above figures that the plow share would cost more than $2.10, to say nothing of the wear of tools. The price for such a share (14-inch) in this country is two dollars and fifty cents, so that you see the smith gets only 40 cents profit on his job. This is about the way with all hand jobs, due principally to the length of time consumed in doing the work. Then again if a man goes to a

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shop to have a piece of work done, and the smith is a little behind-hand and he has to wait almost a half a day, he is apt to grumble at the price charged, because the price charged for the job is small compared with what time the customer has lost, which perhaps is more valuable than that of the mechanic. You will see that be a man ever so energetic he can only accomplish a certain class of work by hand, whereas if he has a cheap power, he can push his business right along.

Now let us take this same plow share made with power. The man goes to his engine, turns the electric button, sets his machine in motion, strikes a fire in the forge, which may be a down draft one, made by the Buffalo Forge Co., Buffalo, N. Y., and hence no smoke or dust. He turns on his fan belt and while his fire is kindling, he gets his slab of steel, which has been previously marked, steps to his rotary shear and cuts out the share, then puts it into his fire while his heat comes. He may talk to his customer about his crops or other things of interest, which goes a long ways towards smoothing the road for a nice round price for the work. When the heat is up, he turns to his trip hammer and draws to shape, say in two heats at the outside. Then back to the fire and brings up to a weld, after which he places it in the welding press, also run by power, then to the emery stone to polish, all of which can be done inside of an hour and a half. Let us figure the cost of these machines: Engine, $250; hammer, $100; shear, $100; emery wheel, $50; drill, $50; total, $500. A helper at two dollars a day would cost $600. So that you see if these machines had to be bought each year there would still be one hundred dollars to buy belt shafts, pulleys and the like, but if we run on next year we have our own machines all in good order to go ahead, whereas if we had a helper it is all to do over again. So you see if the mechanic could only do the same work with the aid of machinery, he would be in position to pocket the helper's wages the second year. But this is not the case, lest some one might say that I wish to knock out the wage-earner. I want to state here that the capacity of our man with power is so great that where he worked one man by hand, he will work two by the use of machinery.

Let us notice some of the things he cannot approach by hand. First he may own a lathe and do all manner of turned work in wood, gaining a good customer from his carpenter friend; also his lumberman. He may run a rip saw and band saw, and cut all manner of strips, circles and segments for his customers because he can always have a nice line of reaches, sills, crossbars, and sidebars, and the like cut from cull axles and tongues bought from a jobber at a nominal cost.

Now as I have said, I ran a shop for eleven and a half years by hand and owned my shop all the time. Nine hundred dollars' worth of work was the largest year's work I ever did by hand. Three and a half years ago I bought a gasoline engine, emery stand, and power drill press, and built a wood lathe, together with a saw stand with rip and cut off. The first year I cleared enough to pay for all the above machines. Last year I did nearly two thousand dollars worth of work, buying also a blower, which runs two fires.

Just here I want to say that in the shop plans of brother smiths, I notice so many have power, but no power blower. I cannot conceive of a greater mistake. I only consume one and a half gallons of gasoline per day, running the above machines at a cost of seventeen cents per gallon. Therefore, in my belief the man with power has at least 50 per cent. the advantage in time and 75 per cent. in capacity and an unlimited field for his energy. Besides, your customers are better satisfied to think they are dealing with an up-to-date man. It is a fact that wherever a man pushes ahead, the plodder always abandons the field. The gas engine is without doubt a time-saver and a money-maker and the smith who declines to get one is making a mistake.

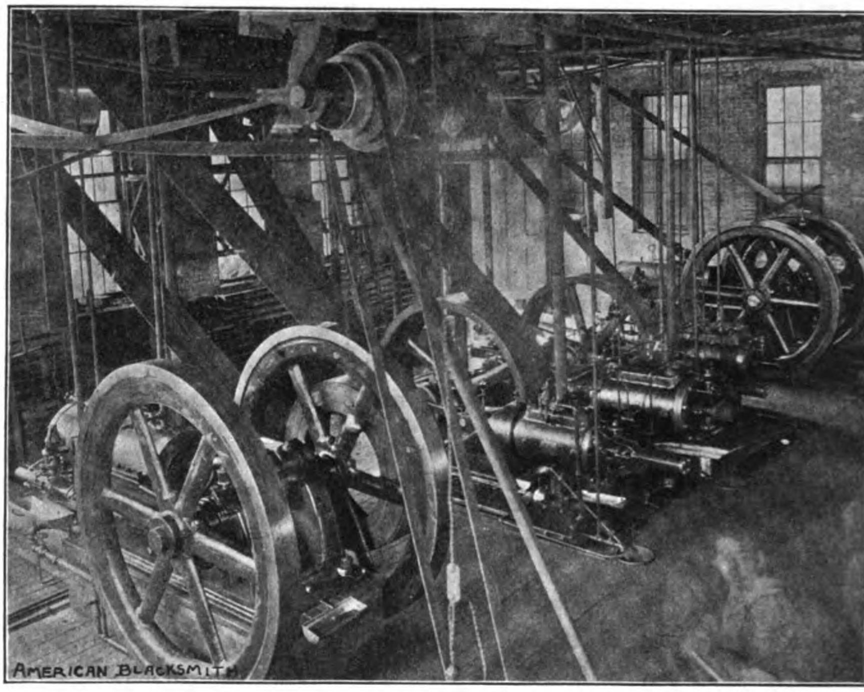
The Cost of Small Power.

Gas Power cites the case of a little machine shop near New York that installed several years ago a small slide-valve steam engine and an upright boiler, the latter capable of giving about 15 horse-power. The engine, however, seldom called for more than three horse-power at most, and for a large part of the time probably not much over half of this.

As steam had to be kept up all day, practically ten hours, it was found that the cost of coal, which was nearly six dollars a ton, came to 90 cents a day.

Gasoline in this same locality is selling at 18 cents a gallon. In spite of that the owner of the shop installed a small upright two-cycle engine, more with the idea of saving a fireman's wages, $2.00 a day, than with the intention of reducing his fuel bill. After a month's running it was found that his gasoline had cost $13.00, against a previous cost for coal of $23.40. So that his total saving was $62.40 a month on an investment of about $175.

Granting that this is an extreme case, there is still little question but what the gasoline engine in small powers is much cheaper than steam.



GAS ENGINES OF THE STAR DRILLING MACHINE COMPANY.

An Up-to-date Gas Engine Plant.

The plant of the Star Drilling Machine Company, at Akron, Ohio, is of interest, as it is one of the few large plants operated entirely by gas engines.

The power plant consists of four 60 and one 35-horsepower Columbus Engines, making a total of 275 horsepower. These engines are so distributed throughout the various departments as to reduce the amount of shafting to a minimum, and were installed by the Columbus Machine Company, of Columbus, Ohio.

One 60-horsepower engine operates the wood-working machinery, another 60 operates the metal working department and the 35 operates the lighting plant. The other two 60-horsepower engines shown in the engraving drive air compressors to operate drop hammers, formerly operated by steam, and all other small pneumatic tools, such as drills, chipping hammers and hoists.

The Star Drilling Machine Co. state that they find this division of their power very convenient, as they can run any part of the plant without operating the balance, and having no long lines of shafting, the loss by friction is small, and the cost of attendance, fuel and supplies much less than with the abandoned steam plant.

The Gasoline Engine for Smiths.

Prize Article.

WOOD BROTHERS.

We have a gasoline engine in our shop, a Fairbanks-Morse six horsepower engine, which will run at full power for ten hours on six gallons of gasoline. The engine cost three hundred dollars complete set up in the shop, and we consider it the best investment we ever made. We have a rip-saw, a band-saw, a planer, a frizzer, a turning lathe, an emery grinder, a boring machine and could run a drill with the same power. We saw our own felloes and hounds on the bandsaw, and then dress them on the planer, which makes each piece the same size and true. This enables the smith to have a full assortment of felloes and hounds at about one-fourth the amount it would cost him to buy them from the dealer, and he is always ready to do a job when it comes to the shop. Then we find that power aids us very much in getting the work ready for the customer, which is the greatest help to the smith. We dress all the timber used in repairing and making new work and it can be dressed in about one-tenth the time it would take to do it by hand and is much nicer to work. We use the frizzer for shaping hounds and plow beams, and chamfering is much better done this way than by hand. The boring machine, another great time-saver, will bore 300 ¾-inch holes in 3 by 3-inch harrow-frame timbers in an hour. We have a metal turning lathe which will turn a 7½-foot shaft or an 18-inch pulley. One man with the use of the engine can do from ten to fifteen dollars' worth of work per day. Men come from all around us to get felloes and hounds sawed. We also grind chill plow points, discs, cutting box blades and mowing machine knives.

The gasoline engine is always ready to start. We use an electric igniter and can start the engine in three minutes and when the work is finished there is no more expense until another job comes along. We put in our engine in June, 1903, and our business last year increased $1,740, with the same number of hands.

Then it makes the work much lighter on the smith. We expect to get a trip hammer and a power drill which will be run by the same engine. We find that a lighter engine would do all the work except running the rip saw, which takes most of the power we have. Sometimes we can saw 5-inch hickory with a 16-inch saw. A four-horsepower engine would run all the other machines we have. Our engine has never given us any trouble and we consider it safer than steam. The gasoline tank being buried in the ground out in the timber shed at the side of the shop makes an explosion impossible. We would advise any smith to get a good make of engine even at a little more cost, for it will pay in the end. There are five other engines in our town, one of them a Fairbanks-Morse and one a Charter, both giving perfect satisfaction. The others run when everything is all right, but if not, they give a great deal of trouble. We think that if a smith is in a fair stand, a gasoline engine to suit his trade will pay for itself in a year, and gasoline is the best and cheapest power that the smith can have.

The Advantages of Gas Engines for Smith Shops.

A Brief Summary.

A gas engine lightens the labor.

It increases the shop capacity; enables more and better work to be done, quicker and cheaper.

It stamps the owner as progressive and advertises the shop.

It attracts trade.

It permits the smith to do work otherwise impossible.

It permits side lines to be taken up.

They are a cheap source of power.

They may be stopped or started at a moment's notice.

All expense stops with the engine.

They are easy to operate.

They require no licensed engineer to run them.

There is no boiler to keep right, no steam to keep up, no ashes to keep down.

They can be set up anywhere and run by anyone.

The fuel is cheap and obtainable anywhere.

The repair expense is trifling.

They take the place of a helper and never go on strike.

They are simple and safe.

They are a good investment from most every standpoint.

Delicate Colors and Their Application.

Preparing Grounds for Vermilion, Some of the Yellows, the Blues, Wine Colors, Carmine, Etc. Applying These Colors and the Method of Procuring Best Results.

M. C. HILLICK.

One of the chief troubles which the country and village carriage painter meets with is in getting the best possible effects from the colors used. The painter working in surroundings entirely different than those met with in the large town or city shop finds himself at a decided disadvantage when sensitive and delicate colors must be handled in order to meet the demand of a public that is growing more and more exacting in respect to color effects and to the character of the finish bestowed upon them.

Vermilion, for example, while not a new color, has within the year returned for a new reign of popularity, and with its return has come the problem of getting the color upon the surface in a way to show all the glow which the color is capable of, when properly treated. While vermilion is a pigment with a good covering power, it is nevertheless the heaviest pigment known in proportion to bulk, and because of this fact, the painter finds difficulty in keeping the pigment sufficiently well mixed to insure requisite opacity or covering power.

Vermilion requires a strong, clean, perfectly prepared ground to develop its best color resources. There should be smoothness to the ground—a smoothness that furnishes absolute freedom from particles and specks of dirt—along with a substantial solidity of color. Bring the surface up in the usual way and when it has been worked thoroughly level and smooth, apply a coat of peach-blow color, which may be made of white lead and Indian red, with perhaps a very small per cent. of the vermilion added. Mix this with a binder of oil, if upon the running parts, thinning to the

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right consistency with turpentine, and in case of body surfaces we use rough-stuff; use elastic rubbing varnish instead of oil, for the binder. Apply this coat with a camel's hair brush and seek to lay it as smooth and clean as if it were the actual vermilion coat.

Mix the vermilion for the first coat to apply over the peach-blow color with sufficient elastic rubbing varnish to give it a decided gloss. A fine, soft bristle brush is the best tool with which to apply the vermilion. Permit this coat to dry through and then apply a second coat of vermilion, which should be mixed as a color-and-varnish, only enough color being used to stain the varnish and enrich the color beneath. This is the sure method of getting the natural brilliancy of the vermilion into the foreground—indeed it is the method necessary to develop the brilliancy of any member of the red family of pigments.

The delicate yellows, constantly and justly popular, such as cream color, canary yellow, 20th Century yellow, primrose, straw color, etc., require exceedingly fine and carefully adjusted grounds. For all these make the ground pure white, and bringing it up through the required coatings, carefully sandpaper and putty so that none of these processes will be necessary upon the last coat of white. Then apply the yellow directly upon the white, and for the final coat of yellow use enough varnish to convert the mass into a free working color-and-varnish, which may be either applied with a camel's hair or a soft, full elastic bristle brush. By this process, any one of the yellows above named will show an undreamed-of lustre and richness; and in addition the color will have a permanence, and will hold to its original purity of tone far more durably than if it were otherwise employed.

What has been said of the yellows in respect to careful preparation of the ground colors will apply with equal force to the ground colors for the aristocratic family of blue pigments. The ultramarine blue, despite the fact that within recent years some very smart shades of blue have been brought into use as competitors of the ultramarine, continues to hold the foremost position as a popular carriage color. The ultramarine is incapable of being used otherwise than as a glazing color, it being more than semi-transparent; and it requires a ground in all respects thoroughly built up and perfected. Any imperfection found to exist in the blue can only be remedied by going back to the early stage of the foundation—at any rate, back of the final coat of ground color. There can be no touching up of the surface after the application of the ultramarine—at least no touching up that will pass unobserved.

A satisfactory ground for ultramarine blue is a dark brown made of five parts of Indian red, and one part drop black and one part Russian blue. Some carriage painters use a ground composed of lampblack. Mix the ultramarine in elastic rubbing varnish, using merely enough of the color to stain the varnish. Flow the varnish-color or glaze on the surface freely—just as you would the clear varnish, in fact. Possibly you may be discouraged at the outcome, for the surface, instead of being the rich, solid blue characteristic of this color, as seen in city repositories, may show a lack of solidity somewhat astonishing to the inexperienced. But when the coat has hardened sufficiently—which means, of course, a condition that will permit rubbing with No. 00 pulverized pumice stone and water—proceed to rub the surface enough to deaden the gloss and smooth away all the dust and dirt specks, if any, and then after carefully washing the surface with clean water, flow on a second coat of the glaze color. Under this second flow of varnish and color the surface should show a clean, solid, uniform field of blue unmatched for beauty and brilliancy of color.

For an especially rich and singularly beautiful blue, flow medium ultramarine blue over a ground of very deep green—20th century green, for example.

The wine colors are for the most part very effective and fetching colors upon such vehicles as surreys, medium weight buggies, depot wagons and paneled top delivery wagons. There are three shades of what is commonly known as wine colors, and when furnished with strong durable grounds these wine pigments wear well, retaining their brilliancy for a long season of service. Indian red slightly darkened with an addition of black—say four parts Indian red and one part drop black—gives a good ground color. To counteract the fading and flaking tendency of the wine color, two faults commonly charged against the pigment, use enough varnish in the ground color to give it a positive gloss when dry. Use the wine color in varnish quite the same as advised for the ultramarine blue, although the wine color, being a pigment of stronger covering power, will furnish adequate opacity of surface with a simple coat.

Maroon lake, a reigning favorite in all sections of the country chiefly as a color, is seen at its best when glazed over a deep Tuscan red ground. The word of caution that has run all through the directions for preparing the ground for the various colors above mentioned urgently needs repeating here. The utmost care and skill are needed to the end that the surface be provided with all the required elements of perfection—smoothness, cleanliness, solidity of color, with a close approach in shade to the maroon lake itself.

Carmine, ever beautiful, and splendid

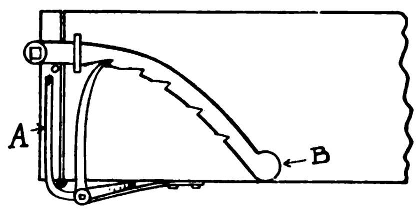

Fig. 1.—SIDE VIEW OF END GATE FASTENER.

in its glow of color even when unadorned, is not the difficult color to handle and apply that the inexperienced are sometimes led to believe. A fine and flawless ground it must have, but this having been acquired, the rest is comparatively easy. For a light carmine, something with all the fire of vermilion with the added richness of the color of ancient glory, bring the surface carefully up to the regulation vermilion coat, making the vermilion, however, to dry without any perceptible gloss. Then apply a coat of clear rubbing varnish into which a few drops of No. 40 carmine have been injected. This varnish, once dry, may

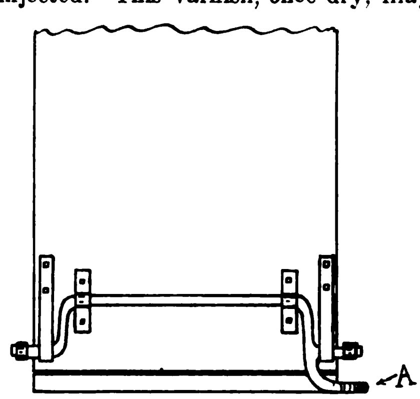

Fig. 2.—BOTTOM PLAN OF END GATE FASTENER.

then be rubbed with pumice stone flour and water sufficiently to knock off the gloss completely. The rubbing varnish serves to even up and eliminate the inequalities of the surface, and to remove a certain "fuzzy" feeling which nearly all red pigments when applied as flat colors possess. And in case of extremely light carmine—light reds of all kinds, in fact—any surface defects, however minute, become strikingly prominent. The surface having been rubbed and washed up, next apply the carmine, adding the

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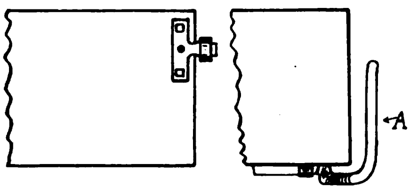
pigment ground in Japan, and best purchased in four-ounce collapsible tubes, to the varnish on the basis of ¾-ounces of carmine to one pint of elastic rubbing varnish. Apply with a soft badger hair brush, and flow the glaze on quite as freely as you would apply the clear rubbing varnish. For a dark, rich carmine, make the ground of Indian red, and apply the carmine directly to the flat coat of pigment, omitting the varnish coat as used in case of the light carmine. For a medium light carmine make the ground of Indian red to which has been added say 20 per cent. of English vermilion both to lighten and enrich the ground.



Figs. 3 and 4.—SHOWING DETAILS OF FASTENER.

To this color, when applied and dry, apply the carmine glaze, mixed as above directed. In applying the carmine do not make the mistake of coating the surface "piecemeal." Flow an entire wheel at once, or at least half of an ordinary carriage gear, or a large panel, etc., working the glaze clear and free. This will insure a surface of uniform color and brilliancy, a result necessary to best develop the real quality of all red pigments—indeed, of all pigments.

End Gate Fastener for Spring Wagons.

J. LAWRENCE HILL.

There is always more or less trouble experienced with all end gate fasteners. Those with a spring which require the thumb to release are sometimes too stiff or too soft so that they will not catch or even return to their proper position; the hole style will get out of alignment, by the spreading of the sides; there is also the drawback that it requires both hands at the same time to open the usual run of fasteners.

With this style, the objectionable features mentioned above are eliminated, first because the handle has a leverage, which enables it to overcome the stiffness of a spring; second, that one handle operates both catches, leaving the other one free to steady or pull open the door, and it has the additional advantage of allowing the gate to be partially opened and holding it so.

Fig. 1 shows the side with the handle, the other side is the same, minus the handle A; the shape of this is seen in Figs. 1, 2, and 4. The spring seen underneath the body in Figs. 1 and 2 must be good and stiff, as it is this which keeps the catch in position. The teeth in B need not be at regular intervals, only where they are required. There is a little pin or stud driven into the gate end, Fig 1, which keeps B from falling too low when the catch is out. Without this pin the teeth would catch in the staple, which is necessary in order to prevent B from leaving the sides of the body.

A Useful Wood-Working Shaper.

J. H. JENSON.

The following drawings and description of a home-made shaper will probably interest those who have woodworking to do in their shops. The top or table is made from two pieces of hard wood, 2″x9″x3 feet 9 inches, held together with three bolts ½x19½ inches, so that it can always be tightly clamped. Each leg at the front will take 23 inches of stock, while the arms above will take 12 inches. The rear legs are of angle iron, 2″ by 2″ by 2′10″, leaving two inches at each end, to bend for feet at bottom and for fastening to table at top. The shaft at rear is 1⅛ inches in diameter and 2 feet long, with a collar at each end. The tight and loose pulleys are 2½ inches face and 6 inches in diameter, the drive pulley 2 by 12 inches.

The two pairs of arms meeting above and below spread out to the legs behind, and extend out in front so as to hold the boxings of the shaper shaft. These arms are not shown in the side view.

The pieces which hold the shaper shaft are 2 feet 10 inches long; the piece to which front legs and arms fasten is ½ by 3½ by 18 inches long.

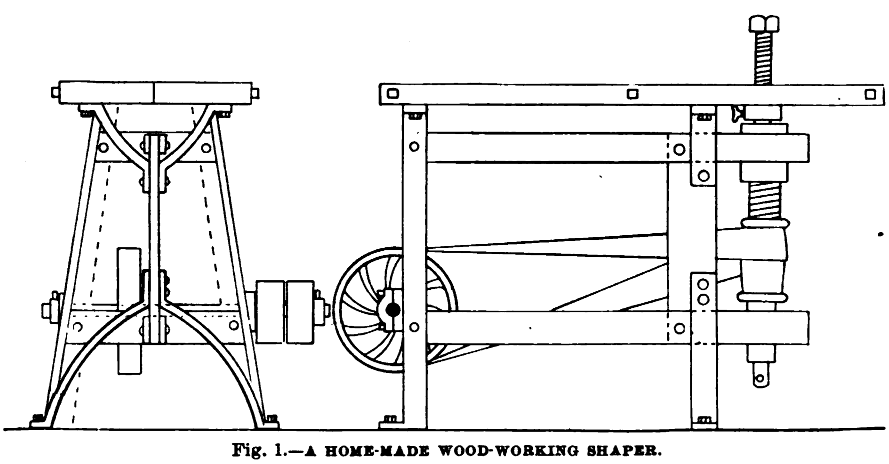
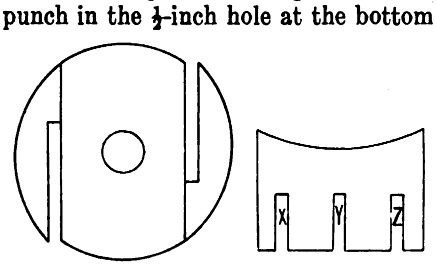


Fig. 1.—A HOME-MADE WOOD-WORKING SHAPER.

The shaft itself is 1⅛ inches in diameter and 2 feet 8 inches long, with a ½-inch hole bored in the bottom end for use when screwing nuts down on shaper head, or when raising and lowering shaper head, as will be explained later. This latter is necessary in order to accommodate different classes of work. The shaft for 5 inches at the top is threaded, being ¾ inch in diameter, and has a collar (not shown) driven down tight. Also it has two lock nuts at the top. A one-inch collar is set on the end of a piece of pipe, with a set screw in it for tightening on the shaft when it is desired to raise or lower same. This pipe is 9 inches long and makes the top boxing or bearing. It is threaded the entire length up to the collar, and on the pipe is a coupling, which has been split with a hack saw so that it can be tightened up, or loosened when raising or lowering the shaft. There is a 7-inch pulley with flanges on the shaft. The lower boxing, 6 inches long, is made from another piece of pipe and babbitted.

To raise or lower the head, first loosen set screw on coupling which holds the bearing, and then tighten set screw in collar at top of bearing. Insert a punch in the ½-inch hole at the bottom



A B

Fig. 2.—SHAPER HEAD AND CUTTER.

of shaft and screw it up or down as desired.

This machine can also be used as a circular saw for small work. Of course it has its limits. With it you can do felloes, rims and such work.

Referring to Fig. 2, A, is an end view of shaper head. This style of head needs no guide for felloe work. At B, which indicates the cutter, notches X and Z are for set screws to hold cutter, and notch Y is for the part of head which serves as guide.

The average mechanic will find this shaper easy to make, and very useful when finished.

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The Smithing of Sigfrid's Sword.

JOHN LUDWIG UHLAND.

Sigfrid was young, and haughty, and proud,
When his father's home he disavowed.

In his father's house he would not abide;
He would wander over the world so wide.

He met many a knight in wood and field,
With shining sword and glittering shield.

But Sigfrid had only a staff of oak;
He held him shamed in sight of the folk.

And as he went through a darksome wood,
He came where a lowly smithy stood.

There was iron and steel in right good store;
And a fire that did flicker, and flame, and roar.

"O smithing-carle, good master of mine,
Teach me this forging craft of thine.

Teach me the lore of shield and blade,
And how the right good swords are made."

He struck with the hammer a mighty blow,
And the anvil deep in the ground did go.

He struck: through the wood the echoes rang,
And all the iron in flinders sprang.

And out of the last left iron bar
He fashioned a sword that shone as a star.

"Now have I smithied a right good sword,
And no man shall be my master and lord.

And giants and dragons of wood and field
I shall meet like a hero, under shield."

HEATS SPARKS WELDS

Harvest Time—welcome days.

Be prepared for your fall and early winter trade.

Uncle Sam has over fifteen thousand rural free delivery mail routes.

Success is failure kicked to pieces by hard words. Are you kicking?

Don't wait for the other fellow to answer that question. If you know the answer send it in for publication.

Hair springs—made out of iron at three dollars a ton; one pound of them is worth seventeen and a half pounds of gold.

Some men complain about not getting their share of trade. They are usually the ones, however, who don't advertise or go after it.

Do you agree with everything said in this journal? No? Then send in your opinion and let the boys hear your side of the story.

Glass was first used for windows about the year 300 A. D. Its existence can be traced back more than two thousand years before Christ.

Leather cannon killed and injured more men at the battle of Leipsic than the magazine rifles and machine guns did during the Boer war.

Don't fail to ask questions on any point that troubles you. The mission of THE AMERICAN BLACKSMITH is to help as well as interest its readers. Ask us.

In Lapland is a lake having fresh water on top and salt water below. Its level rises and falls with the tide—probably it is connected with the sea by an underground channel.

The business man in these days of keen competition closely scrutinizes from a credit viewpoint all orders that come too easily, before he accepts them. Herein is a hint to smiths.

Screws used in watches—some of them are so small that it takes over 300,000 of them to weigh a pound; quite different from the one weighing over 17 tons told of last month on this page.

Like a two-edged sword, competition works both ways—it is either the life or death of trade. What are the smiths doing in your neighborhood? Are they killing prices? It's time to organize.

Some smiths set aside a certain sum each year towards buying new tools, or replacing worn-out ones, and improving their equipment so as to turn out more or better work. A mighty good plan.

Four months more and the icy times will be back again. Realize that? Just about enough time to get your neighborhood solidly organized for higher prices and better times before sharpening sets in.

Petty things.— Don't overlook the small things—constant dripping will wear away a stone. Teach the helper to be more saving; a careless man will waste coal, iron, bolts, nuts, and most any of the things he handles.

A full appreciation of the value of each present moment is one of the hardest things for many to acquire, and one of the most valuable possessions when once obtained. In it lies much of the secret of success or failure. Do it now!

What special efforts are you making at this time to collect old accounts? The best time to press a collection is when the customer is "flush." Perhaps your method of handling old debts would make interesting telling in these columns.

A smith we know invested in a horse rack and now shoes horses whose owners would never have heard of him had he not put in a rack. He has customers come from miles around. This is advertising. An up-to-date shop speaks for itself.

Ahead of time.—The value of being before-handed is most prettily illustrated by keeping the fire insurance policy always paid up. 'Tis said a fire always waits for the policy to run out. When does yours expire? Of course, your shop is insured.

Three gunboats built on the Thames, England, were recently taken apart and shipped by steamer and train to Kosheh on the Nile, a distance of over 4,000 miles. When they were put together at the end of their journey, not a single piece was missing.

Do you know pretty closely your cost and your profit on each job? If you don't, some figuring is in order. Figure in your time and your helper's, rent or taxes, coal, fuel, light, repairs, new tool fund—every item of shop expense should enter into your cost estimates.

If you wait until harvesting time for those machines to be brought in for repairs, you may be swamped with work. Same way with the broken sleighs. Best way is to talk to the owners. Wake 'em up. Don't let them wait till the very last minute to bring in the job.

Does your subscription expire with this number? Send in your renewal today, immediately; for next month starts a new volume and you don't want to miss one number, for we are going to make the paper better and more valuable than ever before. Our specially low long-time rates on page 221 of this issue, will enable you to save.

What's your side line? Some of our smith friends are doing the following for extra profit: Wood sawing, feed grinding, horse clipping, disc sharpening, rubber tiring, cider making, wagon painting, knife making, ornamental iron work, and running agencies for farm wagons, agricultural implements or gas engines. One of the boys is using his engine to furnish electric light for the town.

Tom's wife, faithful soul, had a few hundred dollars left her last month. The hard-worked woman wanted Tom to take it and fix up his place, put in new tools and be prepared to meet the competition of other shops. "No, wouldn't pay. No money in blacksmithing nowadays," was Tom's answer. They say Tom plays the races occasionally, and is given to a few like stunts. Apparently Tom thinks this a good way to use his cash. At any rate, the funds will be much safer in the bank in her name.

Scientific Blacksmithing.— Germany has seven schools solely devoted to the training of blacksmiths and locksmiths. Only public school graduates are admitted at these schools, and the course lasts about three years. The course at the Rosswein school is highly advanced, comprising physics, chemistry, electricity and the practical construction of machinery, and only students who have completed a course at one of the other schools are admitted. The schools are supported by the smiths, the government and private contributors.

Don'ts for the gas engineer. A good deal has been said about the gas engine in this number and Heats, Sparks, Welds thinks a few don'ts will not come amiss here:—

Don't oil the sparker shaft.

Don't forget to feed the engine.

Don't feed it too much fuel.

Don't expect the engine to run all day without any care.

Don't install an engine in a dark or damp place or on weak flooring.

Don't fail to switch off battery current at night or you will exhaust it.

Don't get excited when starting the engine and don't be afraid of it.

Don't allow anyone to stand too close to the engine when it is running.

Don't forget to switch on battery current before trying to start the engine.

Don't keep the gasoline in a tightly closed tank—it may cause trouble.

Don't think a gas engine doesn't need cleaning—have a regular time for it.

Don't allow any nuts or bolts to become loose—examine the engine frequently.

Don't fail to drain cylinder jacket in cold weather for the water may freeze.

Don't use steam engine oil to lubricate a gas engine, as the conditions are different.

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American Association of Blacksmiths and Horseshoers.

A comparatively short time remains now before fall and winter trade sets in. Many blacksmiths are planning to use that time in an effort to raise the prices in their neighborhood and there are few smiths who cannot do likewise with profit. A strong, enthusiastic effort now will be repaid many times over when the run of work at sharpening time comes on. Of course, if any shop feels it is getting as much for its work as it should, then a movement for better prices will not interest it. But how many shops are making the money they should?

Undoubtedly something is wrong with any industrious blacksmith who is content with prices that bring him only a bare living from his labor. There are other things to be thought of besides daily bread—old age or a rainy day ahead, for instance, to say nothing of the comforts and conveniences that his family ought to have.

The solution of the problem is better prices, and the road to better prices is organization. The time is *now*. Any blacksmith can start a movement to bring his neighbor craftsmen together in an organization for their mutual benefit. Write to us for our plans. We will lend a helping hand. But *don't* sit and wait for the other fellow to start things. He never does.

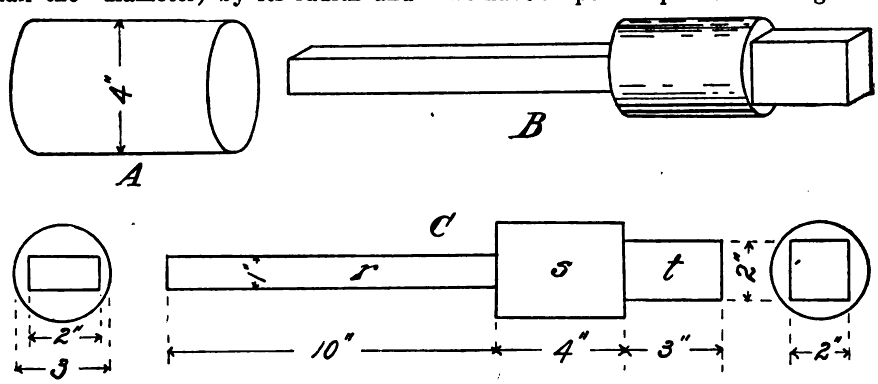
Calculating Stock and Weights of Forgings.

BY A. W. B.

Among the problems which sometimes arise to worry blacksmiths is the one which causes the question—"How much stock will it take to make this forging?" Oftentimes the smith will cut and try till he gets it right, and while this method may answer at times, it cannot be recommended, especially when the ability to make a few simple calculations will enable him to determine beforehand just how much stock is needed, saving both time and material. Then again situations may arise where it is impossible to get along without making some such calculations. Such a case will be considered here and an explanation given.

Referring to the figure, we will suppose the smith is given a bar of stock 4 inches in diameter and told to cut off a piece, A, long enough to make the forging B, the working drawings for which appear at C. The question is, then, how much to cut? The principle upon which we proceed is that the volume of the finished forging will be practically equal to the volume of the piece with which we start. Hence from the dimensions given we calculate the volume of the finished piece in cubic inches. Then we find out how long a piece of the original stock will contain that number of cubic inches. The process is simple, and is worked out as follows:

Referring to Fig. 1, C, our finished piece has a volume equal to the sum of the volumes of the parts r, s and t. The volume of any rectangular piece in cubic inches is equal to its length times its breadth, times its thickness, all in inches. The volume of a cylindrical piece is equal to the area of its circular base times its length, the base area being found by multiplying its radius (half the diameter) by its radius and



HOW TO CALCULATE STOCK AND WEIGHTS OF FORGINGS.

then by $3\frac{1}{7}$. Hence we have as the volumes of r, s, t and the entire piece:

r--2 x1x10= 20 cubic inches
s--$1\frac{1}{2}$x$1\frac{1}{2}$x$3\frac{1}{7}$x4= $28\frac{2}{7}$ " "
t--2 x2 x3= 12 " "
Total volume.....$60\frac{2}{7}$ cubic inches

Hence we shall need to cut off about 60 cubic inches from our original bar. The number of cubic inches contained in a disc or slice of this bar one inch long is 2x2x$3\frac{1}{7}$x1=$12\frac{4}{7}$ or roughly, $12\frac{1}{2}$ cubic inches. Then dividing 60 by $12\frac{1}{2}$ we get 4.8 inches as the length of the original bar that would contain 60 cubic inches. Hence if the smith cuts off 5 inches, he will have just enough to complete his forging, allowing a little for fillets and scaling.

In calculating stock required to bend a circular ring, the following formula may be used: $L=3\frac{1}{7}\times(D+t)$. That is, add the inside diameter, D, of the ring to the thickness, t, of the stock and multiply this by $3\frac{1}{7}$. A link may be considered as two semi circles joined by two straight pieces, and its length found in this way. This does not make any allowance for scarfing.

It is frequently desired to know the weight of a certain forging. This may be found by first finding the volume. Iron weighs 480 pounds per cubic foot or 0.278 pounds to every cubic inch. Steel weighs 490 pounds per cubic foot and 0.283 pounds per cubic inch. A simple rule for finding the weight of rods and bars is as follows. Multiply the breadth by the thickness and this by 64. Then for flat or square bars divide by 19; for rods or round pieces divide by 24. The result will be the weight in pounds of a one-foot length of the given stock. If considerable accuracy is desired use 19.2 for flats and 24.4 for rounds as the divisor. These are for iron. Steel, on an average, is 2 per cent. heavier. Referring to the figure, the weight of the cylindrical part (s) is as follows: 3x3x64 =576. Dividing by 24, (576÷24=24) we have 24 pounds per foot of length as the weight of the 3-inch rod, so that the part (s), being $\frac{1}{3}$ foot long, would weigh 8 pounds. This is a trifle high. Similarly for part r, 2x1x64=128, and dividing by 19, we get 6.74 pounds as the weight of a foot length. Ten inches would weigh (6.74x$\frac{10}{12}$=) about $5\frac{1}{2}$ pounds.

The Progressive Smith as a Business Man.—11.

How to Buy a Smithshop.

BILLY BUNTZ.

"Simply pay your money and take a deed," say folks who don't think business methods worthy of consideration. However, there is a deal of risk in buying haphazard or by taking for granted everything that is said concerning a property. It is but natural for an owner to think his property an excellent one and speak of its worth and advantages, meanwhile covering any drawbacks it may have. These the buyer must ascertain or see.

THE AMERICAN BLACKSMITH from time to time contains the advertisements of some good property bargains in its "For Sale" columns.

The shrewd smith knows that of first importance to buying *anything* is that of having previously considered whether, if the thing was bought, it would serve a profitable end. Thus, in considering whether he should buy a shop, he takes into consideration the rate of rent he is paying or how much his rent would amount to in five or ten years and whether it would be good policy at the end of that time to hold only a bundle of rent receipts or a good equity in a shop, although there are cases, of course, where it might be as cheap to rent as to own, though there is seldom the same satisfaction; he considers whether he requires additional room, whether he could obtain a more suitable or prominent location or a better shop or one having more custom, etc., etc. It is by *thinking* about his business, conditions surrounding it, and the improvements desired that enable him to formulate thoughts which give him an opinion and bring him judgment when he has an opportunity to buy. Often a building or shop is put on sale so suddenly that folks who have given the subject of buying but little thought, are unable to judge or determine the policy or advisability of doing so until after some one with broad perception has "gobbled" the bargain, when the others exclaim "I ought to kick myself!" Think of your necessities, your requirements, look for bargains. A good chance to buy may present itself as early as the morrow.

As a rule, it is wise to buy a shop as soon as the trade of smithing is mastered, or as soon thereafter as finances permit, even though the shop be bought on payments or half on time. Of course all rules have exceptions and circumstances might reverse conditions. The advisability of each individual smith owning his shop is for himself to determine.

Although a shop may be bought quickly in order to forestall others rom obtaining a bargain or desirable property, yet where caution is used and judgment exercised, there are considerable preliminaries attendant upon the transaction. The owner or his agent must be talked with, the reason for selling ascertained, as well as the amount of custom the shop has, the price, etc., while by cross-questioning or doubting the opinions of the owner, he might willingly produce books, receipts or his deed to substantiate his ideas about the present worth of the shop; at any rate, there is little to be gained by agreeing with the owner in all he says, as he is likely to want a rather high price, especially if not over-anxious about selling. However, where the smith is particularly anxious to buy, he still has the chance of afterward concluding to make a better offer.

Before considering the price seriously or making a binding offer, the building should be examined carefully and its general condition and the material of which it is built considered, as well as its dimensions. A carpenter or builder can readily give a fair estimate on what a new building of samé dimensions would cost, when deductions can be made for the age of the building, repairs needed and essentials lacking.

(a) ***THIS MEMORANDUM OF SALE,*** *made this* ....*day of*................1904, *by and between B. J. Jones and John Doe both of the city of* ....;

(b) ***WITNESSETH:*** *That the said B. J. Jones hereby agrees to sell, and the said John Doe agrees to purchase lots numbered*..........*on*.................*Street, in the city of*...................*county of*................ *State of*......................;

(c) *That the said John Doe hereby agrees to pay the sum of* ....*Dollars for said premises;*.............. *dollars being hereby paid into the hands of J. W. Thomas in escrow until the completion of this contract, and the further sum of* ....*dollars, to be paid upon the making, executing and delivering of a general warranty deed by said B. J. Jones and his wife;*

(d) *That the said B. J. Jones is to furnish said John Doe an abstract to said property showing clear title in him;*

(e) *That the* ....*dollars paid by John Doe is to be returned to him in case title should prove defective to said property, but if the title to said lots is perfect and the said John Doe should refuse to carry out his part of this contract or pay the balance of said* ....*dollars due thereunder, then the*..............*dollars paid in escrow as aforesaid, to be forfeited to said B. J. Jones as liquidated damages;*

(f) *That this contract is to be fully executed and completed by both of the parties hereto, on or before the*.......*day of* .... 1904.

(g) ***IN WITNESS WHEREOF,*** *we have hereunto set our hands this* .... *the date first above written.*

B. J. JONES.
JOHN DOE.

Where a shop has machinery, take an inventory of same and make an estimate of the worth of the tools, or obtain their cost when new by writing the manufacturer.

The good-will of a shop or the trade it has is often a matter of conjecture or an unknown quantity to the prospective purchaser, especially where he is buying a shop away from home. A well-equipped shop generally has a good custom, but at the same time the purchaser may state that he does not particularly care to pay much for its good-will for the reason that he thinks it is included in the price or that he himself is able to command plenty of custom.

The worth of the ground should also be carefully considered. In the cities it may be priced by the front-foot, while in the country it could be bought by the acre at a low figure. The situation or location of the ground may also have considerable to do with setting its value, aside from its smithing use, *i. e.*, it might sometimes represent a higher value for other use, by the town growing or business centering near it. Where the ground is low, a high foundation is generally necessary to keep the shop dry, while on high ground. little foundation is needed. These are points to consider when buying ground on which to build.

The terms of sale should be closely scrutinized. Some sellers harp considerably on selling cheaper for cash, their main reason being, probably, that they want to use the money at once, yet they will often offer to sell on time at a higher price, notwithstanding that a mortgage on their own building ought to be a good investment. Where they offer to sell both ways they can sometimes be pinned to the lower price on different terms by disagreeing with them as to the deviation when the one way would be as profitable to them as the other. They might have to invest their money, anyway, were they paid all cash, and a mortgage on their own shop ought to be good protection as well as a good investment. Where the owner insists on al. cash it might be well to offer within two or three hundred dollars of it, or to split the difference.

Where another smith is bought out it is usually well to make a contract with him that he will not again engage in the smithing business in the same town or county. A competitor's shop is easiest bought by having some disinterested outsider or stranger approach him or act as agent, without letting him at

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first know who the real purchaser is.

To carry out the above named suggestions might not take more than an hour, and having decided to buy, a small payment down should be made—the least the owner will accept—say from ten to fifty dollars, to hold the sale. At the time of the payment, however, an understanding should be had as to the purpose of the deposit. In reality it is to forestall others from buying for a certain time, pending the examination of the title to the property. As a rule, the buyer tries not to bind himself absolutely while preventing the seller from backing down or selling to another. He can do this best by making a memorandum agreement with him.

The agreement here drawn is a simple form of contract of this kind. Referring to the reference marks, the clause marked "A" gives the date of the contract, the names of the parties and the place where they reside.

(B) Shows which of the parties is the buyer or the seller, while the property itself is definitely described or located.

(C) The purchase price and the amount paid down. J. W. Thomas is a third party, who holds the binding money. Note that Jones, together with his wife (he being married, she is a joint owner), is to give a warranty deed—which is the best.

(D) Besides furnishing a deed, Jones is to furnish an abstract showing clearly that he really owns the property legally and that it is free from any complications or incumbrance.

(E) Should the buyer refuse to buy he forfeits his money-deposit, or if the title is defective, then his deposit is returned.

(F) The time in which the transaction is to be completed. Were this omitted, either party might soon say that he was losing money by waiting, and annul the contract.

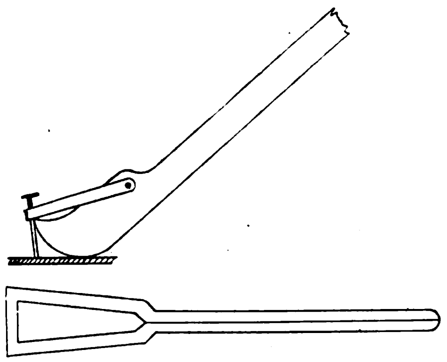
(G) The contract must be signed by both parties. It may also be witnessed, although the contract would be valid were it not.

It sometimes happens that the buyer knows all about a property so far as its excellent location is concerned, its advantages, worth, etc., in which case he might buy it outright of the owner by making a "General Warranty Agreement" with him, which contains the same wording as to the property as would the deed. Such contracts are usually on a printed form, with blank spaces for the insertion of the elements relating to the parties, description of property, etc. Modifying elements may also be inserted, particularly a clause that the owner is to furnish an abstract of title showing that the property is legally and technically vested in him, when the balance due over what was paid down as binding money will be forthcoming upon the tender of a warranty deed.

In order to transact the business to best advantage, it is well to employ a good attorney, who can draw the memorandum, look over the abstract and see that any errors are rectified or that the buyer gets a good title and a warranty deed.

The next number of THE AMERICAN BLACKSMITH will contain a continuation of the present article, entitled, "Abstracts, Deeds, Mortgages."

Where rent is exceedingly cheap there



A HANDY BOLT PULLER AND A TIRE BOLT WRENCH.

need be no rush about buying a shop, but when it amounts to $10 or more per month, it only takes from six to ten years to pay out in rent an amount which would buy a fair-sized shop. Owning a shop usually makes the smith take pride in it. The apprentice who has completed his trade will do well to save his money towards making a part payment on a shop.

The same general suggestions about buying a smithshop also apply to buying a home. Sometimes a shop can be bought which has desirable living rooms over it.

A word of caution: Don't be afraid to go in debt one-third or one-half the price of the shop, but where your means are very limited or you are getting old, don't go too deeply in debt, as, for instance, by buying a high-priced building. In the start, many a smith has bought a cheap lot and built a common shop or bought an old barn or building and converted it into a fairly good smithy, afterwards buying a better location or a well-equipped shop when he was better able to do so.

Bolt Puller—Tire Bolt Wrench.

J. MARION.

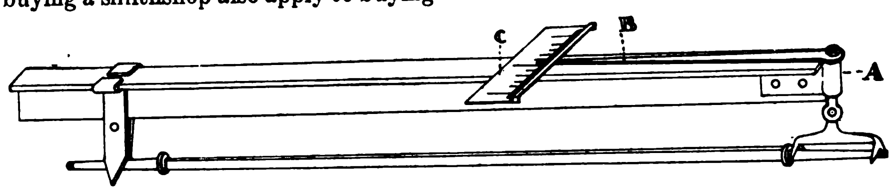
The accompanying sketch shows a tire bolt wrench, one-third size. I find it one of the handiest tools I ever made. The upper sketch is of a spike, nail or bolt puller. I will guarantee it to pull any spike or bolt, if made as shown. I hope some brother of the craft will try both of them and let us know how they work.

A Gage for Accurate Axle Setting.

NELS PETERSON.

A number of axle gages and devices for setting axles have been illustrated and described recently, some of them too crude to be of much value, others so complicated as to involve an array of figures and mathematical problems to be worked out. Although there is a large number of good devices on the market to be used for setting axles, no one has come forward with a description of one that would be of any practical use where quick work is required. Suppose, for instance, a man had to weld and set fifty sets of axles for a day's work; he would feel like retiring for the night if he had to put the wheels on the spindles, measure with rods, etc., to find out if his axle were set right.

The figure herewith shows a gage used largely in factories, and it is so simple that any good smith could make one. The main part could be made out of a piece of T bar; the head, A, is forged out and riveted on the bar. When the gage is in use the axle is laid with one end resting on the anvil, the other end on a trestle or some other



AN ACCURATE AXLE GAGE.

object. The gage is then set on the axle, as shown in the figure. Now, if the axle is perfectly straight and you revolve it, the indicator, B, will point to the center of the plate, C, which is laid off into half and quarter inches, etc., the indicator being about twenty inches long, or the average length of a buggy spoke. You can tell exactly the amount of pitch or gather your axle has by simply watching the point of the

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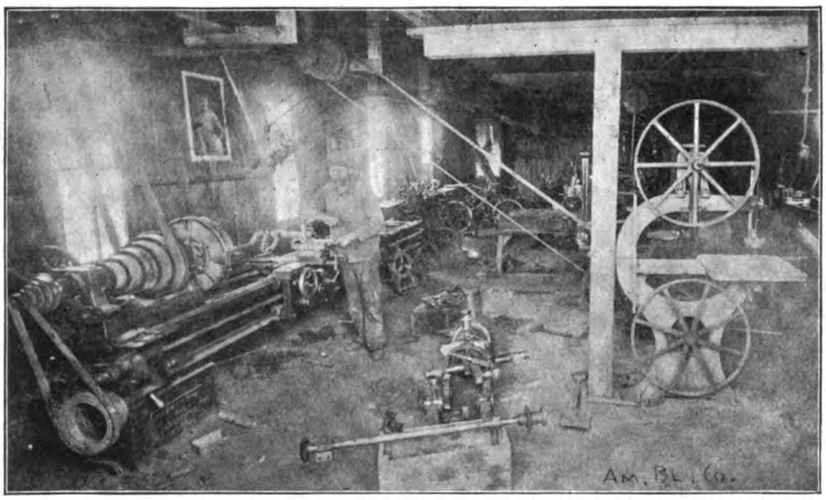
indicator as it moves on the plate while you revolve the axle. I think brother craftsmen will find this a quick method and also very simple.

A Nebraska Shop for General Work.

The photograph shown herewith illustrates part of the shop of Mr. Edwin A. Stone, of Ong, Nebraska. In this room he has an engine lathe, 24-inch swing, 16-foot bed; one lathe of 13-inch swing and 10-foot bed; a 32-inch band saw, metal planer, power hack saw, and emery grinder with one wheel to grind tools and the other side with an adjustable table to do surfacing. Then there is a power screw cutting machine; Little Giant No. 10, which will cut solid iron rods to one inch and pipe to 1¼ inches. His Universal tenoning and boring machine will drill holes in iron to ½ inch, and bore hard wood to 1½ inches, and has bored all the holes in a 4 x 4 oak rake axle, changing the bit twice in ten minutes by the use of cone pulleys. The speed can be changed four times which makes it better for different sized holes. There is also a jig saw, and last but not least a tire bolting machine for taking off and putting on nuts on buggy wheels. To one side is a room 16 by 18 feet, where is stored heavy material, round steel to three inches, flats and squares, pulleys, etc., gasoline and machine oil. Upstairs, wagon and buggy woods, oak and hickory lumber, heavy sheet steel for engine stacks, pipe, etc., is kept. In the blacksmith shop is a disc sharpener, and emery stand for plow work that will run two 14-inch wheels. A drill, hammer and blower, all run by power. The forges are made by the Buffalo Forge Company, of Buffalo, N. Y. The anvils are the Hay-Budden make, weighing 250 pounds. There are also two shears, one down on the floor for long heavy bars, the other a combined Black Giant Punch and Shear. Also several tools such as tire bender, mandrels, swage blocks, etc. Mr. Stone says, "I think machinery pays, and I keep getting more as fast as I can. For power I have a gasoline engine of four horse-power, which is rather small now, but which was plenty large enough when I bought it. Any one getting an engine wants to be sure and get one large enough at first, as it is a great deal of work and expense to change. As for foot and hand power machinery for practical business, I do not think it is much good, as a band saw cutting 2 or 3-inch oak makes business for a four-horsepower engine. I ran a 13-inch lathe with my feet a year and found it rather tiresome."



A FOUR-HORSE POWER GAS ENGINE RUNS THIS NEBRASKA SHOP.

Two Useful Devices for the Repair Shop.

FRED H. WOOD.

The sketches shown herewith are of two devices I have found very convenient. The first, Fig. 1, is intended to keep buggy tongue or shafts from slipping off the trestle while ironing or repairing. Make the Y-shaped iron with ⅝-inch stem and ½-inch branches. Weld a collar to the stem 2 inches from the crotch. Bore a row of holes in the trestle to accommodate different widths of work. I am indebted to Mr. Evans, of Callaway, Neb., for this idea.

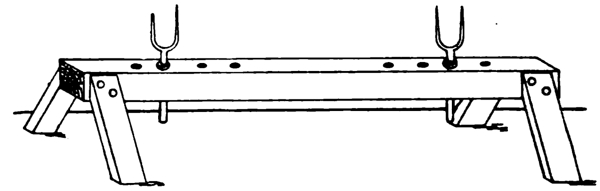


Fig. 1.—A SHAFT HOLDER.

Fig. 2 shows a tool to mark the hole in the landside point of a slip lay. It should be made of flat spring steel light enough to spring with the hand. The blunt plug should be ⅜-inch and the sharp one should be hardened like a center punch. To use, hang up the plow by the clevis. Place lay in position and blunt plug in hole in the frog of plow. Spring together with left

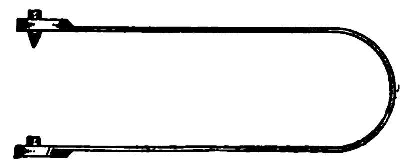


Fig. 2.—A TOOL FOR MARKING THE HOLE IN A SLIP LAY.

hand. Hit a tap with hammer on center punch and your lay is marked on the outside and in the right place.

Wheeled Blacksmith Shop for Use in Battle.

A blacksmith shop on wheels for repairing cannon, gatling guns, gun carriages and everything pertaining to the artillery is the latest addition to the United States army. In the heat of battle, when artillery pieces become impaired from any cause, the movable blacksmith shop is ever in readiness to make speedy repairs, that the guns may quickly resume their work of death.

The wheeled shop is called a battery wagon. The United States is the only nation in the world to possess such an acquisition, and its service in actual warfare will be of inestimable value. In every battle that has been fought with artillery since the cannon ball's deadly work first was known, there has been a crying need for just such an octrivance, but it remained for an American to think out the conception and perfect the invention. How many times has an army been weakened through the disablement of its artillery? How many times has a general been forced to surrender because his cannon were no longer of service? History records many instances, and there are probably many more that have never been chronicled. With the battery wagon to have hurriedly placed the disabled artillery again in action history might tell a different tale in its accounts of numerous battles and it might have changed the fortunes of wars.

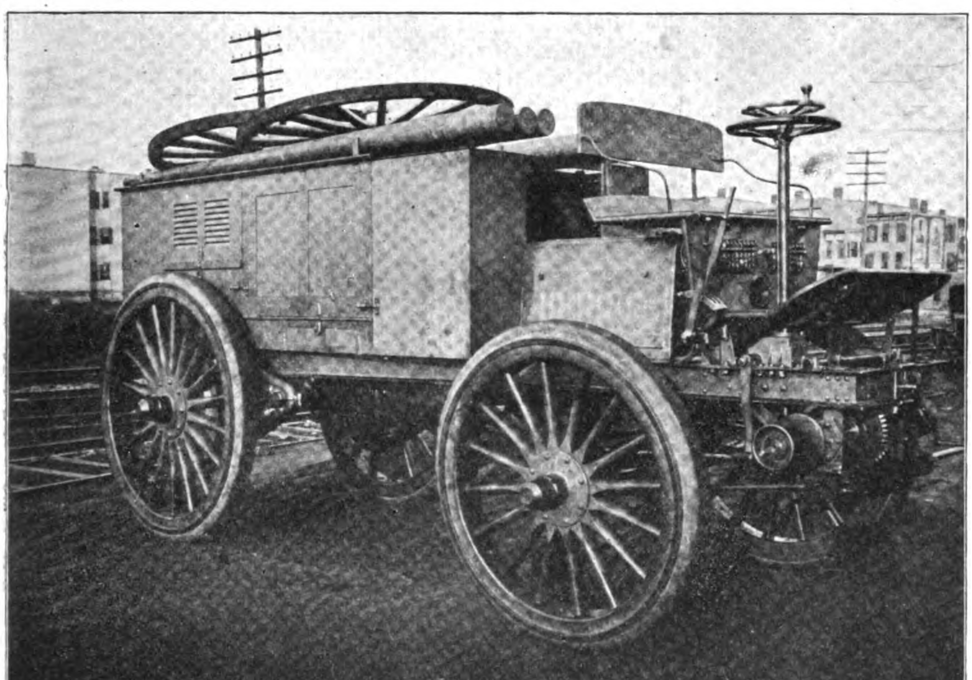
The battery wagon might be called

an army automobile blacksmith shop. It is a huge automobile equipped with all the tools of a blacksmith shop needed for artillery repairs. There is an anvil, a forge, a lathe, emery wheel, grindstone, vise, dynamo for lighting at night and other service, and an abundance of other tools, including hammers, wrenches, files, etc.

The wagon was built for the United States government by the United States Long Distance Automobile Company. It weighs about five tons and is driven with a four-cylinder gasoline engine. The front wheels are 48 inches in diameter and the rear wheels are 56 inches. All the wheels are fitted with solid rubber tires. The machine has four speed changes forward and reverse, and is geared to run at a maximum speed of about 10 miles per hour. It is arranged with drawers and compartments to carry all the small tools and appliances.

The machine attracted great attention when it recently traveled from New York to Washington, making the trip without a single mishap. All along the route people gathered to see it and to marvel at its unique appearance. European publications have sent representatives to America to describe the device, and the probabilities are that it will be imitated by many nations and become an established addition to all armies of the world. The most peaceful citizen can see the necessity of a moving blacksmith shop of this type. It will possibly be the means of bringing the blacksmith, as a hero, before the nation, as it places him upon the field of battle.

We are indebted to Popular Mechanics, Chicago, for the above description and illustrations.



AN AUTOMOBILE BLACKSMITH SHOP FOR USE IN BATTLE.

Diseases of the Foot—Causes, Symptoms and Treatment.

W. O. JULIUS.

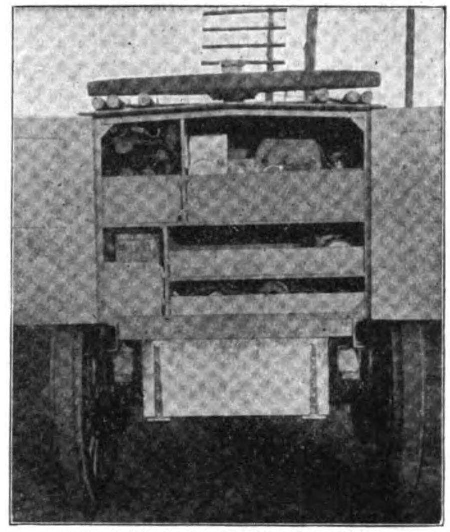
The foot of the horse is the most important part of the animal, inasmuch as this member is subject to many injuries and diseases which render him partially or wholly unfit for the labor which is expected of him. Since the value of the horse depends upon his ability to labor, it is essential that his organs of locomotion should be kept sound, and to accomplish this it is necessary not only to know how to cure diseases to which these organs are liable, but better still, how to prevent them. Of importance to the detection and cure of disease is a knowledge of the construction and uses of the parts which may be affected. But presuming that the readers of THE AMERICAN BLACKSMITH are familiar with the general structure of the foot, ankle and fetlock, we will not go into details about their conformation.

Faulty Structure.

We will start with a condition known as *flatfoot*, which is common to heavy breeds and those raised on low marshy soils. It is confined to the forefeet, which are generally broad and low-heeled and with a wall less upright than seen in the perfect foot.

In flatfeet there can be little or no elasticity in the sole, for the reason that it has no arch, and the weight of the animal is received on the entire plantar surface as it rests on the ground instead of on the wall. For this reason such feet are particularly liable to bruises of the sole, producing corns and pumice sole.

Horses with flatfeet should be shod



REAR VIEW OF BATTERY WAGON.

with a shoe having a wide web pressing on the wall only, while the heels and frog are never to be pared. Flat feet generally have weak walls and as a consequence the nails of the shoe are readily loosened and the shoe cast.

Clubfoot is a term applied to such feet as have the walls set nearly perpendicular. Where this condition is present, the heels are high, the fetlock joint is thrown forward and the weight of the animal is received on the toes. Special shoeing, as a rule, is the only measure of relief that can be adopted. The toe should not be pared, but the heels are to be lowered as much as possible, and a shoe put on with a long toepiece projecting slightly upward, and the heels are to be made thin.

A condition known as *crooked-foot* is where one side of the wall is higher than the other. If the inside wall is the higher, the ankle is thrown outward, so that the fetlock joints are wide apart and the toes close together. Animals with this deformity are pigeon-toed and very liable to interfere, the inside toe striking the fetlock. If but one foot is affected, the liability of interfering is still greater for the reason that the fetlock of the perfect leg is more near the center.

When the outside heel is the higher the ankle is thrown in and the toes turn out. Horses with such feet interfere with the heel. If but one foot is so

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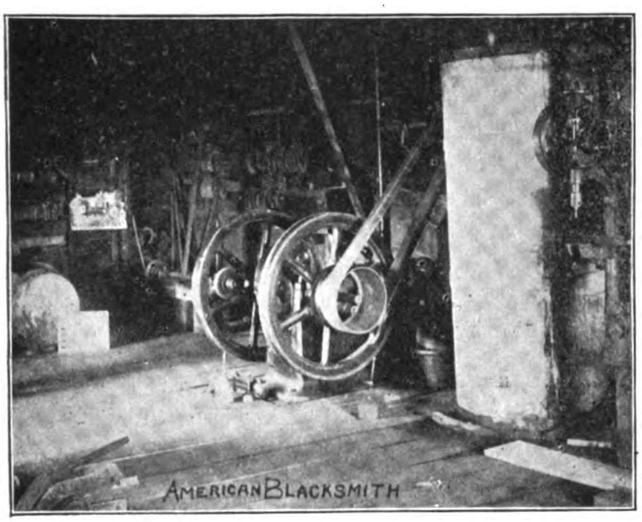
affected the liability of interfering is less than where both feet are affected, for the reason that the ankle of the perfect leg is not near to the center. Such animals are especially liable to stumble and go lame from injury to the ligaments of the fetlock joints.

The deformity is to be overcome by such shoeing as will equalize the disparity in length of the walls and by proper boots to prevent the fetlock from interfering.

Interfering.

An animal is said to interfere when one foot strikes the opposite leg when the animal is in motion. The inner surface of the fetlock joint is the part most subject to this injury, although under certain conditions it may happen to any part of the ankle and may cause lameness, dangerous tripping and thickening of the injured parts. Faulty conformation is the most prolific cause, when the bones of the leg are so united that the toe of the foot turns in or when the fetlock joints are close together and the toe turns out. When the leg is so deformed that the whole foot and ankle either turn in or out, interfering is almost sure to follow.



A GAS ENGINE IN AN IOWA SHOP.

The evidences of interfering are generally easily detected, as the parts are tender, sore and swollen, but very often, especially in trotters, the flat surface of the hoof strikes the fetlock without evident injury and attention is directed to this part only by the occasional tripping and unsteady gait. In such cases proof of the cause may be had by walking and trotting the animal after painting the inside toe and quarter of the suspected foot with a thin coat of chalk, mud or paint.

In treating for interfering it may not be possible to overcome the defect when the trouble is due to a deformity. In such cases and as well in those due to exhaustion and fatigue, the fetlock or ankle boot must be used. In many instances interfering may be prevented by proper shoeing. The outside heel and quarter of the foot or injured leg should be lowered sufficiently to change the relative position of the fetlock joint, by bringing it further away from the center plain of the body, thereby permitting the other foot to pass without striking. A very slight change is often sufficient to affect this result. At the same time the offending foot should be so shod that the shoe may set well under the hoof responsible for the injury and the shoe should be reset every three or four weeks.

Cold water bandages applied to the injured parts will remove soreness and swelling when the cause has been removed, especially in recent cases.

Sprains of the Fetlock.

This trouble is most common in the forelegs and as a rule affects but one at a time. Horses doing fast work and those that interfere are particularly liable to this injury. It generally happens from a misstep, stumbling or slipping, with the result that the joint is extended or flexed to excess. The same result may happen when the foot is caught in a rut or car track and the animal falls or struggles violently.

The symptoms of sprain of the fetlock vary with the severity of the injury. If slight there may be no lameness, but simply a little soreness, especially when the foot strikes on uneven ground and the foot is twisted a little. In cases more severe the joint swells and is hot and puffy and the lameness so intense as to cause the animal to hobble on three legs. While at rest the leg is flexed at the joint affected and the toe rests on the ground.

If the injury is slight, cold water bandages and a few days' rest are sufficient to effect recovery. Where there is intense lameness and swelling the legs should be placed under a constant stream of cold water and when the inflammation has subsided a blister should be applied to the joint.

In some cases, especially in old horses long accustomed to fast work the ligaments of the joints are ruptured in whole or part and the lameness may last a long time. A joint once injured by a severe sprain will never entirely regain its original strength and is ever after liable to a repetition of the injury.

Overreaching.

This is where the shoe of the hind foot strikes and injures the heel or quarter of the forefoot. It very rarely happens except when the horse goes fast, and is therefore most common in trotting and running horses. In trotters the accident generally happens when the animal breaks from a trot to a run. The outside heels and quarters are most liable to the injury.

If an animal is subject to overreaching, the coronet at the heel or quarter is generally bruised or cut, the injury in some instances involving the horn as well. When the hind foot strikes well back on the heel of the forefoot the shoe may be torn from the forefoot or the animal fall to his knees.

If the injury is but a slight bruise cold water bandages applied for a few days will remove all of the soreness. But if the parts are deeply cut it is well to poultice for a day or two, after which cold baths may be used.

When an animal is known to be subject to overreaching he should never be driven fast without quarter boots, and if there is a disposition to grab the forward shoes the trouble may be remedied by having the heels of these shoes made as short as possible while the toe of the hind foot should project well over the hind shoe.

A Blacksmith Shop of Iowa.

JNO. F. PINNE.

The photograph herewith is that of my shop located at Otho, Iowa. I run my emery stand, disc sharpener (which is a Champion), grindstone and drill with my five-horsepower Lewis engine, which I consider one of the best engines on the market. This is manufactured by the J. Thompson & Sons Mfg. Co., of Beloit, Wis. I intend shortly to put in more machinery. My work is that of repairing plows, cultivator shovels, etc., horseshoeing, wagon work, and painting buggies. I started my shop in Otho five years ago. Up to this time they could not keep a smith, as they claimed there was not enough work for a man in the town. However, I have all that I can do at the present time.

The following are some of our prices:

Horseshoeing, plain	$1.20
" toed	1.40

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Re-setting shoes	plain	.50
" "	toed	.70
Setting axle		1.00
Welding springs	per weld	.25
Wagon tongue		1.50 and 2.00
Wagon hounds	front	3.50
" "	hind	2.50
Axles		2.00 to 3.00
Buggy shaft		1.00
Buggy spindles	new	5.00
Setting tires		.50 to 1.00
Singletrees per pair		1.00 to 2.00
Filling Wheels		3.00
Spokes	new	1.50
Rims	new	1.50
New tires	per pound	.03
Making new tires		1.00

Of Interest to Progressive Smiths.

The progressive smith, who is taking time by the forelock and figuring on some advertising scheme for the first of the year, will be interested in the announcement on page XV., of this issue. It sets forth a good opportunity for advertising the smith shop.

QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

Fistula.—I have a horse that has the fistula and I have tried everything that I can think of, but cannot effect a cure. I would like a few hints on curing same. Can some brother smith give me a remedy? H. W. Simon.

A Pacing Horse.—I have a horse to shoe which paces and sometimes trots, but seldom. He always paces in front of a wagon. I would like to ask some brother smith if the horse could be shod so he would not pace. Wm. Hollenberg.

Cells for Engines.—Will some reader of The American Blacksmith give me information as to the best cell to use on an engine, wet or dry? Also how many cells per horse power, and the names of cells being used. M. I. Morgan.

Good Locations for blacksmith shops exist at the following four places. There is no shop at any of them at the present time. For further information address the postmaster, Sims, Center, Flusher and Farmington, all in North Dakota. There is no shop within 22 miles of Center.

With Regard to the Anvil.—I think I can go Carl Bereuter one better on his anvil. If he should have to work on Sunday and wishes to be quiet about it, he should just wind a chain around the waist of his anvil and it will not be in the way like the weight on the horn. H. N. Pope.

Shoeing a Club-Foot.—Answering Brother Smith as how to shoe a club-foot, will say when cutting the hoof don't pare the toe, but lower the heels as much as possible and put on a shoe with a long projecting toe piece, slightly turned up. Make the heels to this shoe thin. O. B.

Softening Hard Feet.—In answer to C. R. C.'s question how to soften hard feet in summer, will say, when shoeing, pack the hollow of the hoof with cotton waste dipped in pine tar and shoe with a leather pad to keep waste in hoof. Painting the outside of hoof with pine tar will help in this treatment. O. B.

An Unusual Shoe.—In answer to Martin Kaffitz, would say that the shoe he asks for was made here in Shelton but later the firm moved to New York. I have often been in the factory and have also put on a good many of them, but do not consider them any better than any well fitted steel shoes, unless for use on very hard pavements. H. N. Pope.

A Raise in Prices.—The smiths of Brighton, Ontario, together with others in that vicinity, have adopted a new set of prices, as follows:

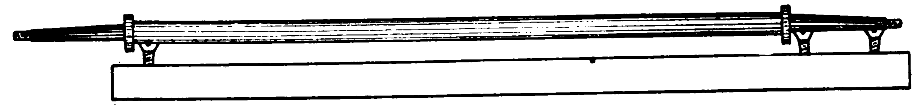
Resetting shoes, each	.10 to .12½
New shoes, each	.25 to .30
Bar shoes and specials	.50 to 1.00

I may say these prices are working all right. W. Ferguson.

Mixing Clay for the Forge.—In answer to A. H., in the August number of The American Blacksmith, would say the clay is already mixed. Get good clay, free from pebbles and pound it to place with a large hammer, but don't use water. He will find this will make a fire place that will last for years without any repairs. I have used mine for over four years. Be sure and get it deep, as a shallow fire is a great mistake. Seven inches deep, at least. Wm. Angle.

Axle Setting.—I have been at the anvil for fifty years and have tried all the known rules for wheel and axle work, and have adopted what has by experience proved to give me the best results, letting all the rest go.

Now as to wheels, the plumb spoke theory is all right where there is but little dish in the wheel, but where there is considerable dish the theory will not do. It is often the case that there is considerable more dish in the back wheels than the front. Consequently if you make the wagon or buggy track you have too much swing in the back wheels. There is always a remedy, if we will hunt for it, and therefore if we are to made a carriage of buggy track and run right we will have to go to the axle. There seem to be so many rules and theories for setting an axle, that younger smiths become confused as to what is right and what is wrong. Having tested all the rules that I ever heard of, would say that the one I now use has given the best results of them all.



A SIMPLE DEVICE FOR SETTING AXLES.

Suppose we have a one-inch axle. The right end I set according to a straight line running from the top of the axle at the left collar to the bottom of the axle at the right collar, giving the axle pitch till its bottom lies along this line. I use a straight edge for this. Then I take a straight edge and put three screws in it, one at the left to come just inside the collar, the other two at the right, at end and collar. See illustration. Adjust the screws so as to have all three touch axle and then set axles by this gauge. The result is that you have an easy running buggy or carriage. This rule applies only to iron axle work, not to wood.

As to track, some wheels have more dish than others. Suppose the back wheels have one inch more dish than the front. If you set your axles both alike, the back wheels will track one inch wider than the front. Where is your remedy? Some say to set the back axle down at point until it does track. That is a mistake. Set your axles all alike by the gauge and take the difference of dish out of the axle. If I find one inch more dish in the back wheels than in front, I make the axle one inch shorter. You will then find that your job will track all right, look all right and run all right.

I would say further that when you use axles that are over one inch, say 1¼ or two inches, do not use the depth of axle, as in the figure, but from 1 to 1¼ inches will do very nicely. S. H. R.

Hardening Small Rolls.—I should like to know of some way to harden small rolls for roller bearings. I have tried heating them in a furnace and then dipping in melted cyanide and afterwards in a barrel of brine, yet they do not seem to get hard enough. I am expected to make them so hard that a file will not touch them, for after three or four-thousandths are worn off them we have to throw them away. Can some craftsman give me some mixture into which I could dip them so as to give satisfaction? Charles R. Hussey.

Bar Shoes.—Answering Jack's inquiry as to the easiest way to make a bar shoe, would say, turn a shoe in the usual manner, leaving the heels a little longer than on ordinary shoes, get the length, thin down the heel, turn and fit, getting it a little narrower than it should be, then weld, finish up and fit to frog as needed. I have seen a good many made quickly and in a first-class shop at that, by taking an ordinary shoe and welding a straight bar across the heels. H. N. Pope.

Hardening Plow Lays.—In reply to L. L. R., in the July issue, in regard to hardening plow lays without warping, will say, use the hardening compound advertised in the July issue and your trouble will be ended. Of course, heating the lay and mode of plunging in water have also a good deal to do with warping, as a plow lay has to be heated uniformly and then plunged straight down in the water. Brother Black's method seems too antiquated to use in these days of progress. A. Z.

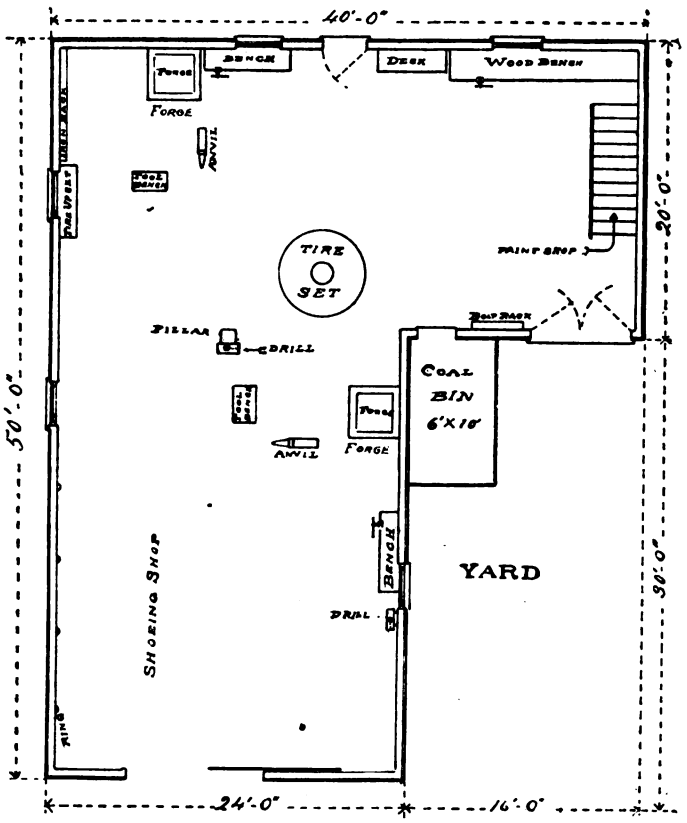
A Gas Engine Query.—I would like to ask the advice of my brother smiths about putting in a gas engine. I have a general shop, doing a good deal of shoeing, wagon repairing and ship work, but no wood work on wagons. In the ship work I could save myself a great deal of hard work in punching heavy material, such as chain plates, block straps and mast head irons, but I do not know if it would pay to put in an engine. I also make a great many knives for fishermen, that is, splitting knives and double-edged throaters. I made twenty dozen for one man this spring. I suppose I could use an emery wheel to finish these if I had an engine. John Day.

A Painting Query.—Can some experienced painter tell me how to paint a Duplex wagon, 1½ gear, body plain, but with two rails. I have lots of them to build in competition with others, and want to turn out a superior wagon to get the business. I want to know a good and cheap formula to paint, stripe, varnish and ornament the body to make it attractive; also want my name on as maker. I prefer red gear and green body, or yellow running gear and red body. CHAS. D. BRIDDELL.

A Texas Letter.—Desiring to have a planer for my shop, and not being able to buy one already rigged up, I would like to know where I can get a mandrel pulley, two boxes and a knife or blades. I will then be able to make the rest. I will then have the best furnished shop as well as the best shop in the county.

With a six horsepower gasolene engine I run a dynamo and furnish light for the business part of the town of Meridian. I have a trip hammer of my own make, a four-fire fan, emery, drill, band saw, spoke machine and rip saw. My shop is of stone and is 27 by 100 feet. CLAY FRANCIS.

Paints.—Will some one tell me about mixing paints or using colors? Say, for instance, I want to lay on the color for a buggy after it has been filled and primed. I want to use drop black ground in linseed oil or vermilion in oil. Now what proportion of Japan drier should I use after the color has been thinned with spirits of turpentine? Too much will make it crack and chip, while too little will make the varnish pull. What is the right amount? J. W. JOHNSON.



PLAN OF A CANADIAN SHOP.

In Reply.—In mixing paint, do not use linseed oil in your vermilion as it darkens it and destroys its brilliancy. The same is said of Japan. Coach black ground in Japan should have a binder of varnish instead of oil and thinned with turps, so as to spread easily under the brush. WALT.

Plans of a Canadian Shop.—As I have never noticed the plans of a Canadian shop in THE AMERICAN BLACKSMITH, I think the plans of my shop shown herewith will compare favorably with any which I have seen. It is L-shaped, the back part sixteen feet high, which makes a good paint shop. I run my work to and from the paint shop, up over the coal bin. Everything is a great deal more convenient than it appears. I have just put in a Henderson cold tire setter. Have been at the craft for forty-five years. DAVID CALLANDER.

Curing a Seedy Toe.—In answer to Brother M. L. Chunn's inquiry in the June number of THE AMERICAN BLACKSMITH, regarding a mule with what we call seedy toe, I will give my experience with one in which I could run the whole length of a barlow knife handle under the shell of the foot. Could get but one or two nails in the heel, so I set the foot on a block and took a chisel and commenced at the side where it was loose and went straight over to the other side, cutting off all the horny substance of the hoof that was loose. I then put on a light shoe, without a toe, to protect the hoof, and had to change the shoe about every two weeks for a couple of months and then it stayed longer. I did this in 1897 and the animal has as good a foot now as ever was on a mule. It goes barefoot now, and before I did the above it had to have a shoe on all the time. The hoof was all right in about eight months. If Mr. Chunn wants references as to what I have written, I will give him same upon application. W. M. COOPER.

A Hardening Compound.—In the July issue the following formula for hardening shovels appears: "Two parts cyanide of potassium, one part carbonate of potash, one part of bicarbonate of soda. Mix and pulverize and apply." The writer never heard of the compound before and is led to infer that the brother smith who offered the same is not a chemist. I feel positive that the compound would not be of much value for the purpose set forth. Cyanide of potassium is made from ferro-cyanide of potassium and in the process of transforming from one to the other the hardening qualities are about set to one side. The carbonate of potash and the bicarbonate of soda are superfluous. Ferro-cyanide of potassium, also known as prussiate of potash, is an animal potash made from horns, blood, leather, etc., and is without question the most ready substance extant for the quick carbonization of iron. Pulverize it as per above, heat the substance to be carbonized and sprinkle the same thereon and allow it to be taken up by the metal. Re-heat and cool as usual. This form of potash is much used by file cutters by mixing the same with chloride of sodium (common salt) and placing the same in the water tank. It causes the files to become harder on the cutting sections. Its penetration is not more than one-hundredth of one inch. HIRAM STRIFF.

A Washington Letter.—I run my shop with a Reliance 2 H. P. gasolene engine. It gives good satisfaction and anybody will do well to get one of these engines. All the expense I have had in the two years is an extra igniter, so I can change when the igniter pins need new mica washers. By having two of them one is always ready on short notice. When the mica washers get greasy, just change igniters, which only takes a minute, and you are ready to start up again. It is the strongest engine I know of. Mine will run six of my machines all at once, and does it well. When your engine is shut down all expense stops, and the engine can be started in half a minute. I have the only shop here that is run by power and you bet I do the business. My man and I put on a set of tires, 1 x 5-16 in just one and one-fourth hours a few days ago.

I have a good trip hammer, which I made myself. Anybody starting up the way I did, without anything, six years ago, can make his own machinery, if he is a good mechanic. I also made my band saw and it works to perfection. To make machinery you must take pains and fit everything right and good so it will run smoothly. C. R. JAMERTHAL.

A Word About Prices.—I believe in doing good work and charging the price. Work in this town has been cut down to almost nothing, but at the same time was not worth much. The farmers from the neighboring towns come with their plows and other work and are glad to pay the price for good work. The following are the prices here:

Shoeing	.25 to .40
Steel plugged shoes	.50
Sharpening lister	.60
" " and hardened	1.00
Sharpening plow, 14 inch	.25
" " 16 "	.30
" " 18 "	.35
Sharpen and hardening plow	.50, .60, .70
Spokes	.20
Felloes	.20
Tires	.50
Welding Pitman	.50
" sickle	.50
Tongues	$2.50 to $3.00
Odd work per hour	.50

I run the best shop in the country, building being 26 x 56, two fires, gas engine, trip-hammer, planer, rip and cross-cut saws, drill and pressure blower, all run by power, and expect to put in lathe and shoeing stock soon. When I get these in I will send you a photo of the shop. J. W. POKORNY.

An Interesting Australian Letter.—No tradesman should be without THE AMERICAN BLACKSMITH. In fact it should be put into the hands of the apprentice as soon as he enters a shop, and through it he will be able to learn his trade quicker. I admire the way in which the paper is endeavoring to secure higher prices. Seeing brothers send in prices from different parts of the States, I thought I would send a few Victorian prices. There are few or no organizations in Victoria. Another mistake made here is the apprentice business. They stay in a shop about twelve months and leave on account of small wages. They receive about 62 cents and board. I think an apprentice should be given a fair wage to commence and then he will do better work. The prices here are:

Horseshoeing, four shoes, plain	$1.12
Resetting	.62 to .75
Calks and toes, four shoes	1.75
New toes, 1½ by ½-in., per pair	7.50
Heavy tires, 2½ by ⅝-in., per pair	11.25
Resetting heavy tires, per pair	3.00
Resetting light tires, per pair	2.00
Plow lays	1.25
Steel points	.25
Welding springs, each	.62
Welding and setting axles	2.50

I may state that in this country there are neither cold tire setters nor horse stocks.

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Could some brother inform me how to remove rivet heads? The rivets belong to dredge buckets and are all steel, from ¾ to ⅞ of an inch thick; some are countersunk and some are not. The countersunk ones cause all the trouble. If some brother can inform me of some tools or some way to cut them off it will save a great deal of trouble and I will be very much obliged. M. QUINLAN.

Cold Tire Setting—I noticed in the August number an article under the heading cold tire setting, signed August Runge, and in reply to the same will say that the above gentleman is very severe in his criticism regarding cold tire setting.

I have a Henderson Cold Tire Setter that I have been using for over three years, and the work the machine has done proves beyond a doubt that this process is a success. I have used my machine on both old and new work. New wheels that have been set with my cold tire setter have been in use for three years without any of the tires slipping the least in all that time. I could send Mr. Runge a hundred testimonials of customers for whom I have set tires, which would prove that the cold process of setting tires has given them the best of satisfaction. Moreover a smith that understands the operation of a cold tire setter of the style I have, will never dish a wheel out of the proper relation to the axle in order to maintain a plumb spoke, whereas, by the old way it is almost impossible to prevent the wheel from dishing. Farmers, as a general rule, are prejudiced against smiths setting their wheels, as they know by experience that they will have their wheels dished. They usually do not have tires set until all the joints or felloes and shoulders on spokes have worn so much that no smith can set the tire and prevent the wheel from dishing more or less, but with the tire setter I can screw the wheel down solid and by applying the pressure, the spokes and felloes will all join up tight and the wheel will come out of the machine solid with not the least more dish than it should have. Furthermore, I can prove that I have taken from two to three inches of dish out of old wheels that have been in constant use for several years and have held their shape. Some of my prices are:

New shoes, old style, per four shoes	$1.25
Resetting shoes, per pair	.25 and .35
Neverslip shoes, four calks, each	.40
" " five " "	.50
Setting tires	1.50
Filling wagon wheels, each	3.00
Single spokes	.15
" felloes	.25
Wagon tongue	2.50
" axle	3.00
" bolster	1.50
" hounds, each	.75
Sharpening plows	.20
Shares, 14-inch	3.00
Cultivator shovel blanks, each	.75
Pointing plows	.50
Tires, 1½ by ½-inch	7.00
Buggy stubs, one-inch, per set	6.00
(50c. extra for every ⅛-inch larger per set)	
Sharpening set of four cultivator shovels	.50

I think these prices are as good as the average. ALBERT SCHUETZ.

Index to Volume 3.

October 1903 to October 1904.

PAGE

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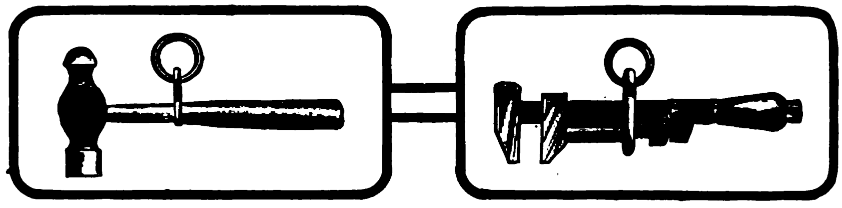
BY SPECIAL ARRANGEMENT

with the manufacturer we have another fine offer to make AMERICAN BLACKSMITH readers. As an inducement to secure new subscribers we are offering DURING OCTOBER the very latest thing in the way of a souvenir or watch charm.

A perfect miniature blacksmith's ball peen hammer



If you are a Subscriber, get us one new subscriber and we will give you either the hammer or the wrench as a premium. **If you are not a Subscriber,** send us a dollar and we will send you THE AMERICAN BLACKSMITH for a year, and a hammer or a wrench.

The illustrations above show these handsome little novelties full size. The hammer is highly finished, and makes the handsomest kind of a charm. The wrench is a perfect working model, carefully made and finely finished. Just out!

SEND DURING OCTOBER STATE WHICH YOU WANT

NOTE A cash prize of $25.00 will be awarded to the person sending us the largest number of subscribers between October 1st, 1903, and April 1st, 1904. Two or more persons sending clubs of equal size, will have the prize equally divided between them. Send for our list of premiums and cash commissions.

AMERICAN BLACKSMITH COMPANY

DRAWER 974 BUFFALO, N. Y.

Trade Literature and Notes.

The Welding Compound Company, of Paterson, New Jersey, are sending out a lot of circular matter advertising their Cherry Heat and Eureka Welding Compound, and showing some illustrations of difficult welds made by their use.

The Western Malleable and Grey Iron Manufacturing Company, of Milwaukee, Wis., send us pamphlet describing their Simplicity Engine, together with a folder of testimonials. As will be noticed in the advertisement of this firm on the front cover, they display their confidence in the Simplicity Engine by offering to ship the same on trial to any user.

Ray Automatic Machine Company, of Berea, Ohio, send us a very novel form of advertisement in the shape of a piece of steel drill rod after annealing with their Vulcan Annealing Putty. The claims of this company regarding the effect of their putty, in the saving which can be made by using it, are well worth investigating. Any preparation which will reduce the rate losses from cracking on dies and other steel pieces in hardening is a boon to the steel user.

Phineas Jones & Company, of Newark, N. J., state that they will be pleased to send free to any carriage maker or friend of the Jones wheel a neat and useful paper weight consisting of a facsimile of a piece cut from the end of a XXXX wheel. One of these paper weights has just been received at this office, and forms certainly a very novel souvenir.

A price list of the above firm has also been received containing prices and information of interest to all carriage and wagon builders. We are informed that Phineas Jones and H. Percy Jones, sons of Henry P. Jones, have just become associated in the business as partners of the same.

The Charles A. Stickney Company, St. Paul, Minn., sent us one of the best and neatest little catalogues of gas engines, which it has been our pleasure to receive for some time. The Stickney Junior, three horse-power gasoline engine is fully illustrated and described in its pages, together with a line of feed mills, pumps and corn grinders. This company advise us that they are represented by agricultural implement houses in every part of the country, making it possible to distribute their goods economically and afford their customers best attention. Their entire factory is devoted to nothing but the production of three horse-power gasoline engines, turning out one engine every thirty minutes of the working day. Their catalogue is free on application.

The Schubert Bros. Gear Company, of Oneida, N. Y., state that among the new style of buggies which they have gotten out, shown in their new catalogue, is one in which the body and panels are all white wood, the frames of the best white ash, and the construction and style of the body such as to take the place of a buggy, stanhope or runabout wagon. It is stated that this is more satisfactory than a regular stanhope because it hangs lower, is more roomy, and the shape of the seat is so constructed that it makes one of the best sitting and riding wagons that was ever offered. Their new fifty-six page catalogue is ready for the trade, showing a full line of all kinds of vehicles in the white, gears tops, trimmings, etc.

The Davison Manufacturing Company, Brooklyn, N. Y., are putting upon the market a neat line of miniature tools for watch charms. The company is already manufacturing miniature butcher's cleavers and miniature monkey wrenches, and each tool, in addition to being handsomely finished, is a perfect working model. They are neat little souvenirs. We are also advised that the company has just introduced a miniature blacksmith's hammer, which will make a nice watch charm for the smith. We have just received from the above company a very handsome souvenir in the shape of a miniature nickel-plated anvil, on the top of which rests in a crossed position a wrench and hammer.

The following reports of test made upon milling cutters of the Omega Steel Company, New Haven, Conn., are taken from data supplied by the above company.

TEST No. 1.—Plain Milling Cutter, 1¾ inches in diameter, running 370 revolutions, cut 1-64 inch deep, 1¼ inches wide, feed 2-10 inch for each revolution of the cutter, cut 2 inches long. Material on which cut was made was machine steel of .10 carbon.

TEST No. 2.—Plain Milling Cutter, 1¾ inches diameter, 1¾ inches face, running 150 revolutions, cut 1-64 inch deep, 1¾ inches wide, feed 2-10 inch for each revolution of the cutter, cut 20 inches long. The material on which cut was made was Jessup's Unannealed Cast Steel.

The same cutter was used in both these tests without grinding and after finishing the same, did not require grinding.

TEST No. 3.—Milling Cutter, 1¾ inches diameter, 12 inches face, ⅞-inch hole. Cutter running 372 revolutions per minute one inch feed. Cut 1¼ inches wide, 1-16 inch deep, seven inches long. Cut was made on machine steel. Same as above on cast iron, cut 14 inches long. Cutter was not in any way harmed.

TEST No. 4.—Milling Cutter 1¾ inches diameter, 2½ inch face. Cutter running 360 revolutions per minute, feed 9½ inches per minute. Cut 1-16 inch deep, 5-82 wide, 7 inches long. Cut was made on Braeburn Unannealed Cast Steel.

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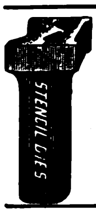
Trade Literature and Notes.

A very attractive folder is that just issued by the Charter Gas and Gasoline Engine Co., Sterling, Ill., U. S. A. This booklet shows many engravings of the engines manufactured by this firm and describes each. By means of section-drawings are shown the principles of the interior workings of these engines.

The Technical School for Carriage Draughtsmen and Mechanics, which is carried on under the auspices of the Carriage Builders' National Association, at 222 Bowery, New York City, recently sent us their prospectus for their school during the coming year. The evening and day classes of this school (nominal fees for tuition) afford an excellent opportunity for fitting oneself for a position with leading carriage builders. Full information may be had by addressing Mr. Andrew F. Johnson, Instructor in Chief.

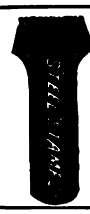
A fine 18-page catalogue from the Turner Brass Works, 122 Kinzie Street, Chicago, describes and illustrates their wide range of name plates. A small folder of unique design is also devoted to the same, while no less than eight other booklets and circulars contain illustrations, descriptions and price lists of the Turner Cluster Arc Gas Light, Vapor Lamps, Double Jet Gasoline Torches, Gasoline Blow Torches, and other specialties.



Steel Stamps.
Steel Letters and Figures

Burning Brands

Stencil Dies, Stencils, etc.
GEO. M. NESS, Jr.,
61 Fulton St., N.Y.



See Our Prize Offers

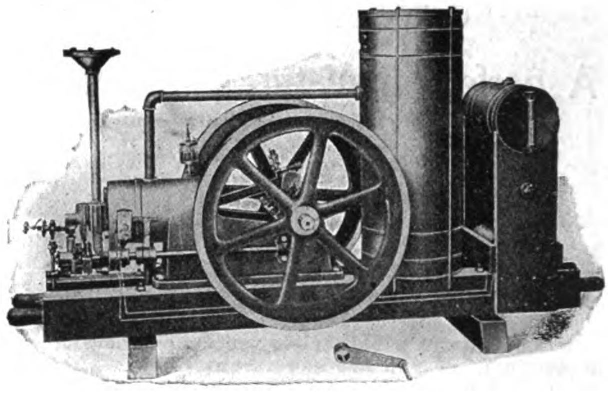
On the first reading page of this issue is announced a prize article contest. FORTY DOLLARS IN PRIZES will be distributed for the best articles on

Vehicle Building and Repairing

Ten prizes in all are offered. Contest closes December 12, 1908. Send in your article early.

Address—
Editor
American Blacksmith
BOX 974,
BUFFALO, N. Y.

WITTE
Gas and Gasoline Engines



WITTE JUNIOR ON SKIDS.

RIGHT IN SIZE, QUALITY AND PRICE

A strong and well mounted rig all ready to run. Perfect electric ignition, air cooled valve-jackets, vertical valves, all parts adjustable, sensitive and economical Governor.

NO MISTAKE MADE IN BUYING THE "WITTE"

Results GUARANTEED. What suits others will suit you.
GET CATALOGUE "J" FOR FURTHER INFORMATION

Witte Gas and Gasoline Engine Company

WITTE IRON WORKS CO.
512 W. 5TH ST.,
KANSAS CITY, MO.

46 South Canal Street
CHICAGO, ILL.

A PROPOSITION

HAVE YOU ALL THE TOOLS NECESSARY TO PROPERLY TAKE CARE OF YOUR FALL BUSINESS?

HERE IS OUR PROPOSITION

WRITE US TODAY what small tools you need, and we will send them to you free of charge, if you will secure a few subscriptions to THE AMERICAN BLACKSMITH. It does not matter what kind of tools you wish. If we do not have those you desire we will get them for you.

SEND US the names and addresses of your neighbor smiths and we will immediately mail each a sample paper. In this way they will be acquainted with THE AMERICAN BLACKSMITH when you call to take their subscriptions.

THIS PROPOSITION holds good during October only. ANY LISTS FOR TOOLS, RECEIVED AT THIS OFFICE AFTER OCTOBER 31ST, WILL NOT BE SENT, UNDER ANY CONSIDERATION. Here is an opportunity of a lifetime to refurnish your shop without cost. Do not neglect it. Write us at once.

ADDRESS

AMERICAN BLACKSMITH COMPANY

TOOL DEPARTMENT DRAWER 974 BUFFALO, N. Y.

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Prices Current — Blacksmith Supplies.

The following quotations are from dealers' stock, Buffalo, N. Y., Oct. 23, 1903, and are subject to change. No variations have occurred since last month's figures.

All prices, except on the bolts, are per hundred pounds. On bars and flats prices are in bundle lots.

Bars—Common Iron and Soft Steel.

1/4 in.. round or square;	Iron, $3.10;	Steel, $2.90
3/8 in., " "	" 2.70	" 2.70
1/2 in., " "	" 2.50	" 2.40

Flats—Bar and Band.

1/4 x 1 in.,	Iron..........$2.50;	Steel..........$2.40
1/4 x 1 1/2 in.,	" 2.40;	" 2.40
3-16 x 1 1/2 in.,	" 2.60;	" 2.60

Norway and Swedish Iron.

1/4 in., round or square	$4.90
3/8 in., " "	4.50
1/2 in., " "	4.30
1/4 x 1 in.	4.30
1/4 x 1 1/2 in	4.20

Horseshoe Iron.

For No. 1 shoe, 3/8 x 1/2 in	$3.40
For No. 2 shoe, 1/2 x 5/8 in	3.00
For No. 3 shoe, 5/8 x 3/4 in	2.90
For No. 4 shoe, 5/8 x 7/8 in	2.90

Toe Calk Steel.

1/2 x 3/8 in. and larger	$3.50

Spring Steel.

5/8 to 1 1/2 in. Rounds.	Op. Hearth $4.00,	Crucible $6.00
1 1/4 to 6 in. by No. 4 gauge to 1/2 in. Flats	" 4.00,	" 6.00

Carriage Bolts. (Net Price per Hundred).

1/4 x 2 in.	$0.54	3/8 x 2 1/2 in.	$0.82
1/4 x 2 1/2 in.	.58	3/8 x 3 1/2 in.	.96
1/4 x 3 in.	.62	3/8 x 6 in.	1.31
5-16 x 2 in.	.65	1/2 x 4 in.	1.70
5-16 x 3 in.	.75	1/2 x 6 in.	2.10

CUMMINGS & EMERSON
Blacksmith and Wagon Makers' Supplies,
PEORIA, ILL.

PADDOCK-HAWLEY IRON CO.
Iron, Steel, Carriage and Heavy Hardware, Trimmings and Wood Material.
ST. LOUIS, MO.

WANTED AND FOR SALE.

Want and for sale advertisements, situations and help wanted, twenty-five cents a line. Send cash with order. No insertions of less than two lines accepted.

FOR SALE—Blacksmith and horseshoeing shop with stock and tools. Good business and location. ANDREW JOHNSON, Cambridge, Ill.

FOR SALE—General blacksmith and horseshoeing shop in lively country town. Good surrounding country. Work the year round. E. G. WALKER, Lemoore, Cal.

I CAN SELL YOUR BLACKSMITHING BUSINESS (with or without real estate)—No matter where it is or what it is worth. Send description, state price, and learn my wonderfully successful plan. W. M. OSTRANDER, 109 North American Bldg., Philadelphia, Pa.

WANTED.—We invite applications from those desiring steady employment, at good wages, as first-class machinists, wood workers, blacksmiths. Experienced men in wagon and carriage manufacturing. Address, STUDEBAKER BROS. MFG. CO., South Bend, Ind.

WANTED—Salesmen, visiting blacksmith and wagon stock supply houses, to introduce the best line of leather aprons on the market. Territories open east of Pittsburg, south of Ohio River and west of Missouri River. Address with references. RICHARD PICK M'F'G CO. 10 5th Avenue, Chicago, Ill.

FOR SALE—Small, profitable business—the manufacture of ice tongs, five different sizes. Business can be moved to any locality, and affords an excellent opportunity for a blacksmith who desires a business of his own, or can be used in connection with other business. Reason for selling is age and poor health. Address D. B. MORTON, Groton, N. Y.

BE AN EXPERT BLACKSMITH—By using Toy's Colored Tool Tempering Charts, A and B, explaining Scientific and Plain Tempering to Standard in Oil, Water or Tallow, showing true color each tool should be and tells what each tool will stand. These charts are same as are used by Woolwich Arsenal, England.

Also new treatise on all the new steels and seventy-five new methods and recipes for forging and welding on machine and plow work, all the secrets in plow making and repairing and ten new steel welding compounds for different kinds of steel, also Thermite Welding fully explained, it welds solid in the twinkle of an eye.

All the above for One Dollar. Samples free.

Forty years a factory steel worker.

W. M. TOY, Sidney, O.

NICHOLSON FILE COMPANY

NICHOLSON.

PROVIDENCE, R. I., U. S. A.,

THE K&F TRADE MARK.

MANUFACTURERS OF

FILES AND RASPS

Blacksmiths Recommend our Rasps.

BECAUSE

Their Wearing Qualities Have Been Proven.

The "Sure Step" Horse Shoe

The Only Rubber Horse Shoe that can be Fitted Hot.

Consists of an iron body provided with a rubber tread. Prevents stumbling, slipping and interfering

HOW TO FIT THE SHOE Take out rubber, heat shoe to a dull cherry red, shape to hoof. Then allow shoe to cool slowly. Replace rubber, clinch well all around, inside of shoe, also two pegs at toe. This shoe can also be shaped cold, as metal will give to widen or narrow same. Run in Regular Sizes, 1 to 7.

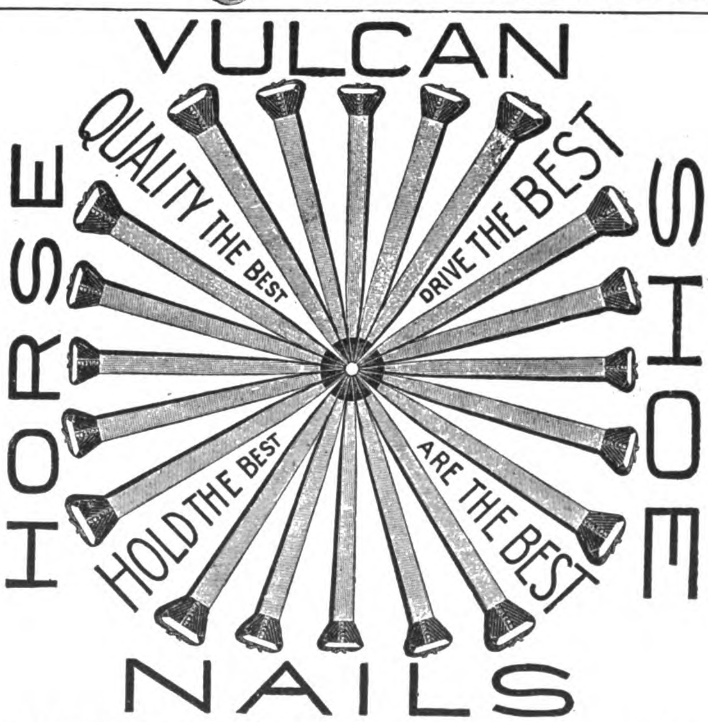
GET OUR PRICES **The most reasonable, as well as most durable Rubber Shoe on the Market.**

MANUFACTURED BY

THE HAHN MANUFACTURING CO.

360-362 Grand Street, NEW YORK.

Be sure and send for Free Illustrated Circular.



THE FOWLER NAIL COMPANY, SOLE MANUFACTURERS, SEYMOUR, CONNECTICUT

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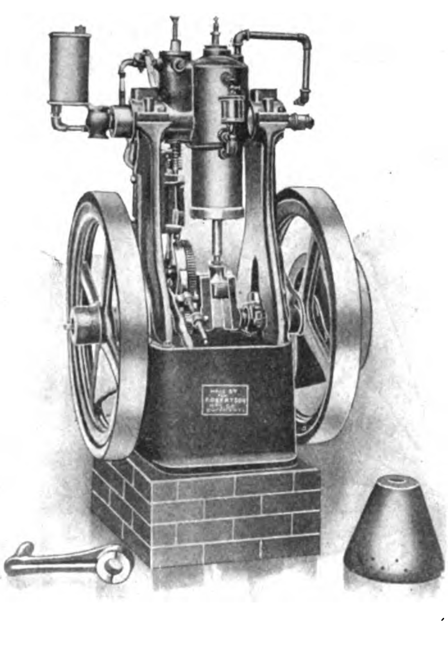
New Devices of Interest.

Progress in the arts and crafts is shown, among other ways, by new tools and implements as perfected and marketed by manufacturers. A new device implies improvement, better or quicker methods, else there were no excuse for its creation. Under the above heading will be described from time to time, new articles pertaining to the craft, selected solely on the basis of novelty and interest to readers and entirely irrespective of any advertising considerations.

A New Style of Gas Engine.

The accompanying illustration shows a new style of gas engine, which has just been perfected, and which embodies some features of radical departure from other types of engines.

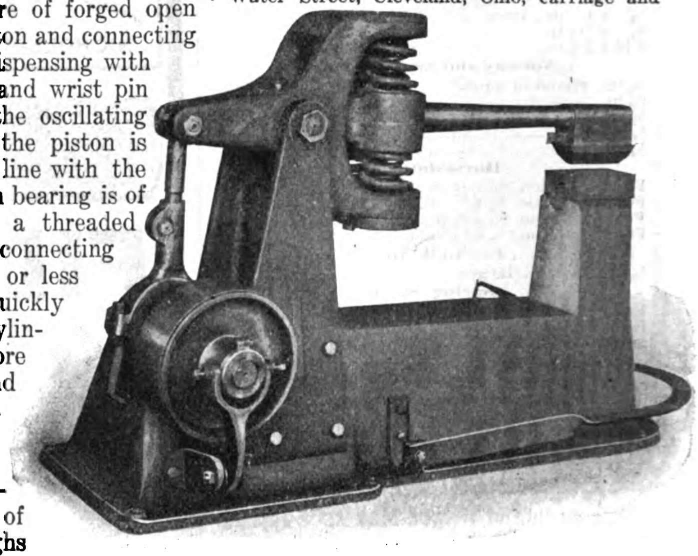
One of the distinctive features of the engine is its oscillating cylinder, the charge being introduced through one of the trunnions. The engine is constructed on the four-cycle type, drawing in the charge on one downward stroke of the piston, compressing it on the return, firing it at the beginning of the next downward stroke and exhausting the burnt gases upon the following upward stroke. As in other four-cycle engines there is one impulse every other revolution. The hit and miss governing principle is applied to the engine by a mechanism of extreme simplicity, and fuel supply is so governed that no charge is taken in except when the load demands it. The fuel mixture of gas and air, as mentioned, is taken through a chamber in the trunnion, which is kept at a fairly high temperature by the heat of the exhaust, thus promoting the efficient use of fuel. A claim is made foi maximum economy in the use of fuel,



combined with simplicity in construction. Ignition is by electric spark by means of a mechanism so simple that the timing of the spark can be changed, with the engine in operation, by the simple movement of the lever. A novel and improved means is employed for lubricating the piston.

The engine is so constructed that it may be changed to run either on gas or gasoline, as desired, in a very few minutes. An especially designed form of muffler is attached to the engine, rendering the exhaust almost noiseless, as it is claimed.

The base and supports are of one casting. The cranks are of forged open hearth steel. The piston and connecting rod are solid, thus dispensing with the usual crosshead and wrist pin connection, and by the oscillating form of the cylinder the piston is always in a straight line with the crank. The crank-pin bearing is of hard bronze, having a threaded sleeve to receive the connecting rod, by which more or less compression can be quickly adjusted for. The cylinder is of 4-inch bore with 6-inch stroke, and is provided with a water jacket and the necessary connections. The engine occupies a floor space of 25 by 28 inches, weighs about 700 pounds, and is guaranteed to develop four horse-power. It is built by the Robertson Manufacturing Company, of Buffalo, N. Y.



The Dayton Power Hammer.

A novel form of power hammer which of late has been placed before blacksmiths and wagon makers is the Dayton Hammer, shown by the accompanying engraving. Not only is the hammer adapted to the needs of the wagon and general smith, but larger manufacturing concerns have found the small size of considerable use to their tool dressers. The manufacturers, from whom comes our information regarding the hammer, state that one of their customers, a horseshoer, finds he can at the present price of steel, work up old shoes into rod stock economically, and produce a fine article.

These hammers are made in two sizes by the Miami Valley Machine Tool Co., Dayton, Ohio, as follows:—

	No. 1.	No. 2
Weight	900 lbs.	1,500 lbs.
Floor Space	48″ x 20″	50″ x 20″
Base to top of anvil	24″	28″
Diameter of crank shaft	1 3/16″	1 15/16″
Length of Helve	26¼″	34″
Diameter of Helve (large end)	1¾″	3″
Bearing of Helve in head	6¼″	7″
Size of Springs	⅜″	½ & ¾″
Length of Stroke	8″	8″
Diameter of Pulley	11¾″	11¾″
Speed of Pulley	275 Rev.	250 Rev.

Trade Literature and Notes.

New Etna Coal Company, Chattanooga, Tenn., send us a very catchy folder, illustrating some of the reasons why their New Etna coal is superior for blacksmithing purposes. Although often overlooked, the quality of blacksmithing coal is an important item in securing the best results at the forge, so that the many good points in New Etna coal as cited by the above company are well worth looking into.

Complete, and at the same time handsome, is the "Fall—1903"—catalogue of Cray Bros., 57-59 Water Street, Cleveland, Ohio, carriage and **wagon materials and tools. It is termed a net cash catalogue, and in it is listed a complete line of tools and supplies for blacksmiths and wagon builders. Notice is given of lower quotations on iron, carriage bolts and skeins. Special attention is also directed to the fact that this firm are now manufacturing tops and cushions, in a trimming shop of their own just opened.**

The well-known wheel manufacturers, Phineas Jones & Company, of Newark, N. J., have sent us their 1904 calendar. The subject is entitled "The Treasurer,' by J. G. Brown, N. A. They will be happy to mail a copy to any one on receipt of four cents in stamps to cover postage.

The National Machinery Company, of Tiffin, Ohio, manufacturers of bolt and nut machinery, are offering a foot bolt heading machine, suitable for blacksmith and repair shops. This machine is provided with ten sets of dies for holding various sizes of blanks from ⅜ to 1¼ inches diameter. The blank to be headed is gripped in the dies by a foot treadle and the stock for the head is upset by hand.

Suitable grooves are provided on the anvil for finishing the square or hexagon sides of the bolts. This machine is suitable for upsetting various styles of forgings in addition to making bolts.

The Champion Tool Company, Limited, of Conneaut Lake, Pa., sent us their neat 28-page catalogue for 1906, containing a complete list, with prices and engravings, of their blacksmiths' and horseshoers' tools.

Bertsch & Company, Cambridge City, Ind., U. S. A., have sent us their new circulars "C" and "U," cataloguing, with engravings, their punches and shears.

The Standard Ball Axle Works, Lancaster, Pa., have still further perfected their axle, the same now presenting many new points of interest and high quality. The claim is made that, owing to perfect construction and lubrication, 25 per cent. less draft is the result of its use.

All horseshoers and farriers will be interested in the unusual offer made by the Putnam Nail Company, Neponset, Boston, Mass., to send free of charge a quarter-pound of any size of their New Putnam horseshoe nails upon request. The confidence of this firm in their new nail is so great that they are willing to go to the expense of thus introducing their product. The claim is made that these new nails are uniform, properly proportioned, will not break, sliver, crimp or cut off, and that they hold in the clinch and drive easily. The offer for a quarter-pound sample of any size of nail, sent free of charge upon application, is a liberal one, and forms a good opportunity for all horseshoers to acquaint themselves with the good points of this particular nail.

The Louden Machinery Company, Fairfield, Iowa, send us their catalogue, illustrating their complete line of hay tools, door hinges and hardware specialties. This firm has recently placed upon the market a novel form of tire setting machine, for which flattering claims are made.

"Specialties for the Vehicle Trade," the McGovern Tire Setter Company, Cincinnati, Ohio, proclaim in their new catalogue. This booklet

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Prices Current — Blacksmith Supplies.

The following quotations are from dealers' stock, Buffalo, N. Y., Nov. 28, 1908, and are subject to change. A considerable scaling from last month's prices is exhibited.

All prices, except on the bolts, are per hundred pounds. On bars and flats prices are in bundle lots.

Bars—Common Iron and Soft Steel.

1/4 in., round or square;	Iron, $2.80;	Steel, $2.80
3/8 in., " "	" 2.40	" 2.40
1/2 in., " "	" 2.20	" 2.20

Flats—Bar and Band.

1/4 x 1 in.,	Iron $2.20;	Steel...............$2.20
1/4 x 1 1/4 in.,	" 2.10;	" 2.10
3-16 x 1 1/2 in.,	" 2.80;	" 2.80

Norway and Swedish Iron.

1/4 in., round or square	$4.90
3/8 in., " "	4.50
1/2 in., " "	4.80
1/4 x 1 in.	4.80
1/4 x 1 1/2 in	4.20

Horseshoe Iron.

For No. 1 shoe, 3/8 x 1/2 in	$8.80
For No. 2 shoe, 1/2 x 5/8 in	2.90
For No. 8 shoe, 5/8 x 3/4 in	2.80
For No. 4 shoe, 5/8 x 7/8 in	2.80

Toe Calk Steel.

1/2 x 3/8 in. and larger... $8.00

Spring Steel.

3/8 to 1 1/4 in. Rounds.	Op. Hearth $8.00,	Crucible $5.00
1 1/4 to 6 in. by No. 4 gauge to 1/2 in. Flats	" 8.00,	" 5.00

Carriage Bolts. (Net Price per Hundred).

1/4 x 2 in	$0.54	3/8 x 2 1/2 in	$0.82
1/4 x 2 1/2 in	.58	3/8 x 3 1/2 in	.96
1/4 x 3 in	.62	3/8 x 6 in	1.31
5-16 x 2 in	.65	1/2 x 4 in	1.70
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CUMMINGS & EMERSO

Blacksmith and Wagon Makers' Supplies,

PEORIA, ILL.

PADDOCK-HAWLEY IRON CO.

Iron, Steel, Carriage and Heavy Hardware, Trimmings and Wood Material. . . . .

ST. LOUIS, MO.

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Want and for sale advertisements, situations and help wanted, twenty-five cents a line. Send cash with order. No insertions of less than two lines accepted.

FOR SALE—Blacksmith and horseshoeing shop with stock and tools. Good business and location. **ANDREW JOHNSON, Cambridge, Ill.**

FOR SALE—Cheap, one 4-horse-power engine and 6-horse boiler in good running condition. Address, **J. J. HILL, Hendricks, Minn.**

FOR SALE—For a good bargain, a first-class blacksmith shop; splendid equipment. Write at once to **H. STADE, Flandreau, S. D.**

WANTED—A blacksmith for foreman of college shop to instruct apprentices and students. **AMERICAN BLACKSMITH, Box 974, Buffalo N. Y.**

WANTED—Horse shoers, helpers! Write today for our special proposition. An opportunity for every reliable and enterprising horse shoer. No investment required. Address **Veterinary Dept., TROY CHEMICAL CO., Troy, N. Y.**

WANTED.—We invite applications from those desiring steady employment, at good wages, as first-class machinists, wood workers, blacksmiths. Experienced men in wagon and carriage manufacturing. Address, **STUDEBAKER BROS. MFG. CO., South Bend, Ind.**

DON'T BUY Toy's New Treatise on Steel, unless you want to be an expert steel worker and master blacksmith. They explain forging, annealing and tempering, high speed and self-hardening steel with 75 new ideas and methods on machine and plow forging and welding; with ten recipes for making your own compounds for welding the different kinds of steel solid. Thermite welding fully explained. It welds R. R. rails in the twinkling of an eye. Also two hand colored scientific tool tempering charts, A and B, explaining all hardening and tempering to a standard in oil, water or tallow, showing true color each tool should be, and tells what it would stand. These are the same as used by Woolwich Arsenal, England.

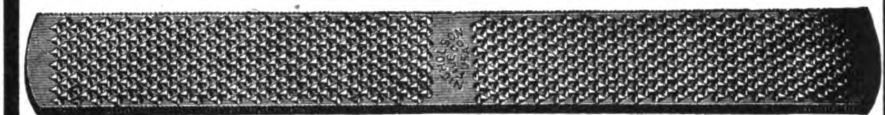
All the above for one dollar. Samples free. 40 years a factory steel worker. **W. M. TOY, Sidney, O.**

NICHOLSON FILE COMPANY

PROVIDENCE, R. I., U. S. A.,

THE K&F TRADE MARK.

MANUFACTURERS OF



FILES AND RASPS

Blacksmiths Recommend our Rasps.

BECAUSE

Their Wearing Qualities Have Been Proven.

The "Sure Step" Horse Shoe

The Only Rubber Horse Shoe that can be Fitted Hot.

Consists of an iron body provided with a rubber tread. Prevents stumbling, slipping and interfering

HOW TO FIT THE SHOE Take out rubber, heat shoe to a dull cherry red, shape to hoof. Then allow shoe to cool slowly. Replace rubber, clinch well all around, inside of shoe, also two pegs at toe. This shoe can also be shaped cold, as metal will give to widen or narrow same. Run in Regular Sizes, 1 to 7.

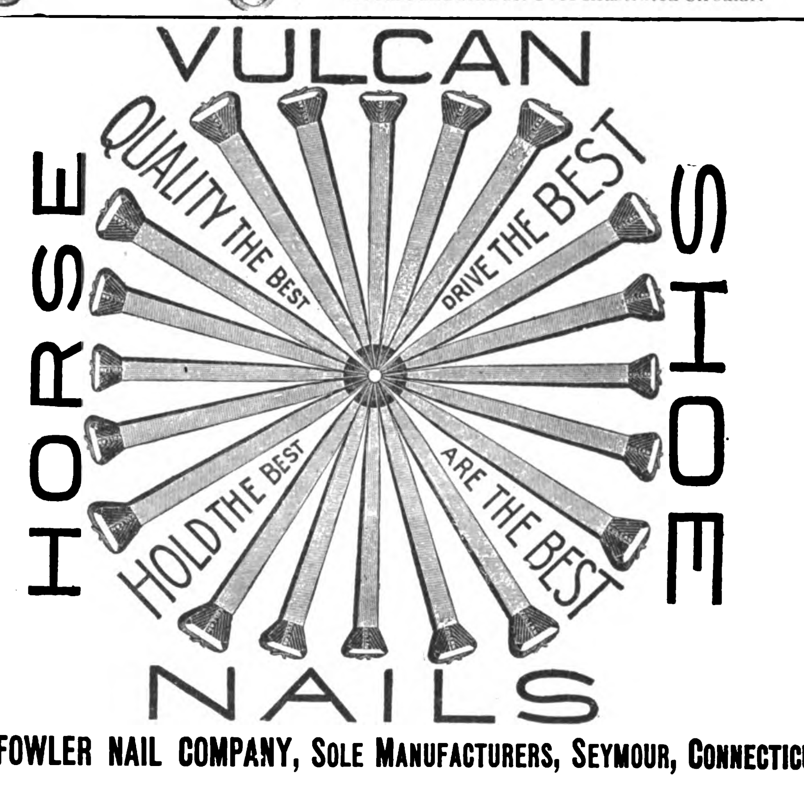
GET OUR PRICES **The most reasonable, as well as most durable Rubber Shoe on the Market.**

MANUFACTURED BY

THE HAHN MANUFACTURING CO.

360-362 Grand Street, NEW YORK.

Be sure and send for Free Illustrated Circular.



THE FOWLER NAIL COMPANY, SOLE MANUFACTURERS, SEYMOUR, CONNECTICUT

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New Devices of Interest.

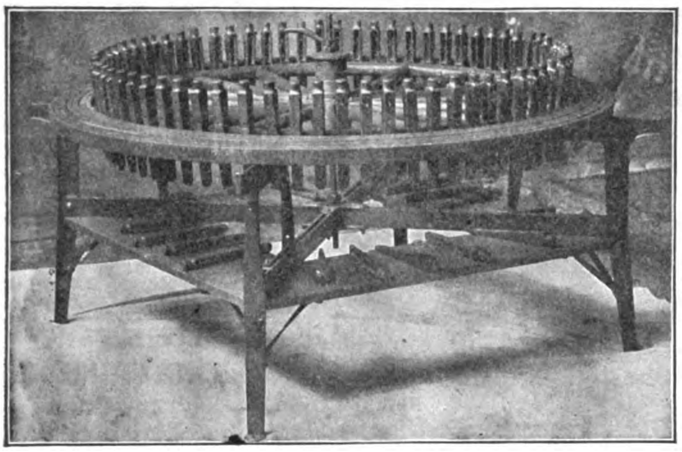
Progress in the arts and crafts is shown, by new implements as perfected by manufacturers. A new device implies improvement, else there were no excuse for its creation. Under the above heading will be described new articles pertaining to the craft, selected on the basis of interest to readers and entirely irrespective of advertising considerations.

A New Style of Hand Tire Setter.

An entirely new principle is claimed for the Locke cold tire setter which has just been placed on the market by the Louden Machine Co., Fairfield, Iowa. A series of steel bands adapted to nest in each other are laid upon a special trestle, and the wheel is laid on the inner ends of the arms inside of the bands. A series of malleable iron wedges are set between the wheel and the inner band and are consecutively driven with a hammer. The pressure is applied all around the tire. For larger wheels the inner bands are removed.

The wedges are always under the control of the operator. By driving a little harder here and a little lighter there, the pressure can be regulated at will to raise a bent-in plane in the rim of the wheel or to press in a bulged-out part of the tire. The dish can be regulated with exactness. The screw for regulating the dish can be set to suit any sized hub.

The Locke Setter, it is claimed, will set

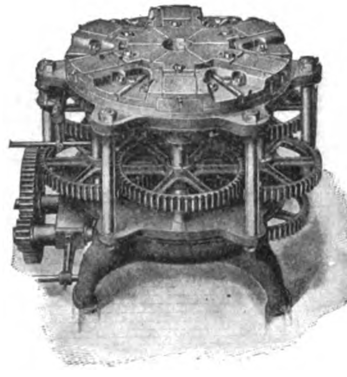


an ordinary tire in five minutes without hard work. Felloes may be sawed out, should it be found necessary, while in the machine, and by leaving out three or four of the wedges and driving the others the tire can be sprung away at any spoke so the end of the tenon can be cut off and a small wedge set in if needed. The bands are made beveled to correspond with the incline of the wedges, so that the face of the wedge next to the tire will stand true with the face of the tire.

The standard size is composed of 1 trestle, 11 bands of 1 by 1½-inch steel, 100 malleable iron wedges and 1 lever for withdrawing wedges. The inside diameters of the bands run from 3 feet 2 inches to 4 feet 10 inches and tires can be set from 3 feet to 4 feet 6 diameter. A light 4 foot 8 tire can be set by using the largest band singly.

A Machine for Banding Hubs.

In every car load of hubs, a percentage of them have to be thrown away on account of



being season cracked. One of the advantages claimed for the McGovern Hub Banding Machine, which has just been put upon the market by the McGovern Tire Setter Co., Cincinnati, Ohio, is that it will save all such cracked hubs. The machine consists essentially of six dies, which are turned out to fit any size of hub and which are operated simultaneously in or out from the center by means of six eccentric blocks and gears. The dies are tongued to preserve a circle always and prevent kinking. The machine is geared up to high power, so that it can compress the bands cold, either setting them in tightly or sinking them in, as preferred. A lever is provided by means of which the operator can control or quickly reverse the movement of the dies. Hubs from three to thirteen inches in diameter may thus be banded.

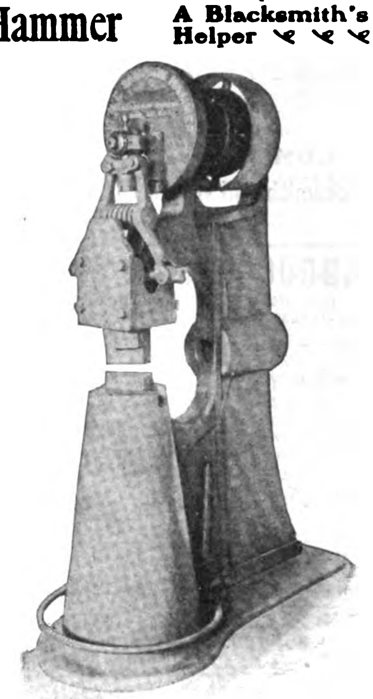
Trade Literature and Notes.

At the C. B. N. A., exhibition recently, much attention was paid to the exhibit made by John E. Hobbs, of North Berwick, Me., who showed his patent hub runners and his patent double-ender spring sleigh. The runners enable the owner of a fine carriage of any sort to convert it in ten minutes into a comfortable sleigh. These runners can be sold by blacksmiths everywhere, as a good profit can be made on them. Mr. Hobbs also exhibited his spring sleigh, which is made on a new principle, and was much admired.

One of the best things of the kind which has come to our attention is the Crown Trace Lock, made by The York Specialty Co., of York, Pa. It does what its name suggests, locks the trace and does it quickly, easily and securely, without any pulling, tugging or swearing on the part of the man who does the hitching. It takes but a second's time to operate it either way, and is always on duty holding the trace like a vise, and making accidents impossible. Its strongest feature is its simplicity. Wagon makers find a large and quick sale among all carriage users, owing to its simplicity, effectiveness and low cost.

A handsome catalogue comes to us from Boynton & Plummer, Worcester, Mass., illustrating and describing in a complete and tasty manner their line of drills, forges and tire machines. Among others is shown their improved, upright, self-feeding drill, No. 11. Special attention is called to the wheel on the front of this machine for hand feeding and for a handy, quick return. Another feature is the guard over the gears, which acts also to stiffen the frame. The self-feed can be thrown in or out instantly, and has several changes of feed, for light or heavy drilling. A great amount of interesting data regarding their machines is contained in this catalogue which will be sent free anywhere, on request.

The "Little Sampson" Hammer A Blacksmith's Helper



Patent applied for.

First-class Material, First-class Workmanship and a FIRST-CLASS HAMMER, at a price within reach of the humblest Knight of the Anvil on this Globe.

COLEMAN IRON WORKS COMPANY,
Elmira, N. Y., U. S. A.

EASY PROFITS

Follow an explanation of the many advantages of our

IMPROVED FOLDING WAGON BOX

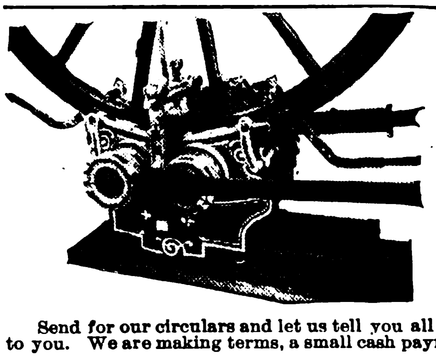
Simple, durable, convenient, strong, easily knocked down, compactly stored.

Any Farmer or Wagon User is quick to appreciate the time, labor and storage-space saving qualities of the folding farm wagon box.

ANY BLACKSMITH or wagon builder can easily, quickly and cheaply build the Folding Box right in his own shop, **by using our Irons**, and can secure all the wagon trade in his neighborhood with quick and **EASY PROFITS**.

Write at once for descriptive circular of our Irons, with directions for building Folding Wagon Boxes.

FOLDING WAGON BOX CO., HAVERHILL, OHIO.



SHIPPED ON FREE TRIAL

and if not satisfactory and as represented we pay the freight both ways.

The Brooks

Cold Tire Setter

is an up-to-date hand power machine. Sets heavy and light tires cold without removing bolts or tires.

Send for our circulars and let us tell you all about it, the information may prove of great value to you. We are making terms, a small cash payment and balance later on. Write us to-day.

The Brooks Tire Machine Co., 121 North Water St. Wichita, Kan.

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Prices Current — Blacksmith Supplies.

The following quotations are from dealers' stock, Buffalo, N. Y., Dec. 28, 1908, and are subject to change. No variations have taken place since last month's quotations.

All prices, except on the bolts, are per hundred pounds. On bars and flats prices are in bundle lots.

Bars—Common Iron and Soft Steel.

¼ in.. round or square;	Iron, $2.80;	Steel, $2.80
⅜ in., " "	" 2.40	" 2.40
½ in., " "	" 2.20	" 2.20

Flats—Bar and Band.

¼ x 1 in.,	Iron $2.20;	Steel $2.20
¼ x 1¼ in.,	" 2.10;	" 2.10
3-16 x 1½ in.,	" 2.30;	" 2.80

Norway and Swedish Iron.

¼ in., round or square	$4.90
⅜ in., " "	4.50
½ in., " "	4.30
¼ x 1 in.	4.80
¼ x 1½ in	4.20

Horseshoe Iron.

For No. 1 shoe, ⅜ x ½ in	$3.30
For No. 2 shoe, ½ x ⅝ in	2.90
For No. 3 shoe, ⅝ x ¾ in	2.80
For No. 4 shoe, ⅝ x ⅞ in	2.80

Toe Calk Steel.

½ x ⅜ in. and larger	$3.00

Spring Steel.

⅝ to 1½ in. Rounds.	Op. Hearth, $3.00,	Crucible $5.00
1¼ to 6 in. by No. 4 gauge to ½ in. Flats	" 3.00,	" 5.00

Carriage Bolts. (Net Price per Hundred).

¼ x 2 in	$0.54	⅜ x 2½ in	$0.82
¼ x 2½ in	.58	⅜ x 3½ in	.96
¼ x 3 in	.62	⅜ x 6 in	1.31
5-16 x 2 in	.65	½ x 4 in	1.70
5-16 x 3 in	.75	½ x 6 in	2.10

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Blacksmith and Wagon Makers' Supplies,
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ST. LOUIS, MO.

WANTED AND FOR SALE.

Want and for sale advertisements, situations and help wanted, twenty-five cents a line. Send cash with order. No insertions of less than two lines accepted.

FOR SALE—A Standard Hub Boring Machine used one season. **W. E. GIDDINGS, Springfield, Vt.**

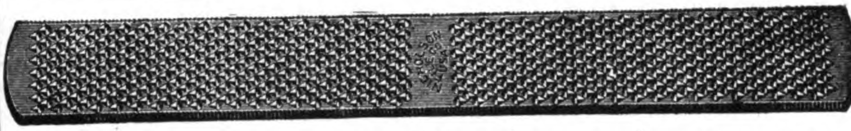
FOR SALE—A good paying blacksmith and woodworker's shop, including business and building, also carrying farm machinery. Room to carry wagons and buggies if desired. Am located on the main street of one of the best dairy towns of Illinois. **W. J. SHULZ, Huntley, Ill.**

WANTED.—Blacksmiths, Horseshoers and Wheelwrights to act as subscription representatives during leisure time. Big money in return for little exertion. Write us today regarding this proposition. Address,
AMERICAN BLACKSMITH COMPANY, Subscription Dept., Buffalo, N. Y.

FOR SALE—Small profitable business—the manufacture of ice tongs, five different sizes. Business can be moved to any locality, and can be used in connection with other business. It affords an excellent opportunity for a man to establish a business of his own with only a few hundred dollars' investment. Reason for selling is age and poor health. **D. B. MORTON, Groton, N. Y.**

DON'T BUY Toy's New Treatise on Steel, unless you want to be an expert steel worker and master blacksmith. They explain forging, annealing and tempering, high speed and self-hardening steel with 75 new ideas and methods on machine and plow forging and welding; with ten recipes for making your own compounds for welding the different kinds of steel solid. Thermite welding fully explained. It welds R. R. rails in the twinkling of an eye. Also two hand colored scientific tool tempering charts, A and B, explaining all hardening and tempering to a standard in oil, water or tallow, showing true color each tool should be, and tells what it would stand. These are the same as used by Woolwich Arsenal, England.
All the above for one dollar. Samples free.
40 years a factory steel worker.
W. M. TOY, Sidney, O.

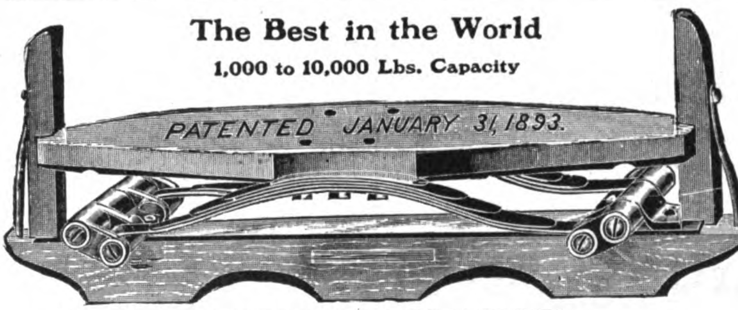
NICHOLSON FILE COMPANY
PROVIDENCE, R. I., U. S. A.,
NICHOLSON.
THE K&F TRADE MARK.
MANUFACTURERS OF



FILES AND RASPS
Blacksmiths Recommend our Rasps.
BECAUSE
Their Wearing Qualities Have Been Proven.

The "Sure Step" Horse Shoe
The Only Rubber Horse Shoe that can be Fitted Hot.
Consists of an iron body provided with a rubber tread. Prevents stumbling, slipping and interfering
HOW TO FIT THE SHOE Take out rubber, heat shoe to a dull cherry red, shape to hoof. Then allow shoe to cool slowly. Replace rubber, clinch well all around, inside of shoe, also two pegs at toe. This shoe can also be shaped cold, as metal will give to widen or narrow same. Run in Regular Sizes, 1 to 7.
GET OUR PRICES The most reasonable, as well as most durable Rubber Shoe on the Market.
MANUFACTURED BY
THE HAHN MANUFACTURING CO.
360-362 Grand Street, NEW YORK.
Be sure and send for Free Illustrated Circular.

The Reiter Patent Bolster Spring
The Best in the World
1,000 to 10,000 Lbs. Capacity
ECONOMY
DURABILITY



SEE THAT HANGER
This spring, applied to your rough wagon, means economy and comfort not heretofore obtainable. Too cheap to be without, and attached to your wagon in two minutes without any change whatever in your bolster. Note the general design and correct principles. Cannot be broken by overloading or rebounding, a feature entirely its own. Saves man, wagon, horses and harness, to say nothing about half your wagon cost in giving you a rough wagon that will meet every demand of the expensive spring wagon.
ORDER FROM YOUR DEALER OR DIRECT, GIVING CAPACITY AND WIDTH BETWEEN BOLSTER STAKES.
MANUFACTURED EXCLUSIVELY BY
PITTSBURG BOLSTER SPRING CO.
P. O. Box 1083 PITTSBURG, PA.

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Trade Literature and Notes.

A handsome gas engine catalogue is that now issued by the Charter Gas Engine Company, of Sterling, Ill. This catalogue will be forwarded free to any address upon receipt of request.

Lazier gas and gasoline straight-line engines are the subject of catalogue No. 10 of the Lazier Gas Engine Company, of Buffalo, N. Y. These engines are designed for all stationary power purposes.

H. L. Chapman, Marcellus, Mich., is sending out a great many neat cards, illustrating his new gasoline engine of small size, which he is placing upon the market at the present time.

A neat price list of carriage axles comes to us from the Dalzell Axle Co., of South Egremont, Mass., accompanied also by a handsome folder descriptive of their Doctor's Special Axle.

Champion Tool Company, Conneaut Lake, Pa., has just issued a neat hanging card, giving weights and measurements of iron and steel for making certain weights of shoes. This card will be sent free upon request to any address and will be found to contain information of no small value.

The Motsinger Device Manufacturing Company, Pendleton, Ind. sent us several circulars illustrating their improved Anti-Sparker, which they claim does away most successfully with starting and running batteries on gas and gasoline engines. A great many testimonial letters testifying to the merits of their machine are also included.

The handsome catalogue of the Model Gas Engine Company, of Auburn, Ind., is devoted to a complete description of the design, construction and operation of their Model Engine for operating on gas, gasoline, kerosene, crude oil or distillate. Among the chief claims for the Model Engine are simplicity of design and high economy of fuel consumption. The catalogue will pay sending for by any one interested in gas engines or their application for power purposes.

A bunch of new literature comes from The Turner Brass Works, Franklin and Michigan streets, Chicago, Ill. A red folder listing their torches, a brand new one in green containing interesting information concerning the New Turner Carburettor and foot-treadle, and a neat booklet describing their kick plates and brass specialties are among the lot. Two other small leaflets complete the collection which will be found very interesting and useful reading.

Lennox Machine Company, Marshalltown, Iowa, write us that one particular feature of their engine is that the electric ignitor can be cleaned while the engine is running; that they put a friction clutch on all of their engines, with the lever on the inside of the balance wheel where it cannot possibly be caught in the belt; that the total repairs of the Lennox engine for 1902 did not exceed over one-fifth of a cent per month for each engine. They also state that at present they are working overtime to fill orders for engines furnaces, rotary beveling and splitting shears, tapping machines and hot-air, all-steel furnaces.

Special attention is directed to the advertisement of Cray Brothers, of Cleveland, Ohio, on page 52, the outside rear cover of this issue. The advertisement is very interesting for two reasons. In the first place a very unique offer is made to blacksmiths and wagon builders. To anyone not already a subscriber to The American Blacksmith, they offer to present a year's subscription to the paper free, in return for their name, cut from the advertisement in question and accompanied with an order amounting to $5.00 or more. Those who take advantage of this offer before February 20, receive a handsome calendar free, also. The prices given in the special offers of this advertisement are unusually inviting. Cray Brothers assure us that because of doing all of their soliciting by mail without the expense of men on the road, they are able to make bed rock prices on their goods. Immediate shipments is one of the features of this firm's business. Their latest net price list of everything for the blacksmith and wagon-maker will be cheerfully mailed free on request to anyone in the trade.

The Welding Compound Company, of Paterson, N. J., are announcing to the trade that the sales of their Cherry Heat Compound for the year 1903 were the largest in the history of their business.

The Buffalo Electrotype & Engraving Company, of Buffalo, N. Y., are distributing a handsome portfolio showing proof of various specimens of their work—color process, half tone engraving, wood cuts, pen and ink sketches and electrotyping.

The York Specialty Company, York, Pa., are marketing a neat trace lock for which they claim simplicity and rapidity of operation, and perfect locking. Circulars describing the Crown Trace Lock can be had upon application to the makers, as above. There are no springs or complicated parts to get out of order, and they are adjusted with ease.

A fully and handsomely illustrated catatogue is that of the Chicago Flexible Shaft Co., of 186 Ontario St., Chicago, Ill., just received, relating to horse clipping and grooming machines and carriage heaters. This catalogue illustrates and describes a large variety of such machines as manufactured by the Chicago Flexible Shaft Company. The Clark Carriage Heater is particularly interesting at this time of the year when the mercury is flirting with the zero mark. Catalogue may be had free upon request to the above company.

The West Tire Setter Co., of Rochester, N. Y., state they recently shipped a special machine to the Johnston Harvester Co., of Batavia, N. Y., to be used for rounding up their tires and rims for metal wheels, the dies in this machine having grooves cut in the face of the same to receive the heads of spokes which project through the rims of these wheels. They have also just shipped to the Kilbourne & Jacobs Mfg. Company, of Columbus, Ohio, another special machine for setting tires on wheels, 16 inches diameter up to 24 inches. Some of the wheels on which this machine is to work are all metal, and others are wood with iron tire. It is seldom, they say, that they have a call for a machine to work on such small diameters, and American Blacksmith readers might be interested to know that they make such a machine.

This company have recently changed their office location to 509 Ellwanger & Barry Building, Rochester, N. Y.

New Books.

A systematic treatise on "How to Frame a House," is one of the four new books by Owen B. Maginnis. It gives valuable information upon this subject, with illustrations of all the different processes involved. Price, $1.00.

Another book of interest to the building blacksmith, is "Roof Framing Made Easy," by O. B. Maginnis. Like the other works of Mr. Maginnis, this is clearly worked out and profusely illustrated. Price $1.00.

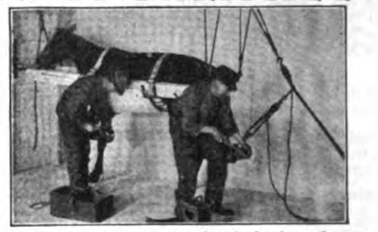
The very important topic of steel hardening and tempering is ably discussed by F. Reiser, in his book, "The Hardening and Tempering of Steel," just published by Scott, Greenwood & Co. Van Nostrand Co. have American rights. The work is translated from the original German by A. Morris and H. Robson, B. S. The various processes of treating different tools and pieces are separately taken up,—an excellent book of reference. Price, $2.50.

"Modern Machine Shop Tools," their construction, operation and manipulation, including both hand and machine tools. This is the heading of the new book by William H. Van Dervort, M. E. It is a large book of 544 pages, well printed and containing 673 engravings of tools and methods. How to make and how to use the ordinary shop tools, and many interesting facts concerning them are recorded in a bright, interesting way. The book makes a very valuable addition to the library of any blacksmith or machinist.

It may be had on approval from The American Blacksmith, P. O. Drawer 974, Buffalo, N. Y. Write for the book, and if you like it send $4.00 and it is yours; if not, return it.

Any of the foregoing mentioned books can be had of The American Blacksmith, P. O. Box 974, Buffalo, N. Y., on receipt of price.

BENEDICT'S
Safety Horse Rack and Hoist Block
LEADS THEM ALL



Because they are best designed, most simple in construction, have fewer parts, contain more genuine improvements. THE SAFETY HORSE RACK has a net gain of 50 per cent. on the lift over any other rack made, is automatic and self adjusting, has the most practical foot lift, can be successfully operated by one man in one-fifth the time of other makes.

ITS PERFECTION is undisputed by hundreds now in use—all giving entire satisfaction to their owners. BETTER than accident insurance and is heartily endorsed by all veterinarians as the most practical and humane, and one thing we bank on with confidence born of a thousand trials, is that you will find it a warm friend in time of need.

Right Prices and Fair Dealing.
J. Z. BENEDICT, Patentee.
MANUFACTURED AND SOLD BY
Benedict Manufacturing Co.
DELAWARE, IOWA, U. S. A.

The following is a list of Second-hand Gasoline Engines on hand at this date. All of them are guaranteed to be practically the same as new engines.

One 1½ H. P. Webster "Handy Man"	$65.00
One 2 H. P. Webster gasoline engine	75.00
One 2½ H. P. Webster gasoline engine	90.00
One 3 H. P. Webster gasoline engine	100.00
One 1½ H. P. Webster "Handy Man," with pumping jack attachment	100.00
One 4½ H. P. Webster gasoline engine	125.00
One 5 H. P. Webster gasoline engine	150.00
One 4 H. P. Davis engine, made at Waterloo	90.00
One 6 H. P. Dempster engine; new, just been tested	150.00
One 6 H. P. Standard engine, made at Des Moines, Iowa	175.00
One 1½ H. P. Fairbanks' "Jack of all Trades"	90.00
One 10 H. P. Portable Root & Vandervoort gasoline engine, with steel trucks and friction clutch; practically new	400.00
One 65 H. P. Stationary Detroit gasoline engine, for electric light plant	500.00

The following is a List of Refitted Wagon and Hopper Scales on hand:

One 4-ton Fairbanks' Pattern Scale, with double beam, 7 x 14 platform	50.00
One 10-ton Fairbanks' Platform Scale, with compound beam and office fixtures, 7 x 14 platform	110.00
One 6-ton single beam Fairbanks' Wagon Scale, with 7 x 20 platform	65.00
One 6-ton Howe Scale with compound beam, 8 x 22 platform	70.00
One 4-ton Howe Scale with double beam, 8 x 14 platform	55.00
One 60-bu. Fairbanks' Dormant Hopper Scale	60.00
One 600-bu. Fairbanks' Hopper Scale, with compound beam and office fixtures and levers to bring beam below	125.00
One 750-bu. Fairbanks' Hopper Scale, with compound beam and office fixtures and levers to bring beam below	150.00

Also the following List of Saws, New Grinders and Second-hand Rolls in Excellent condition:

One Webster Steel Frame Wood Saw, new	$25.00
One Webster Cyclone Ear Corn-Cob Crusher; capacity 10 to 15 bushels per hour; brand new; never been used	19.25
One Webster Cyclone Corn and Cob Crusher; capacity 30 to 60 bushels per hour; brand new; never been used	29.50
One Invincible Power Grinder, burrs 14 inches in diameter; capacity 30 to 50 bushels per hour, requiring 12 to 16 H. P.	34.65
One Set of 3-roll No. 1 Wilford & Northway feed rolls; capacity 60 bushels per hour	60.00
One Set of Allis Feed rolls, 9 x 24; capacity 125 bushels per hour; new housings and new feed	75.00

ALLEN P. ELY & CO. OMAHA, NEBRASKA

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Prices Current — Blacksmith Supplies.

The following quotations are from dealers' stock, Buffalo, N. Y., Jan. 30, 1904, and are subject to change. No variations have taken place since last month's quotations.

All prices, except on the bolts, are per hundred pounds. On bars and flats prices are in bundle lots.

Bars—Common Iron and Soft Steel.

1/4 in., round or square;	Iron, $2.80;	Steel, $2.80
3/8 in., " "	" 2.40	" 2.40
1/2 in., " "	" 2.20	" 2.20

Flats—Bar and Band.

1/4 x 1 in.,	Iron $2.20;	Steel $2.20
1/4 x 1½ in.,	" 2.10;	" 2.10
3-16 x 1½ in.,	" 2.80;	" 2.80

Norway and Swedish Iron.

1/4 in., round or square	$4.90
3/8 in., " "	4.50
1/2 in., " "	4.80
1/4 x 1 in.	4.80
1/4 x 1½ in.	4.20

Horseshoe Iron.

For No. 1 shoe, 3/8 x 1/2 in.	$3.80
For No. 2 shoe, 1/2 x 5/8 in.	2.90
For No. 3 shoe, 5/8 x 3/4 in.	2.80
For No. 4 shoe, 5/8 x 7/8 in.	2.80

Toe Calk Steel.

1/2 x 3/8 in. and larger $8.00

Spring Steel.

3/8 to 1½ in. Rounds.	Op. Hearth $8.00,	Crucible $5.00
1¼ to 6 in. by No. 4 gauge to ½ in. Flats	" 8.00,	" 5.00

Carriage Bolts. (Net Price per Hundred).

1/4 x 2 in.	$0.54	3/8 x 2½ in.	$0.82
1/4 x 2½ in.	.58	3/8 x 3½ in.	.96
1/4 x 3 in.	.62	3/8 x 6 in.	1.31
5-16 x 2 in.	.65	1/2 x 4 in.	1.70
5-16 x 3 in.	.75	1/2 x 6 in.	2.10

CUMMINGS & EMERSON
Blacksmith and Wagon Makers' Supplies,
PEORIA, ILL

PADDOCK-HAWLEY IRON CO.
Iron, Steel, Carriage and Heavy Hardware, Trimmings and Wood Material. . . . .
ST. LOUIS, MO.

WANTED AND FOR SALE.

Want and for sale advertisements, situations and help wanted, twenty-five cents a line. Send cash with order. No insertions of less than two lines accepted.

FOR SALE—House, blacksmith shop and tools. A splendid opportunity.
T. J. BAUTA,
R. R. No. 2, Lexington, Ind.

FOR SALE—Will sell tools and stock, and rent shop. Best opportunity in country.
MRS. MARY NELLESEN,
Box 270, Bessemer, Mich.

WANTED—One first-class blacksmith—must be good plowman. Steady work and good wages.
EVERSOLE BROS., Hindsboro, Ill.

WANTED—Blacksmiths to represent us in every shop in the country. Send for our premium and cash commission offers.
AMERICAN BLACKSMITH, Box 974, Buffalo, N. Y.

FOR SALE—Modern blacksmith shop, tools, iron and wood stock. Two fires, low rent; get good prices. A snap at $275.00. Best grain town in Illinois. Investigate.
E. O. BECKMAN,
Piper City, Ills.

FOR SALE—A good paying business. A 22x42 shop, 7 miles from the nearest other shop. Stock worth about $200. Can give plenty of references as to locality and business done. A splendid bargain.
H. J. WERTZ, Bladensburg, Iowa.

I CAN SELL YOUR BLACKSMITHING BUSINESS (with or without real estate) no matter where it is or what it is worth. Send description, state price, and learn my wonderfully successful plan.
W. M. OSTRANDER,
109 North American Bldg., Philadelphia.

FOR SALE—The best general shop in central Missouri. Doing good business and making money; all tools and machinery first class; no competition. If you are looking for a good proposition at a bargain, address
HATFIELD & SMITH, Centerview, Mo.

A FINE OPPORTUNITY for some progressive blacksmith to make some money. We will sell at a low figure our patent rights to a new style of Axe, which is a fine one and a ready seller. Has lots of advantages over the old style of axe. Address,
LUKE TAYLOR, Wood, N. C.

NICHOLSON FILE COMPANY

PROVIDENCE, R. I., U. S. A.,

MANUFACTURERS OF

THE K&F TRADE MARK.

FILES AND RASPS

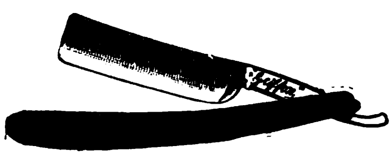
Blacksmiths Recommend our Rasps.

BECAUSE

Their Wearing Qualities Have Been Proven.

A Good Razor

will be presented free to you as a reward for doing a little missionary work for us. The following will explain:—



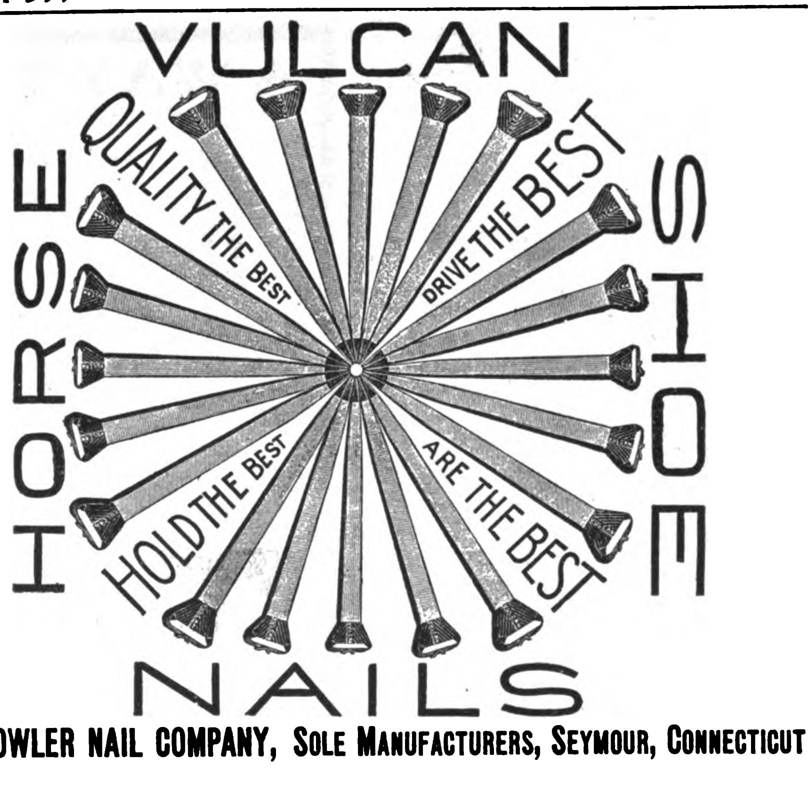
The style of razor is shown by the engraving. Its blade is 5 inches long, made from the famous "Griffon" steel, hand forged and carefully tempered. The handle is of high grade hard rubber. The manufacturers guarantee this razor to give good honest service for a life-time. Each razor enclosed in a neat case.

The RAZOR will be sent you absolutely free, postpaid, for

Three new yearly subscriptions to THE AMERICAN BLACKSMITH at $1.00 each, or for
Two new subscriptions and 25c. additional, or for
One new subscription and 50c. additional.

Get two or three smiths to subscribe and win this splendid premium. You can include your own name as one, if not already a subscriber. Send cash by stamps or money order.

AMERICAN BLACKSMITH COMPANY
Drawer 974 BUFFALO, N Y.



THE FOWLER NAIL COMPANY, SOLE MANUFACTURERS, SEYMOUR, CONNECTICUT

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New Books.

A very reliable book is "Magner's A. B. C. Guide to Sensible Horseshoeing." It contains full information of the science and art of horseshoeing, with outlines of the anatomy of the horse. The author, D. Magner, D. V. S., has already written several works on allied topics, and is an authority in his special sphere. The book is strongly bound in cloth. The print is large and good, and many illustrations enliven and elucidate the text. This work is published by The Werner Co., and may be had from THE AMERICAN BLACKSMITH, P. O. Drawer 974, Buffalo, N.Y. Price, $1.00.

To the smith who has any inclination towards ornamental iron work for odd minutes, the new book "A Handbook of Art Smithing," published by Bruno Hessling, will be found both interesting and valuable. The book is profusely illustrated with 214 plates that give many suggestions for art designs in a wide variety of styles. It is translated from the German of Franz Meyer, an acknowledged authority. This text book may be had of THE AMERICAN BLACKSMITH, P.O. Drawer 974, Buffalo, N.Y. Price, $2.50.

Trade Literature and Notes.

Following up their special advertisement on the rear cover of the January AMERICAN BLACKSMITH, Cray Brothers, Cleveland, Ohio, make another set of special offers for a limited time in this month's issue. Their advertisement on page III is interesting in many ways.

A little pamphlet issued by The Hahn Mfg. Co., 360 Grand St., New York, N. Y., tells the advantages of the "Sure Step" horse shoe. Is of interest to horseshoers.

The advertisement of R. S. & A. B. Lacey, Patent Attorneys, appears in this issue. This firm is old-established and reliable. They publish valuable books on the subject of inventions, which they will mail free to parties interested.

To the smith who makes a business of handling farm machinery the catalogue from Loudon Machinery Co., Fairfield, Iowa, will be found very interesting. The Louden hay tools, barn door hangers and hardware specialties are catalogued therein.

The American Steel & Wire Company, Chicago, Ill., have recently issued a new catalogue, listing their various products, among which of especial interest to our blacksmith readers are their Juniata Horseshoes, steel and iron, and their Juniata Toe Calks.

The New Era Works Company, of Dayton, Ohio, manufacturers of a complete line of gas and gasoline engines, various styles and prices, send us a handsome and fully illustrated catalogue of their engines, advising us at the same time that in future they will be known as the New Era Gas Engine Company. The catalogue is a most complete one, fully illustrated, and contains full information regarding gas engines, large and small.

An attractive catalogue is the one issued by Badger State Machine Company, Janesville, Wis., showing their line of new Badger punches and shears. Punches and shears for all manner of work are shown and described in this interesting booklet, which will be sent free on request to anyone in the trade.

The Champion Tool Company, Conneaut Lake, Pa., have sent us their new catalogue just off the presses, which gives full line of blacksmiths' and horseshoers' tools. A number of new and interesting tools are shown in the catalogue. This company makes the claim that they are the designers of the greatest part of the farriers' tools on the market at the present time. Catalogue sent free on request.

The following letters received by the Weber Gas & Gasoline Engine Company, Kansas City, Mo., may be interesting as showing the experience of engine users:

"I consider your 5 H. P. engine far in advance of any engine I have ever seen for simplicity, ease in starting and operation, and for its great power.

"I run a 16-inch by 10-foot lathe, a band saw, emery wheel, 12-inch grind stone, and pump to supply creamery situated close by shop, and it would be only play for it to drive all of them at the same time. I have never used it on full load, and cannot say how much gasoline it would use per 10 hours, but it certainly is economical in the use of fuel. It is the admiration of all who see it in operation. T. J. SHEPHERD, Martinsburg, Ind."

"I am very well satisfied with my engine. I have a small wood-working shop and do general contracting. I have a 14-inch crescent rip saw, one 26-inch band saw, one 16-inch swing saw, one double head emery grinder, and one 100-lb. grind stone. I have run them all at the same time in light work, and the engine did very well. I run two and sometimes three machines in general work every time I run. Taking it altogether, it runs as well and better than I expected when I got it.
C. P. ROHAN, Maybank, Texas."

"The 5-H. P. Engine which I bought of you about six months ago has given perfect satisfaction. I run two hammers, drill and emery stand, band saw, rip saw wood turning lathe, all at the same time. If I were in need of another gasoline engine, I would certainly buy a Weber.
T. L. BROWN, Wortham, Texas."

The Cortland Welding Compound Co., Cortland, N. Y., in a recent communication called special attention to the merits of their "Borax-ette," (see ad. on front cover of this paper). They claim that it has great advantages for steel tires, axles, springs and general welding, as it does not have to be applied between the laps, but is used the same as borax on the outer surface of the work; that the steel will not slip when welding, but unite like iron; that it is unequalled for plow work as it welds at a low heat, and scales off, leaving the work smooth and clean.

Blacksmiths have the opportunity of trying this compound for themselves, as they offer to send free samples to every blacksmith in the United States and Canada. Or it can be procured of dealers in blacksmiths' supplies.

McGovern Tire Setter Company, of Cincinnati, Ohio, write regarding their tire setter: "The McGovern Machine is the only machine in the world that is equipped with large circle bands. These circle bands are flexible and have a give to them, which permits us to lay the tire up close over the entire circumference of the rim whether the wheel be 98%, 99%, or 100% round. In other words, wheels are not a true circle and our machine comes to the shape of the wheel, setting the tire without any driving, strain or injury to the wheel. This is impossible in any other method. The McGovern Machine is automatic in action, another important feature. Then again, it is provided with an adjustable gauge for dishing wheels, and we guarantee to dish one hundred or one thousand wheels all to the same degree of measurement."

DON'T BUY Toy's New Treatise on Steel, unless you want to be an expert steel worker and master blacksmith. They explain forging, annealing and tempering, high speed and self hardening steel with 75 new ideas and methods on machine and plow forging and welding; ten recipes for making your own compounds for welding the different kinds of steel. Thermite welding fully explained. It welds R. R. rails in the twinkling of an eye. Also two hand colored scientific tool tempering charts, A and B, explaining all hardening and tempering to a standard in oil, water or tallow, showing true color each tool should be, and what it would stand, as used by Woolwich Arsenal, England.
All the above for one dollar. Samples free.
W. M. TOY, Sidney, O.

The Hero 4-H. P. Gas and Gasolene Engines manufactured by The Robertson Manufacturing Company, Buffalo, N. Y., are the right engines for blacksmiths, wagon makers, etc. They are the simplest four cycle engine on the market, with the greatest economy in fuel. The company have installed a lot of new machinery to meet the demand and are making a specialty of this engine. The price being about half the ordinary make of engine with a liberal guarantee back of them, no wonder they are popular. All interested should write the company as above.

This Handy Level

Will be given you Absolutely free

if you send us $1.00 for one new subscription to The American Blacksmith.

The Level is 2 inches long, just the right size to carry in your pocket. It is handsomely enameled in black and the mountings highly polished. Guaranteed accurate.

HERE'S ANOTHER OFFER: Send $1.00 for a new subscription and we will give you a good, reliable hoof knife free.

The knife is made of refined crucible cast steel and tempered by a secret process. The handle is of hard wood. An exceptionally good article. Will last for years.

Get your neighbor smiths to subscribe for The American Blacksmith or send in your own name if you are not a subscriber and get premium free.

AMERICAN BLACKSMITH COMPANY

DRAWER 974 ***BUFFALO, N.Y.***

A WAY TO MAKE MONEY!

SEE THAT HANGER

The best way to make money is to save it. **A REITER PATENT BOLSTER SPRING** on an ordinary farm wagon gives exactly the same results obtained from an expensive spring wagon at **less than one half the cost**. You can't afford to be without a Set. In ordering specify distance between standards and the capacity required. Be sure you get the Reiter as it has many features entirely its own.

"SEE THAT HANGER."

ORDER FROM YOUR DEALER OR DIRECT, GIVING CAPACITY AND WIDTH BETWEEN BOLSTER STAKES.

MANUFACTURED EXCLUSIVELY BY

PITTSBURG BOLSTER SPRING CO.

P. O. Box 1083 PITTSBURG, PA.

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Prices Current — Blacksmith Supplies.

The following quotations are from dealers' stock, Buffalo, N. Y., Feb. 27, 1904, and are subject to change. No variations have taken place since last month's quotations.

All prices, except on the bolts, are per hundred pounds. On bars and flats prices are in bundle lots.

Bars—Common Iron and Soft Steel.

¼ in., round or square;	Iron, $2.30;	Steel, $2.30
⅜ in., " "	" 2.40	" 2.40
½ in., " "	" 2.20	" 2.20

Flats—Bar and Band.

¼ x 1 in.,	Iron $2.20;	Steel $2.20
¼ x 1¼ in.,	" 2.10;	" 2.10
3-16 x 1½ in.,	" 2.30;	" 2.30

Norway and Swedish Iron.

¼ in., round or square	$4.90
⅜ in., " "	4.50
½ in., " "	4.30
¼ x 1 in.	4.30
¼ x 1½ in	4.20

Horseshoe Iron.

For No. 1 shoe, ⅜ x ½ in	$3.30
For No. 2 shoe, ½ x ⅝ in	2.90
For No. 3 shoe, ⅝ x ¾ in	2.80
For No. 4 shoe, ⅝ x ⅞ in	2.80

Toe Calk Steel.

½ x ⅜ in. and larger	$3.00

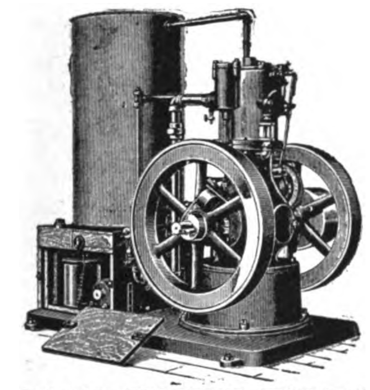
Spring Steel.

⅜ to 1½ in. Rounds.	Op. Hearth $3.00,	Crucible $5.00
1¼ to 6 in. by No. 4 gauge to ½ in. Flats	" 3.00,	" 5.00

CUMMINGS & EMERSON
Blacksmith and Wagon Makers' Supplies,
PEORIA, ILL.

PADDOCK-HAWLEY IRON CO.
Iron, Steel, Carriage and Heavy Hardware, Trimmings and Wood Material. . . . .
ST. LOUIS, MO.

If you want to know how big an engine you need, write us and we will furnish all desired information free.* We are experts at installing power in *small shops. Also,* we make engines, particularly for blacksmiths—sizes 1 to 12 H. P.



PEASE ENGINE WORKS
GOSHEN, IND.

WANTED AND FOR SALE.

Want and for sale advertisements, situations and help wanted, twenty-five cents a line. Send cash with order. No insertions of less than two lines accepted.

FOR SALE—Wagon and vehicle factory; general blacksmithing and farm implements. Established 36 years. Apply,
Box 76, Osceola, Mo.

WILL SELL, lease or rent, my shop and good-will in thriving town. Reason for selling, poor health. A splendid opportunity. Address,
JOSEPH BECHLER, Seckman, Mo.

FOR SALE—My blacksmith shop; double forge, all tools necessary for plow work, horse-shoeing and wagon work; gasoline engine; in a lively town, finest farming country in the North-west. SWAN N. LUNDGREN, Battle Lake, Minn.

I CAN SELL YOUR BLACKSMITHING BUSINESS (with or without real estate) no matter where it is or what it is worth. Send description, state price, and learn my wonderfully successful plan. W. M. OSTRANDER,
109 North American Bldg., Philadelphia.

NICHOLSON FILE COMPANY

NICHOLSON.

PROVIDENCE, R. I., U. S. A.,

THE K&F TRADE MARK.

MANUFACTURERS OF

FILES AND RASPS

Blacksmiths Recommend our Rasps,

BECAUSE

Their Wearing Qualities Have Been Proven.

Everybody Says THAT THE BEST BOOK ever written on Selecting, Forging, Hardening, Tempering and Working Steel is

THE AMERICAN STEEL WORKER

Mr. E. R. Markham, the author, has had 27 years of practical experience. **For $2.50** you get the benefit of all he knows. We recommend the book as the very best published. **We also offer** to send you the book free for inspection. If it fills the bill, keep it and pay for it; if it doesn't, send it back. Wouldn't make this offer if we didn't know the book was a good one. We think you'll want it. Cloth bound, 343 pages, 160 special illustrations. **Send today.**

AMERICAN BLACKSMITH COMPANY
BOX 974 - - BUFFALO, N. Y.

THE FOWLER NAIL COMPANY, SOLE MANUFACTURERS, SEYMOUR, CONNECTICUT.

Trade Literature and Notes.

A book of engines comes from the Western Malleable & Grey Iron Mfg. Co., Milwaukee, Wis. It gives full particulars concerning the build, workmanship, materials and general principles of the Simplicity gas and gasoline engines. This book is well worth the attention of the smith contemplating the installation of power.

On page XXIX, Luther Bros., 2 Villard Ave., N. Milwaukee, Wis., show a new drilling device which they emphasize as being of special value to blacksmiths and wagon men.

A new hoof trimmer has been recently introduced by the J. L. Henry Co., of Detroit, Mich. The blade is of shear steel, cutting down on a brass face, which is rounded to allow the smith to govern the depth of his cut. The blades are adjustable and may be removed for grinding. This tool may be used for cutting and trimming the sole. Send for illustration and description.

Cray Bros., Cleveland, Ohio, have a new set of special spring offers to make this month, on the rear cover of this issue. They inform us that these offers are meeting with unqualified approval on the part of the trade.

The Olin Gas Engine Co., Buffalo, N. Y., will send free to any address, their handsome new catalogue, illustrating and describing their engines, built in 12 sizes, from 2 to 60 horse power. The average cost of running their 2 H. P. engine is stated to be but 15 cents for 10 hours, with gasoline at 15 cents per gallon.

The following is one of the many similar letters which The McGovern Tire Setter Co., Cincinnati, Ohio, inform us they constantly receive. "I have been using the McGovern Tire Setting Machine, Power Model, for nearly three years, and I am glad of the opportunity to say that I am very much pleased with it in every respect. To show you how much I think of it, I would not take a thousand dollars ($1,000.00) for this machine if I could not get another one just like it. The McGovern Tire Setter does much better work in every way, than can possibly be done the old way. It gives perfect results, and pleases my customers. It is a money maker for me, and I consider it a paying investment." Henderson Carriage & Wagon Works, Henderson, N. C.

A new rim clamp is now being placed upon the market, the result of an effort to produce a practical tool for holding rims while the joints are being sawed to a final fit; and a tool that can be applied instantly. The under plate is machined perfectly straight, which holds the rim in such a manner that the joint is bound to be perfect and the rim straight. The rim is held so firmly that it cannot pinch the saw. The patterns are strongly ribbed, and are made strong enough to meet all requirements and not spring out of true. As well as being a rim clamp, it is a superior clamp for hundreds of places where a clamp is needed, as it holds like a vise. It has the capacity of two ordinary clamps, and is as quickly applied as one. A circular containing full instructions for the use of the tool will be sent free on application to the Bliss Manufacturing Co., S. Egremont, Mass., the makers.

The same company is also issuing circulars of a new tire bolt clamp, which is intended to meet the demand for a good practical tire bolt clamp better than the means of the past. It is claimed to be a perfect tool for the work of holding tire bolts from turning while nuts are being put on or taken off them. Sleigh shoe bolts, or any bolts within its capacity. The patterns are strongly ripped and metal is put where it will make the strongest tool with suitable weight to make it handy for a tool that has been used so constantly. The screw is steel pointed, and hence most durable.

These two tools are shown in the advertisement of the Bliss Manufacturing Company, on the opposite page.

The Best Investment

you can make is a book that will tell you how to do things quicker, better or cheaper. The following books may be able to tell you something you want to know:

Turning and Boring Tapers	$ .25
Threads and Thread Cutting	.25
Machine Shop Arithmetic	.50
Gas Engine Hand Book	1.50
Home Mechanics	1.50
Practical Electricity	2.00
American Steel Worker	2.50

Any book costing over a dollar will be sent you on approval—return if it isn't what you want. THE AMERICAN STEEL WORKER is an especially valuable book. See ad on page XVII.

American Blacksmith Company
Box 974——Buffalo, N. Y.

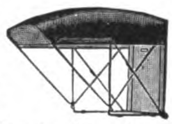
1,000 Blacksmiths and Carriage Makers Wanted.

Those who are thinking of installing a gasoline engine up to 4 H. P. An engine that will save you money. About half the ordinary price to start with and less to operate. Write the

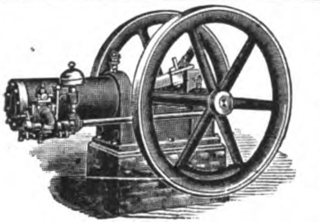
ROBERTSON MANUFACTURING CO.
BUFFALO, N. Y.

A FULL Rubber Top for $5.50

Send cash with order.
Write for catalogue showing complete line of tops, cushions and trimmings.



Lyman Wood Manufacturing Co.,
Racine Jct., Wisconsin.



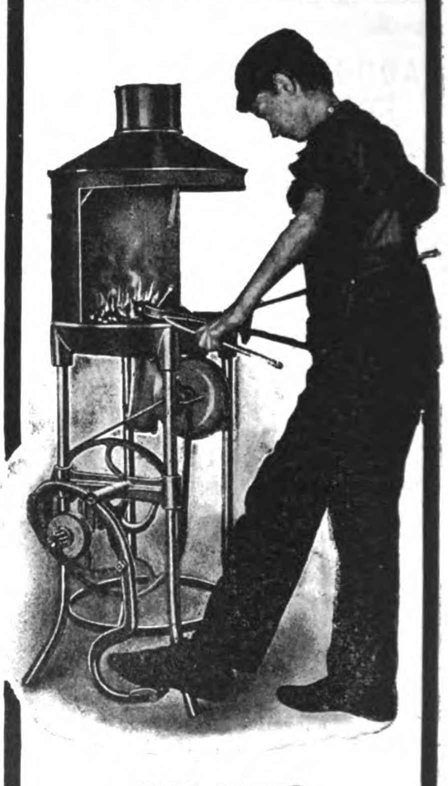
The Village Blacksmith's Dream.

Asleep on his cot he has a vision. The old dilapidated shop in which he has toiled for years has been transformed, and in its place he sees a new shop with modern equipment—Power Hammers, Drills, Blowers and whirling shafts driven by a "Capital" Gasoline Engine. Business increases and his coffers are overflowing with dollars. But alas, there is an awakening and he finds this all an empty dream. However, realizing the usefulness of power, he buys one of the Capital engines and thus makes his dream a reality. Kind friends, do thou likewise. Post Office address of builders.

C. H. A. DISSINGER & BRO., - Wrightsville, Pa.

An erroneous principle in the construction of the ordinary forge necessitates the operation of the hand wheel or handle just at the time when both hands are required to attend properly to the work.

HERE IS A CORRECTIVE



BOTH HANDS
are free for work with

The Kickdrive

A kick of the Lever starts the machine, an occasional kick keeps it running continuously.

WRITE FOR A BOOKLET.

SLOTKIN & PRAGLIN
210-212 C. CANAL STREET,
New York.

A WAY TO MAKE MONEY!

ECONOMY — DURABILITY

The Best in the World
1,000 to 10,000 Lbs. Capacity

SEE THAT HANGER

The best way to make money is to save it. **A REITER PATENT BOLSTER SPRING** on an ordinary farm wagon gives exactly the same results obtained from an expensive spring wagon **at less than one half the cost.** You can't afford to be without a Set. In ordering specify distance between standards and the capacity required. Be sure you get the Reiter as it has many features entirely its own.

"SEE THAT HANGER."

ORDER FROM YOUR DEALER OR DIRECT, GIVING CAPACITY AND WIDTH BETWEEN BOLSTER STAKES.

MANUFACTURED EXCLUSIVELY BY

PITTSBURG BOLSTER SPRING CO.

P. O. Box 1083 — PITTSBURG, PA.

NICHOLSON FILE COMPANY

NICHOLSON.

PROVIDENCE, R. I., U. S. A.,

THE K&F TRADE MARK.

MANUFACTURERS OF

FILES AND RASPS

Blacksmiths Recommend our Rasps.

BECAUSE

Their Wearing Qualities Have Been Proven.

Hanford's Balsam of Myrrh

THE PEER OF ALL REMEDIES

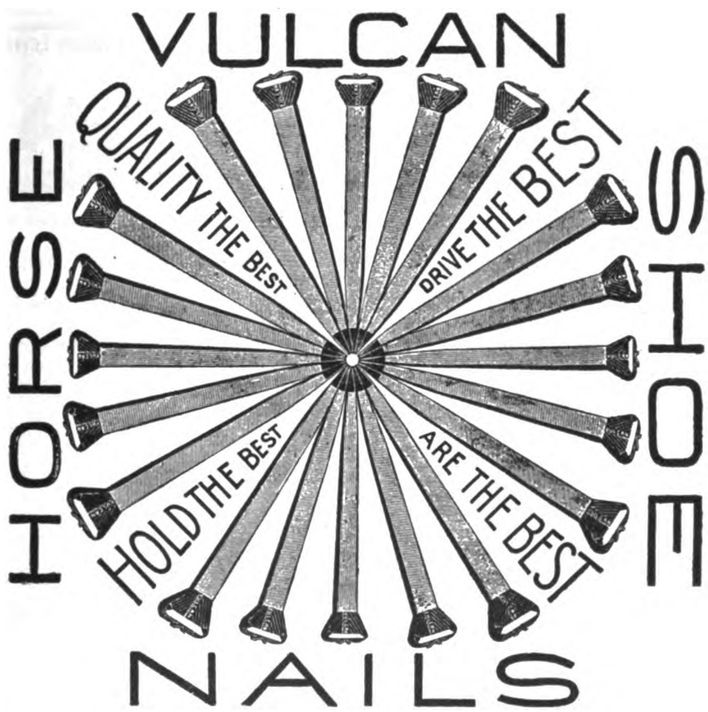
For Domestic Animals

GUARANTEED without an equal in healing flesh wounds of all kinds. Removes proud flesh; Prevents Gangrene; Cleanses and heals old sores; Cures cuts, burns, bruises, lameness, sprains, etc.

Produces instantaneous results. Cheapest and most effective remedy known.

For Sale by All Dealers, or by Mail, 25c., 50c. and $1.00

G. C. HANFORD MFG. COMPANY, SYRACUSE, N. Y.



THE FOWLER NAIL COMPANY, SOLE MANUFACTURERS, SEYMOUR, CONNECTICUT.

Prices Current — Blacksmith Supplies.

The following quotations are from dealers' stock, Buffalo, N. Y., March 27, 1904, and are subject to change. No variations have taken place since last month's quotations.

All prices, except on the bolts, are per hundred pounds. On bars and flats prices are in bundle lots.

Bars—Common Iron and Soft Steel.

1/4 in., round or square;	Iron, $2.80;	Steel, $2.80
3/8 in., " "	" 2.40	" 2.40
1/2 in., " "	" 2.20	" 2.20

Flats—Bar and Band.

1/4 x 1 in.,	Iron $2.20;	Steel........$2.20
1/4 x 1 1/2 in.,	" 2.10;	" 2.10
3-16 x 1 1/2 in.,	" 2.30;	" 2.80

Norway and Swedish Iron.

1/4 in., round or square	$4.90
3/8 in., " "	4.50
1/2 in., " "	4.80
1/4 x 1 in.	4.80
1/4 x 1 1/2 in	4.20

Horseshoe Iron.

For No. 1 shoe, 3/8 x 1/2 in	$3.30
For No. 2 shoe, 1/2 x 5/8 in	2.90
For No. 3 shoe, 5/8 x 3/4 in	2.80
For No. 4 shoe, 5/8 x 7/8 in	2.80

Toe Calk Steel.

1/2 x 3/8 in. and larger	$3.00

Spring Steel.

5/8 to 1 1/2 in. Rounds.	Op. Hearth $3.00,	Crucible $5.00
1 1/4 to 6 in. by No. 4 gauge to 1/2 in. Flats	" 3.00,	" 5.00

Carriage Bolts. (Net Price per Hundred).

1/4 x 2 in.	$0.54	3/8 x 2 1/2 in.	$0.82
1/4 x 2 1/2 in.	.58	3/8 x 3 1/2 in.	.96
1/4 x 3 in.	.62	3/8 x 6 in.	1.31
5-16 x 2 in.	.65	1/2 x 4 in.	1.70
5-16 x 3 in.	.75	1/2 x 6 in.	2.10

CUMMINGS & EMERSON

Blacksmith and Wagon Makers' Supplies,

PEORIA, ILL.

PADDOCK-HAWLEY IRON CO.

Iron, Steel, Carriage and Heavy Hardware, Trimmings and Wood Material. . . . .

ST. LOUIS, MO.

IT WILL COST YOU LESS

to subscribe to THE AMERICAN BLACKSMITH direct, but it might be more convenient for you to get it from your news dealer. Any news stand will get THE AMERICAN BLACKSMITH for you. Price, 10 cents a copy.

WANTED AND FOR SALE.

Want and for sale advertisements, situations and help wanted, twenty-five cents a line. Send cash with order. No insertions of less than two lines accepted.

FOR SALE—A first class blacksmith shop; splendid equipment. A bargain. Write at once to D. W. CRIPE, Cisco, Ill.

FOR SALE—Only shop in town. Also stock and tools. Cause cannot stand the horseshoeing. J. H. MILLER, Box 153, Sullivan, Ohio.

FOR SALE—Will sell tools and stock and rent shop. A bargain. Investigate. J. A. PENCE, Kinross, Iowa.

FOR SALE—A good paying blacksmith and wagon shop with tools and stock. For information address GEO. W. SCHMIDT & SON, Mokane, Mo.

A FINE OPPORTUNITY for a progressive blacksmith or manufacturer to make some money. Will sell at a low figure patent rights to a new, spoke puller just patented. Write J. F. MELVIN, Martinsville, Ill.

FOR SALE—One-half interest in blacksmith and wagon shop, repository, tools and materials of all kinds for wagons. For particulars apply to THOMAS BALL, Fairland, Indian Territory.

I CAN SELL YOUR BLACKSMITHING BUSINESS (with or without real estate) no matter where it is or what it is worth. Send description, state price, and learn my wonderfully successful plan. W. M. OSTRANDER, 109 North American Bldg., Philadelphia.

FOR SALE—A compound for brazing cast iron and all other metals, with full particulars for doing the work. Sample package one dollar. Large package and exclusive agency for two dollars. For further particulars, address THE BIG FOUR BRAZING COMPANY, Seneca, Mo.

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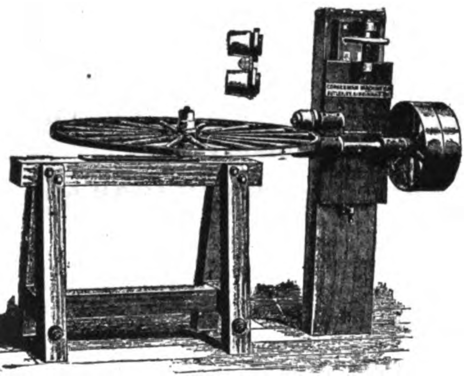
Trade Literature and Notes.

Cray Bros., Cleveland, Ohio, make their ad each month especially attractive in many ways. Their announcement on the rear cover of this issue will be of interest to blacksmiths and wagon builders. A unique offer is made to the trade to induce them to "get acquainted" with Cray Brothers, their goods and prices.

Muncie Wheel & Jobbing Company, Muncie, Ind., are calling special attention of the trade to their line of wheels. Their 1904 special catalogue No. 37, contains a great amount of information regarding the wheels they make a specialty of. As indicated by their striking advertisement on page III, this catalogue will be sent free, and should be in the hands of every blacksmith and wagon builder.

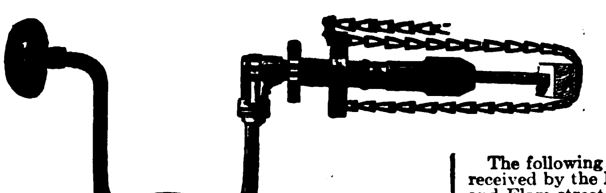
Some of the advantages of Brazit, for brazing cast iron, as manufactured by the United States Compound Company, New Bedford, Mass., are brought out in an interesting circular from that firm. Several broken parts of cast iron machinery in a printing office were quickly mended by the use of this new compound. One of the machines was of an old style not made at the present time, so that it would have been discarded but for Brazit. Another cylinder press was saved at least three days' idleness by the use of Brazit. The circular issued by the above company contains several interesting hints to blacksmiths, regarding profits which can be had by the use of this compound.

The machine which is illustrated herewith shows a new tool of interest to all blacksmiths and wagon repair men. It is a patent tire truer built by the Cordesman Machine Company of Cincinnati, Ohio, who inform us that, though just placed upon the market, over 200 are now in use. This machine can be handled by a boy, and the operation of truing the tire with the felloes of the vehicle or wagon wheels can be quickly and accurately ac-



complished, leaving the felloes entirely free from hammer marks and at the same time giving a better finish to the wheel. Another feature which is claimed for the machine is that it prevents the possibility of the tire being fractured, as often happens when tires are hammered on.

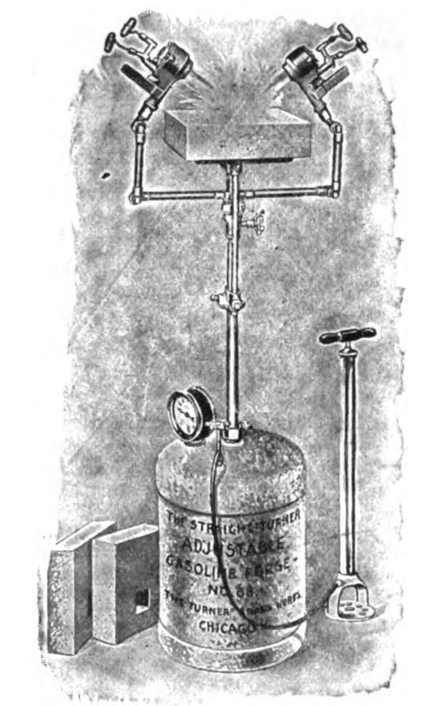
The accompanying illustration shows a new combination brace and force drill, which is manufactured by Luther Bros. Company, North Milwaukee, Wis. This device may be termed two machines in one. In addition to possessing all the advantages of the ordinary brace, it may also be used for drilling iron or other metals. The chain and screw feed attachment converts it into a force feed drill. The feed pressure is given by the use of the feed wheel which works on ball bearings, thus reducing friction to a minimum. The operation will be clearly understood from the accompanying engraving. It is much superior to the ordinary press



drill for the reason that the operator is not obliged to do any pressing himself to feed the drill, this being automatically taken care of by means of the chain and screw feed attachment. The portability of this drill will also recommend it to users. The makers inform us that a large number of these drills have already been sold to blacksmiths and wagon builders since its recent introduction. In their advertisement on page XIII a special offer is made regarding this device.

The Turner Brass Works, 63 North Franklin Street, Chicago, are manufacturers of the No. 88 Straight Turner Adjustable Brazing Forge, herewith illustrated. This forge is fitted with double jet burners mounted on a compound swivel in such a manner as to enable the operator to place the burners in any position, making this forge adjustable to all kinds of work.

The Turner Double Jet Burners generate a temperature of over 3000 deg. F., which is a much higher temperature than produced by any single jet burners, due to the fact that both air and gas are fed through the two jets and burned in the



combustion chamber, so as to produce the maximum degree of heat from the fuel. The supply tank is made of boiler steel, strongly riveted, and heavily galvanized, and each brazer is tested at a pressure of 150 lbs. before shipping.

This forge is specially desirable in brazing tubular axles and other work in automobile construction, and the adjustable features render it excellent for brazing large pieces of cast iron, brass, and other metals, as well as for general forge and shop work.

A circular describing this brazer will be furnished by the manufacturers on request.

The following is one of the testimonials recently received by the McGovern Tire Setter Co., Garrard and Elam streets, Cincinnati, Ohio:

Will say that I have used one of the McGovern Tire Setting Machines for the past three years, and I have had grand success on all styles of wheels. This machine is a "Cracker Jack" in setting the channel tire. It does it better than any other method can possibly do it.

I have had two men attending to the machine, wedging up spokes and fitting the wheels where felloe bound, and they reset forty sets of tires per day with ease, and these were all kinds and sizes of tires. The machine is O. K. in every respect. It is a big labor saver, it advertises the business and will make money in any shop. I have trade that come from fifteen miles around, right through cities of 5000, to get their tires set with my McGovern Machine. They all like it.

I guarantee my tire for the season and never have to reset any.

THE FERGUSON BUGGY CO., Ann Arbor, Mich.

We Make 2 3 5 & 8 Horse Power Engines.

Greatest Opportunity Ever Offered

For 85.00 We'll Sell You The Best Gasoline Engine ever made **The CHICAGO**

a complete engine in every detail, erected on wood base, self-contained, with Electric Spark Igniter. Water and Gasoline Tanks, Batteries and connections, all ready to run. Each engine thoroughly tested and **Guaranteed Absolutely Perfect,** and

Full 2 Horse Power with pulley for running all kinds of machinery by belt.

Pumping attachment as shown in cut $12.00 extra.

Simplest engine ever produced. Results of 14 years experience. Fewer Parts, Highest Efficiency, Greatest Economy, Lowest Price. OTHER SIZES AT PROPORTIONATE PRICES. We make 3, 5 and 8 Horse Power engines all on same lines.

Cut This Ad Out and send it to us and we will mail you catalogue free, it shows large cuts, gives full description and more information on gasoline engines than was ever given before. We have revolutionized the gasoline engine business. Catalog tells what we have learned in 14 years. **Chicago Gasoline Engine Co.** 57 North Jefferson St. **Chicago.**

BLACKSMITHS AND OTHERS

Wanting a Gasoline Engine for the least money, with all the modern improvements, guaranteed O. K., and recommended by users and experts, write for full particulars to . . . .

The Robertson Mfg. Co., Buffalo, N.Y.

SPECIAL

TO INDUCE Blacksmiths, Horseshoers and Wheelwrights, who do not know THE AMERICAN BLACKSMITH, to become acquainted with the paper and read it regularly, the following special offer is made:

For $1.00 we will send THE AMERICAN BLACKSMITH for one year, and

Your Choice of one of the Five Following Premiums

A strong, serviceable FARRIER'S HOOF KNIFE, Crucible Steel and Bone Handle.

A handy 3½-inch POCKET BENCH LEVEL, Neat and Useful.

A handsome MINIATURE BLACKSMITH'S HAMMER Watch Charm.

A perfect working model MINIATURE MONKEY WRENCH, or

YOUR NAME AND ADDRESS ON A RUBBER STAMP WITH INKING PAD COMPLETE.

YOU WILL FIND that THE AMERICAN BLACKSMITH itself is the biggest dollar's worth that goes into your shop. Twenty pages of solid reading matter guaranteed each month from the brightest writers of the craft. No trade puffs or stale clippings.

IF YOU ARE A SUBSCRIBER ALREADY, send us the subscription of your friend or neighbor smith, and we will give you your choice of one of the premiums. State premium desired. Send money by Registered Letter, Express Order, Stamps or Money Order, but not Checks.

AMERICAN BLACKSMITH COMPANY
P. O. Drawer 974.
Buffalo, N. Y. U. S. A.

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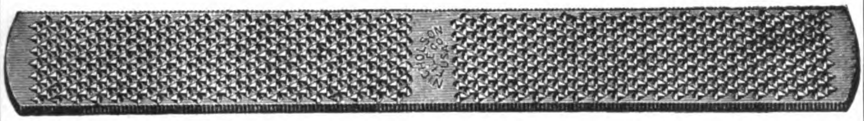
NICHOLSON FILE COMPANY

NICHOLSON.

PROVIDENCE, R. I., U. S. A.,

MANUFACTURERS OF

THE K&F TRADE MARK.



FILES AND RASPS

Blacksmiths Recommend our Rasps.

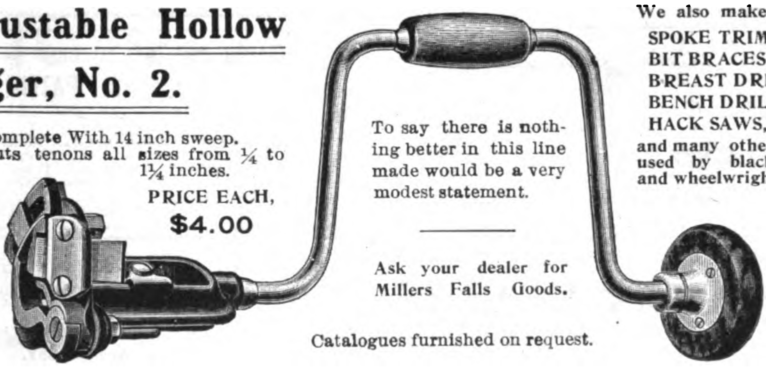
BECAUSE

Their Wearing Qualities Have Been Proven.

Adjustable Hollow Auger, No. 2.

Complete With 14 inch sweep. Cuts tenons all sizes from 1/4 to 1 1/4 inches.

PRICE EACH, **$4.00**



To say there is nothing better in this line made would be a very modest statement.

Ask your dealer for Millers Falls Goods.

Catalogues furnished on request.

We also make SPOKE TRIMMERS, BIT BRACES, BREAST DRILLS, BENCH DRILLS, HACK SAWS, and many other Tools used by blacksmiths and wheelwrights.

MILLERS FALLS CO., - - 28 Warren Street, New York.

THE FOWLER NAIL COMPANY, SOLE MANUFACTURERS, SEYMOUR, CONNECTICUT.

Prices Current — Blacksmith Supplies.

The following quotations are from dealers' stock, Buffalo, N. Y., April 21, 1904. and are subject to change. No variations have taken place since last month's quotations.

All prices, except on the bolts, are per hundred pounds. On bars and flats prices are in bundle lots.

Bars—Common Iron and Soft Steel.

1/4 in.. round or square;	Iron, $2.80;	Steel, $2.80
3/8 in., " "	" 2.40	" 2.40
1/2 in., " "	" 2.20	" 2.20

Flats—Bar and Band.

1/4 x 1 in.,	Iron............$2.20;	Steel..............$2.20
1/4 x 1 1/2 in.,	" 2.10;	" 2.10
3-16 x 1 1/2 in.,	" 2.30;	" 2.30

Norway and Swedish Iron.

1/4 in., round or square	$4.90
3/8 in., " "	4.50
1/2 in., " "	4.30
1/4 x 1 in	4.30
1/4 x 1 1/2 in	4.20

Horseshoe Iron.

For No. 1 shoe, 3/8 x 1/2 in	$3.30
For No. 2 shoe, 1/2 x 5/8 in	2.90
For No. 3 shoe, 5/8 x 3/4 in	2.80
For No. 4 shoe, 5/8 x 7/8 in	2.80

Toe Calk Steel.

1/2 x 3/8 in. and larger.................................... $3.00

Spring Steel.

3/8 to 1 1/2 in. Rounds.	Op.Hearth $3.00,	Crucible $5.00
1 1/4 to 6 in. by No. 4 gauge to 1/2 in. Flats	" 3.00,	" 5.00

Carriage Bolts. (Net Price per Hundred).

1/4 x 2 in	$0.54	3/8 x 2 1/2 in	$0.82
1/4 x 2 1/2 in	.58	3/8 x 3 1/2 in	.96
1/4 x 3 in	.62	3/8 x 6 in	1.31
5-16 x 2 in	.65	1/2 x 4 in	1.70
5-16 x 3 in	.75	1/2 x 6 in	2.10

CUMMINGS & EMERSON

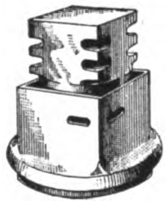
Blacksmith and Wagon Makers' Supplies,

PEORIA, ILL

PADDOCK-HAWLEY IRON CO.

Iron, Steel, Carriage and Heavy Hardware, Trimmings and Wood Material. . . . .

ST. LOUIS, MO.



Extension Axle Nuts.

Sure Cure for Wabbles and Rattles. Strongly endorsed by practical repairmen. Also Attractive Fence Machine Proposition.

County Rights on Easy Terms.

Hardware Specialty Co.

Box 10, Pontiac, Mich.

WANTED AND FOR SALE.

Want and for sale advertisements, situations and help wanted, twenty-five cents a line. Send cash with order. No insertions of less than two lines accepted.

FOR SALE—Eight horsepower Porter Steam Engine, in good condition.
CORTLAND CARRIAGE GOODS CO., Cortland, N. Y.

FOR SALE—A blacksmith and wood repair shop in good location. For further information adddress W. C. McEWN, New Bethlehem, Pa.

FOR SALE—Best located shop in Chant County. See interior view October, 1903, American Blacksmith. Big shoeing trade. Must sell on account of health. Price, with tools, $1100.
NORMAN B. BIE, Forestville, N. Y.

FOR SALE—Blacksmith shop in Lincoln, Ill. Wish to sell on account of sickness. For further information address WENDEL KNOCHEL, Lincoln, Ill.

MAIL COURSE IN BUSINESS, Telling each smith individually where his methods are lax, how he can better himself and his shop, increase his custom and make more money.
Address postal to BILLY BUNTZ,
Author, "Progressive Smith as a Business Man,"
Care AMERICAN BLACKSMITH, Buffalo, N. Y.

I CAN SELL YOUR BLACKSMITHING BUSINESS (with or without real estate) no matter where it is or what it is worth. Send description, state price, and learn my wonderfully successful plan. W. M. OSTRANDER,
109 North American Bldg., Philadelphia.

FOR SALE—A compound for brazing cast iron and all other metals, with full particulars for doing the work. Sample package one dollar. Large package and exclusive agency for two dollars. For further particulars, address THE BIG FOUR BRAZING COMPANY, Seneca, Mo.

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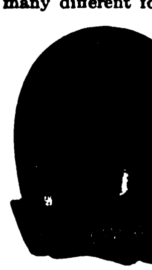
Trade Literature and Notes.

The accompanying illustration shows one of the many different forms of hoof pads manufactured by Morgan & Wright, Chicago, Ill. They inform us that these pads are extremely tough, and that they are very easy pads to fit. They will take two sizes of shoes, whereas nearly all other pads on the market take but one. Morgan & Wright are well and widely known as pioneer manufacturers of rubber pads, so that they are in an exceptionally good position to turn out a satisfactory product.

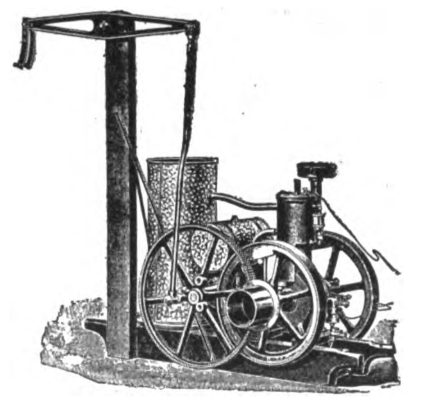


The Little Giant Controller is a new device that horse owners will be interested in. This idea furnishes us a new theory in driving and is endorsed by expert trainers and drivers of trotting and running horses. This device consists of a spring band weighing only four ounces and is so constructed that it takes all pressure off the lower jaw and controls with 80% less pull on the lines and bit. It is absolutely humane as it never bears on the parts until the horse starts to run; then the pressure is brought to bear on the proper controlling parts, which makes the horse stop; as soon as the horse stops pulling, the spring band releases its hold and goes back to the natural position. The patentee of this Controller is Dr. P. Harvey Flynn of New York City. He claims that his new idea will work on all bridles, from the plow horse to the finest and it does not interfere with wind or gait; also that it does the work as well without overdraw or checkrein as with it; and does away with all checkbits. Is sold by the harness trade, under a guarantee to do the work or money refunded. See add on this page.

The Gasoline Engine as a Power.—On the farm, the several motive powers of the past have been the steam engine, the horsepower and the windmill. To all of these there has been serious objection. The steam engine requires an engineer. If the machinery is shut down for a short time, the steam must be kept up and the expense goes on. It is impracticable to run a steam engine in a barn.

The use of the horse-power has its drawbacks as well as the windmill. The windmill has undoubtedly been of more service to the farmer than any other power, but a windmill must have wind, and this cannot be depended upon. It comes and goes as it pleases without regard to whether the stock is watered or fed.

With the gasoline engine all of these difficulties are overcome, as it can be started in a moment's



time and is always ready for service. The expense of the gasoline engine at the present time is but a trifle more than a first class windmill. The gasoline engine is supplanting the windmill in many localities. The Chicago Engine is also finely suited to the requirements of farm work, so that many blacksmiths are now acting as agents for their sale to farmers. A large illustrated catalogue of this engine can be had by addressing the manufacturers, The Chicago Gasoline Engine Co., 57 North Jefferson St., Chicago, Ill.

$5.50 FOR FIVE FIFTY we are selling a Tip Top Buggy Top. Write us. Send also for our free complete catalogue. We have a full line of trimmings.

PRICES RIGHT.

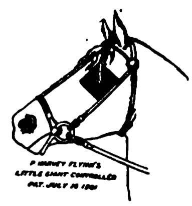
Buffalo Carriage Top Co., Buffalo, N. Y.

SCRAPE SET.

Every blacksmith and farmer can set his own scrape with the **Jackson Perfect Scrape Set.** Price $5.00 complete. Address

P. A. JACKSON,
GOODWATER, ALA.

RUNAWAYS IMPOSSIBLE!



My Little Giant Controller is a guaranteed conqueror of hard pullers and runaway horses or money refunded. It does not punish your horse or interfere with wind or gait. It works on all bridles, with or without overdraw or checkrein. Curb chains and straps stop the circulation and the lower jaw becomes numb; this is why your horse runs away. Price $2.50.

Manufactured only by

P. Harvey Flynn, Patentee,

73 WARREN STREET, NEW YORK.

LAY IN

a line of our primers, fillers, ruff stuffs, elastic and Japan colors, and our paint and varnish removers. They never fail to give perfect satisfaction. Once a user, always a user.

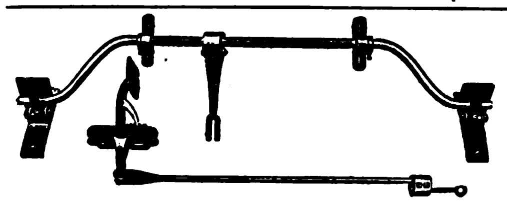
The Chas A. P. Barrett Co.

Manufacturers of Coach and Car Colors.

Factory, Troy, Ohio.

Office, 118 E. Third St., Dayton, Ohio.

Write for our New Coach Color Book and Catalogue.



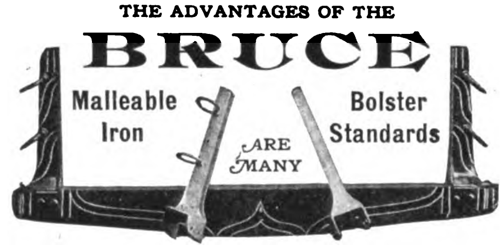
EASY to apply is **WHITE'S ADJUSTABLE PATENT BRAKE**

with inside lever and lock, for buggies, surreys, or spring wagons. Fits any and all.

Special Prices. Send Cash With Order.
With 7/8-inch Roller Bar, $2.75.
With 1-inch Roller Bar, $3.00.
In ordering state width of track and if for buggy, surrey, or spring wagon.

GEO. WHITE, 20 to 25 25th St., Rock Island, Ill.

THE ADVANTAGES OF THE



Best Malleable Iron Thoroughly Tested

MAXIMUM SOLIDITY AND STRENGTH.
Prevents Wear on Box.
Great Time and Labor Saver.

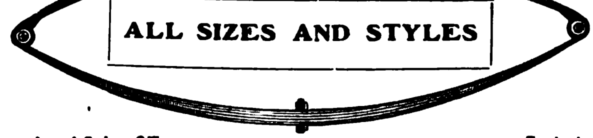
A GREAT MONEY MAKER FOR ALL WHO HANDLE THEM.

WRITE FOR PRICES

A. H. Harshbarger, Bement, Ill.

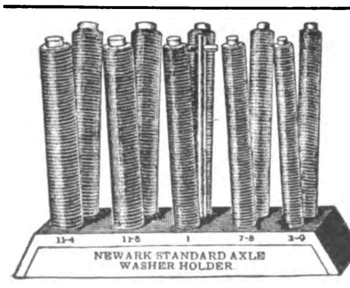
Cincinnati & Hammond Spring Co.

Manufacturers of Vehicle Springs



General and Sales Office, Nos. 909-923 SUMMER STREET, CINCINNATI, O.

Factories, CINCINNATI, O., HAMMOND, IND.



SOLID LEATHER AXLE WASHERS.

OUR PATENT AXLE WASHER HOLDER Combines CONVENIENCE, ECONOMY AND DURABILITY. Holds 500 Newark Standard Axle Washers. Every wagon and carriage manufacturer wants one. Handiest thing around the factory.

The "Standard" and "I.X.L." brand of Solid Sole Leather Axle Washers are our specialty. Send for descriptive catalogue No 3. We make washers for every axle on the market.

Write now for prices and FREE SAMPLE of our washers. Mention this paper.

THE NEWARK LEATHER WASHER MFG. CO., NEWARK, NEW JERSEY.

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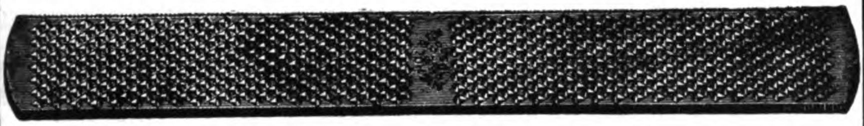
NICHOLSON FILE COMPANY

NICHOLSON.

PROVIDENCE, R. I., U. S. A.,

MANUFACTURERS OF

THE K&F TRADE MARK.



FILES AND RASPS

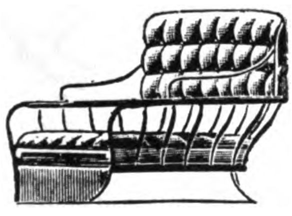
Blacksmiths Recommend our Rasps.

BECAUSE

Their Wearing Qualities Have Been Proven.

La Crosse Buggy Top & Supply Co.

La Crosse, Wis.



Manufacturers of

BUGGY TOPS TRIMMINGS
BODIES GEARS

Send for catalogue.

Dealers in the West will save freight by buying from us.

Jobbers of

Anything and Everything for Buggies

THE FOWLER NAIL COMPANY, SOLE MANUFACTURERS, SEYMOUR, CONNECTICUT.

Prices Current — Blacksmith Supplies.

The following quotations are from dealers' stock, Buffalo, N. Y., May 20, 1904, and are subject to change. No variations have taken place since last month's quotations.

All prices, except on the bolts, are per hundred pounds. On bars and flats prices are in bundle lots.

Bars—Common Iron and Soft Steel.

1/4 in.. round or square; Iron, $2.80; Steel, $2.80
3/8 in., " " " 2.40 " 2.40
1/2 in., " " " 2.20 " 2.20

Flats—Bar and Band.

1/4 x 1 in., Iron............$2.20; Steel..............$2.80
1/4 x 1 1/2 in., " .... 2.10; " 2.10
3-16 x 1 1/2 in., " .... 2.80; " 2.30

Norway and Swedish Iron.

1/4 in., round or square.............................. $4.90
3/8 in., " " 4.50
1/2 in., " " 4.80
1/4 x 1 in.. 4.30
1/4 x 1 1/2 in 4.20

Horseshoe Iron.

For No. 1 shoe, 3/8 x 1/2 in............................ $3.30
For No. 2 shoe, 1/2 x 5/8 in............................ 2.90
For No. 3 shoe, 5/8 x 3/4 in............................ 2.80
For No. 4 shoe, 5/8 x 7/8 in............................ 2.80

Toe Calk Steel.

1/2 x 3/8 in. and larger.............................. $3.00

Spring Steel.

5/8 to 1 1/2 in. Rounds.Op.Hearth $3.00, Crucible $5.00
1 1/4 to 6 in. by No. 4
gauge to 1/2 in.Flats " 3.00, " 5.00

CUMMINGS & EMERSON

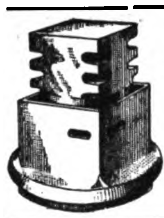
Blacksmith and Wagon Makers' Supplies,

PEORIA, ILL

PADDOCK-HAWLEY IRON CO.

Iron, Steel, Carriage and Heavy Hardware, Trimmings and Wood Material.

ST. LOUIS, MO.



Extension Axle Nuts.

Sure Cure for Wabbles and Rattles. Strongly endorsed by practical repairmen. Also Sand Boxes or Hub Covers, guaranteed to keep boxes free from grit. AGENTS WANTED.

County Rights on Easy Terms.

Hardware Specialty Co.

Box 10, Pontiac, Mich.

WANTED AND FOR SALE.

Want and for sale advertisements, situations and help wanted, twenty-five cents a line. Send cash with order. No charge less than fifty cents.

FOR SALE—Eight horsepower Porter Steam Engine, in good condition.
CORTLAND CARRIAGE GOODS CO., Cortland, N. Y.

POWER TIRE SETTER FOR SALE.—$550.00. Will set tires up to 1x5 and 60 in. diam. Address, GREAT LAKES ENGINEERING WORKS, Detroit, Mich.

FOR RENT—Blacksmith shop with 6-horse engine and all power machinery, 8 fires, good location and cheap rent. CHAS. SCHMIDT, Bristol, S. Dak.

FOR SALE—Blacksmith and wagon shop doing from $4,000 to $6,000 business in one of the best locations in Colorado. Reason for selling, interested in mining. CATO & BURKE, Rifle, Colo.

FOR SALE—A good paying Blacksmith and Wagon Shop, located in one of the best and largest dairy communities in America. Will sell on account of poor health. Write for terms.
W. J. SCHULZ, Huntley, Ill.

MAIL COURSE IN BUSINESS, Telling each smith individually where his methods are lax, how he can better himself and his shop, increase his custom and make more money.
Address postal to BILLY BUNTZ,
Author, "Progressive Smith as a Business Man,"
Care AMERICAN BLACKSMITH, Buffalo, N. Y.

I CAN SELL YOUR BLACKSMITHING BUSINESS (with or without real estate) no matter where it is or what it is worth. Send description, state price, and learn my wonderfully successful plan. W. M. OSTRANDER,
109 North American Bldg., Philadelphia.

FOR SALE—A compound for brazing cast iron and all other metals, with full particulars for doing the work. Sample package one dollar. Large package and exclusive agency for two dollars. For further particulars, address THE BIG FOUR BRAZING COMPANY, Seneca, Mo.

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Trade Literature and Notes.

SPECIAL ATTENTION is directed to page 16, where will be found the new announcement of H. D. Taylor Company, Buffalo, N. Y. Their special offers of tools at attractive prices will interest AMERICAN BLACKSMITH readers. The large stock carried by this company enables them to take prompt care of all orders for tools and supplies.

THE BOOB WHEEL CO., of Cincinnati, Ohio, incorporated with a capital stock of $10,000 has bought out the Queen City Wheel Co., and under the above title will continue the manufacture of wheels, gears and hardware. Correspondence is solicited.

ALL THE RIGHTS, title and interests and plant of the Little Giant punch and shear, formerly owned by Mr. C. Crothers, Kansas City, Kansas, have been sold to the Little Giant Punch and Shear Company, of Sparta, Ill., at which place the plant is now being installed. Orders and inquiries for the Little Giant punch and shears should be sent to the new firm, who will give the same their best attention.

DR. P. HARVEY FLYNN, 73 Warren St., New York City, sends the following unique testimonial written by John F. Bederman, coachman for Mrs. Wm. McKinley, Canton, Ohio.

"I use your Little Giant Controller on our horses and find they do all you claim for them. One of our horses shied badly and was hard to hold, but with your Controller I can drive him up to the cars, which was very difficult to do. Enclosed find draft for $5.00. Please send me two more Controllers for two of my friends."

THE McGOVERN TIRE SETTER CO., Cincinnati, Ohio, forward the following testimonial to the merits of their machine:

"After studying the principle of Cold Tire Setting and experimenting with 5 other Cold Tire Setting Machines, I finally decided that the *McGovern Tire Setter* was the most practical machine and produced the most satisfactory results of any that I had used. My judgment in this respect has proved correct. I have used your McGovern Machine in setting both new and old tires, both plain and channel styles on all kinds and conditions of wheels with the very best of success. My McGovern Tire Setter has greatly advertised my business and has been the means of building up my trade, especially so at the expense of my competitors, who have used others makes of Tire Setters. I have increased my trade quadruple, setting 1,077 tires in 32 days, in 1902. My machine has paid for itself three times and more, too. It is the best investment a repair man can possibly make and it is worth every dollar it cost. Your machine certainly deserves success."

E. H. KELLER, Fort Worth, Texas.

THE D.-C. BOOK CLUB is a new plan recently started by the Derry-Collard Co., 256 Broadway, New York City, which will doubtless interest all who have any taste for reading. It affords an excellent plan for accumulating a library of just exactly the books desired, under extremely easy terms. Full particulars will be sent on request. Briefly stated the plan is as follows: You decide to pay 1, 2, 3 or 5 dollars a month as you choose, and send in the first payment. You pick out the books or papers that you want and they are sent to you, to a value not exceeding three payments in advance. That is if you pay $2 a month, you receive $6 worth at once. You can select any book of any publisher on any subject. Mechanical books, costing $1.00 or more would be sent on 5 days' approval, so that you can be sure they are just the books you want. You can quit at any time, or if you continue one year, you receive the 12th month free.

"BOOK OF VEHICLE TIRES and Sundries" is the title of a handsome catalogue just received from Morgan and Wright, of Chicago, Ill. In addition to illustrating and describing their various styles of tires, channels and accessories, this booklet gives instructions for operating the Morgan and Wright Tire Fitting Machine, and will be found of interest and value to every one having anything to do with rubber tire work.

HARDWARE SPECIALTY CO., Pontiac, Mich., are putting out an improved Sand Box or Hub Cover that keeps boxes free from grit. No sand or dirt can work into the box over the shoulder of the axle and the lifetime of a carriage axle will be indefinitely extended. It is light, neat, durable and easily applied. It is made of cold rolled steel in the form of a cap or bell that overhangs or encloses the inner half of the hub, but does not touch it. One of its most novel, simple and effective features is the method of fastening to the axle, which must be seen to be appreciated. Price for single set, $2.50, post paid; 3 sets or more, $150 each, by express. Several hundred sets are already in successful use. This article for new buggies and their Extension Axle Nuts for old ones make a "team" that offer an opportunity to make a sale to practically every party solicited.

THE PUTNAM NAIL COMPANY, Neponset, Mass., U. S. A., has always considered it of the utmost importance to have its nails drawn down on all four sides alike. This was the "hot process," and they have now adopted it in the "cold process." Anyone can readily see that by drawing the nail down on all four sides alike with a drawing roll, the tenacity of the nail, as well as the holding power, is greatly increased; whereas, if a blank is made and then produced by rolling down on one side only, the molecules of the iron are disturbed, and the nail has not the same holding power. This can be illustrated by taking a piece of paper and running a sharp knife over it. It will immediately curl up, which shows that the molecules on one side have been disturbed more than those on the other. Now the nail cannot curl up, but is held firmly in position; consequently, when this rolling process takes place, there has to be a breakage of the molecules and its tensile strength is diminished. The New Putnam nail seems to have all the advantages of the old, with the additional point that it is absolutely uniform both in set and finish, and that it is a fine driving nail. The company will promptly send samples and quotations upon request.

A REMARKABLE SUCCESS. That American workmanship, ingenuity and skill excel that of all other nations is demonstrated on every hand. As an interesting instance may be cited the remarkably successful manufacturing of wrought iron anvils in this country. Barely twelve years ago there was not a wrought anvil made in America, and the English product was the standard for quality throughout the world. At that time the Hay-Budden Manufacturing Co. started to manufacture wrought anvils and while eminently successful from the start, they had considerable difficulty in convincing the American blacksmith that a strictly high grade anvil was being produced. Appeals to patriotism by using the slogan "America for America" influenced a trial, and that was all that was necessary. The "Hay-Budden" anvils proved so high in quality that they soon began to export in large numbers. The makers therefore decided that "All the World for America" was the proper slogan, with the result that today the "sun never sets" on the "Hay-Budden" anvils. They are extensively used in South Africa, Australia, Mexico, South America and Canada. Large shipments have been made to China and Japan. The great Trans-Siberian Railroad has 60 300-pound ones in use at their various shops. "Hay-Budden" anvils are today standard quality throughout the world, and this result has been accomplished within 12 years.

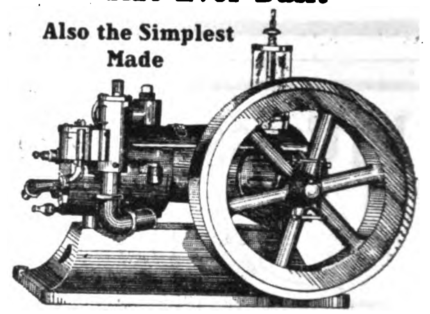
AN IMPROVED UPRIGHT POWER DRILL with Wheel Holding Attachment has been put on the market by Boynton & Plummer, Worcester, Mass., and we are able to give the following brief description of it. The drill is designed to be fastened to the wall or post by the brackets which are cast on the upright column for this purpose, taking up much less room that the ordinary floor drill, yet possessing all of the features of the floor drill, and more, inasmuch as it is provided with a wheel holding attachment on which wheels may be revolved under the point of drill. Spindle is counterbalanced by weight in column, has a vertical traverse of 11½ inches and is arranged with No. 3 Morse taper socket. Table has a vertical traverse of 18 inches, making the greatest distance between spindle and table 24 inches, allowing heavy work to be handled. Table is of the swing type and is operated by rack and pinion. Drill has 24-inch swing and is equipped with both lever and screw feed, which can be changed instantly from one to the other by means of a small lever, throwing the feed worm in or out of mesh with the worm gear. Lever is arranged with notched ratchet by which the entire traverse of the spindle may be operated with the lever always at a convenient point or angle. Drill has a 4-step cone pulley of the following dimensions: 11, 8¾ inches, 6¾ inches and 4 inches for 2¼-inch belt and is furnished with countershaft to match. Driving pulleys on countershaft 10 inches for 3-inch belt. Entire length 72 inches, weight 610 pounds. This drill, as well as all others of their make, are shown in a 116-page catalogue, which will be gladly sent to all interested, on application.

QUICK ACTING CLAMPS is the title of a catalogue recently issued by the Batavia Clamp Company, of Batavia, N. Y. A large line of varying types of clamps is illustrated and described and listed in this catalogue. Free on request.

CAPITAL GAS ENGINE CO., Indianapolis, Ind., send two interesting catalogues, one a large 24-page book, handsomely illustrated, describing their larger sizes of gas, gasoline, and crude oil engines, while the other booklet deals with their Hoosier Gas Engine, built in sizes from two to five horse-power, with special features adapting it to the situation where a small dependable power is needed.

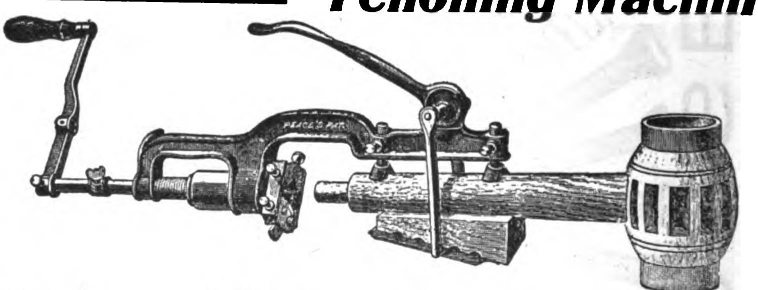
RUBBER STAMPS
STEEL STAMPS
AND STENCILS
SEND FOR CATALOGUE.
A. C. GIBSON CO.,
338-340
WASHINGTON STREET
BUFFALO, N. Y.

Most Powerful Engine for its Size Ever Built
Also the Simplest Made



3 H.P. 21 INCHES LONG 150 POUNDS
There's value in our agency. One blacksmith sold three the first month
Get Catalogue and Particulars
—Free on request.
Cushman Motor Co.
Lincoln, Nebr.

PEACE'S Improved-Spoke Tenoning Machine



Every machine warranted. No need of using a spoke trimmer, as the knife starts on the blunt end of the spoke and centers perfectly. The chuck, to hold bit for felloe boring, is adjusted without removing the cutter head. The auger is kept cutting by force of a spring. Anyone can work it; is adapted to any size spoke or dish of wheel; is readily applied without moving wheel from where spokes are driven; is easily clamped to the spoke in a second's time, so as to hold it steadily while boring, and is as quickly detached. Cuts every tenon perfectly true, cutting from ¼ to 1¼ inch.

Price, Net Cash, - - - - - $8.50
Price, with Felloe Boring Attachment, Net Cash, 9.50

Sold by Paddock-Hawley Iron Co. Gen'l Agents, St. Louis, Mo.
DEALERS in Iron, Steel, Wagon and Carriage Materials and Tools of all kinds.
Write for our special 88 Catalogue of Power Tools and Machinery for Blacksmith purposes. We furnish complete equipments of everything needed in this line.

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NICHOLSON FILE COMPANY

NICHOLSON.

PROVIDENCE, R. I., U. S. A.,

THE K&F TRADE MARK.

MANUFACTURERS OF

FILES AND RASPS

Blacksmiths Recommend our Rasps.

BECAUSE

Their Wearing Qualities Have Been Proven.

A RUBBER STAMP

of two lines with your name and address, together with an inking pad, complete, is offered as a premium for one new subscription to the

AMERICAN BLACKSMITH

Send us $1.00 and a new name, (your own if not now a subscriber,) and receive the stamp outfit free.

American Blacksmith Company,

P. O. Box 974. BUFFALO, N. Y.

THE FOWLER NAIL COMPANY, SOLE MANUFACTURERS, SEYMOUR, CONNECTICUT.

Prices Current — Blacksmith Supplies.

The following quotations are from dealers' stock, Buffalo, N. Y., June 21, 1904, and are subject to change. No variations have taken place since last month's quotations.

All prices, except on the bolts, are per hundred pounds. On bars and flats prices are in bundle lots.

Bars—Common Iron and Soft Steel.

¼ in.. round or square;	Iron, $2.80;	Steel, $2.80
⅜ in., " "	" 2.40	" 2.40
½ in., " "	" 2.20	" 2.20

Flats—Bar and Band.

¼ x 1 in.,	Iron $2.20;	Steel..............$2.20
¼ x 1¼ in.,	" 2.10;	" 2.10
5-16 x 1½ in.,	" 2.80;	" 2.80

Norway and Swedish Iron.

¼ in., round or square	$4.90
⅜ in., " "	4.50
½ in., " "	4.80
¼ x 1 in.	4.80
¼ x 1½ in	4.20

Horseshoe Iron.

For No. 1 shoe, ⅜ x ½ in	$3.30
For No. 2 shoe, ½ x ⅝ in	2.90
For No. 3 shoe, ⅝ x ¾ in	2.80
For No. 4 shoe, ⅝ x ⅞ in	2.80

Toe Calk Steel.

½ x ⅜ in. and larger	$3.00

Spring Steel.

⅝ to 1¼ in. Rounds.	Op. Hearth $3.00,	Crucible $5.00
1¼ to 6 in. by No. 4 gauge to ½ in. Flats	" 3.00,	" 5.00

Carriage Bolts. (Net Price per Hundred).

¼ x 2 in.	$0.54	⅜x2½ in.	$0.82
¼ x 2½ in.	.58	⅜x3½ in.	.96
¼ x 3 in.	.62	⅜x6 in.	1.31
5-16x 2 in.	.65	½x4 in.	1.70
5-16x 3 in.	.75	½x6 in.	2.10

PADDOCK-HAWLEY IRON CO.

Iron, Steel, Carriage and Heavy Hardware, Trimmings and Wood Material. . . . .

ST. LOUIS, MO.

CUMMINGS & EMERSON

Blacksmith and Wagon Makers' Supplies,

PEORIA, ILL

WANTED AND FOR SALE.

Want and for sale advertisements, situations and help wanted, twenty-five cents a line. Send cash with order. No charge less than fifty cents.

FOR SALE—Blacksmith shop and tools. Selling because can't stand shoeing. For information address, W. POWERS, Port Byron, N. Y.

POWER TIRE SETTER FOR SALE.—$550.00. Will set tires up to 1x5 and 60 in. diam. Address, GREAT LAKES ENGINEERING WORKS, Detroit, Mich.

FOR SALE.—Blacksmith shop at Waupaca. Selling on account of old age. For further information address, JACOB NELSON, Waupaca, Wis.

FOR SALE—House, four lots, well-improved Blacksmith Shop and tools, doing a good business. Reason for selling, poor health. $1,000 for all, $600 without tools. A. BRUTON, Hill City, Kan.

SIX RECEIPTS FOR $1.00—Tempering edge tools, tempering gun springs, soldering fluids, welding compound, engraving on steel, case hardening. Address, G. H. ROOF, Barr, S. C.

FOR SALE—Blacksmith and wagon shop doing from $4,000 to $6,000 business in one of the best locations in Colorado. Reason for selling, interested in mining. CATO & BURKE, Rifle, Colo.

FOR SALE—A good paying Blacksmith and Woodworking Shop including business and building. Also carrying farm machinery. Good wide-awake town and plenty of work. For particulars address, BOX 311, Lemoore, Cal.

I CAN SELL YOUR BLACKSMITHING BUSINESS (with or without real estate) no matter where it is or what it is worth. Send description, state price, and learn my wonderfully successful plan. W. M. OSTRANDER, 109 North American Bldg., Philadelphia.

MAIL COURSE IN BUSINESS, Telling each smith individually where his methods are lax, how he can better himself and his shop, increase his custom and make more money. Address postal to BILLY BUNTZ, Author, "Progressive Smith as a Business Man," Care AMERICAN BLACKSMITH, Buffalo, N. Y.

FOR SALE—A Compound for Mending Your Broken Castings. Cast iron and all other metals can be successfully brazed. Sample package one dollar. Large package and exclusive agency two dollars. All cash orders prepaid. For further particulars, address BIG FOUR BRAZING COMPANY, Seneca, Mo.

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Trade Literature and Notes.

THOSE desiring an engine of 15 horse-power or so will be interested in the circular recently issued by the Capitol Gas Engine Company, Indianapolis, Ind., illustrating and describing their 4-cycle Knikerbocker Gas and Gasoline Engines.

CRESCENT FORGE & SHOVEL CO., Havana, Il., forward us a four-page folder of their Cultivator Shovels, Moldboards, Plow Points, Subsoilers, Fin Cutters, and Cultivator Shovel and Plow Points, describing and illustrating different patterns of the same. Also a pamphlet of their Crescent Fitted, Bolted, Steel Plow Shares. Free upon request.

AMONG many circulars recently received is one from the Thompson Tuyere Iron Company, Indianapolis, Ind., illustrating and describing their Thompson Extension Fire Tuyere Iron for securing any size of fire from two up to fourteen inches in length. Also their Gem Fire Bed and their Improved Thompson Foot Power Vise with Steel Anvils.

P. HARVEY FLYNN, 83 Warren Street, New York City, is the manufacturer of the Kentucky Medicated Hoof Remedy, which is the subject of a circular recently received. His claim is that this remedy will prevent, as well as cure, brittle hoofs, corns, quarter or center cracks, split hoofs, etc., as well as relieving dry, sore, or contracted feet. The remedy is antiseptic and disinfecting.

A VERY NEAT CATALOGUE from the Peerless Motor Company, of Lansing, Mich., shows in an attractive manner the various steps and tools used in the construction of the "Noiseless" Gas and Gasoline Engine manufactured by this firm. The catalogue is handsomely illustrated and will be sent free upon application to any address.

AMONG THE MANY interesting engine catalogues which have come to this office, that of the New Era Gas Engine Company, Dayton, Ohio, is notable. This company is building engines from two horsepower up to 125 horsepower, operating on gas, gasoline, kerosene, distillate, and liquid fluids. Catalogue will be forwarded upon request to any address.

A WAR MAP of Japan, Corea and Manchuria in colors and on a sheet 30 by 38 has recently been issued by John L. Smith, 20 South 6th Street, Philadelphia. The map embraces a large stretch of territory surrounding the seat of war in the Far East, and may be had from the publisher prepaid for twenty-five cents.

A NOVELTY in the form of a pen is being placed on the market by Mr. R. T. Gillespie, Rochester, Pa. It is termed a reservoir pen and by means of a simple attachment will carry enough ink from one dipping to write, as is claimed, three pages of note paper. The price is 25c.

THE "PATTERSON" EMERY GRINDER which carries 10x1½ inch Emery wheels, fitted with a flanged pulley, is shown on this page. Beside it stands a very clever attachment which can be used either with this or any other make of grinding machine. This attachment is fastened to the floor by two lag screws, an endless polishing belt (shown curled up on the floor) running over the two flanged pulleys, which are 7 inches in diameter and capable of carrying belt 3 inches or less in width. A simple and durable arrangement is provided for tightening and loosening the belt.

The stud on which the flanged pulley revolves is drilled with holes at right angles to each other, the end tapped out to receive a compression grease cup as shown in the cut. This device insures perfect, clean and economical lubrication. The two pulleys and the attachment weigh 105 pounds. The horizontal adjustment is 7 inches. This device is manufactured by the Miami Valley Machine Tool Company, Dayton, Ohio, from whom further particulars may be had.

TWO circulars have just come to hand from the American Well Works, of Aurora, Ill., illustrating and describing their forms of portable well drilling machinery. This firm make a complete line of such tools and their catalogue may be obtained free upon request.

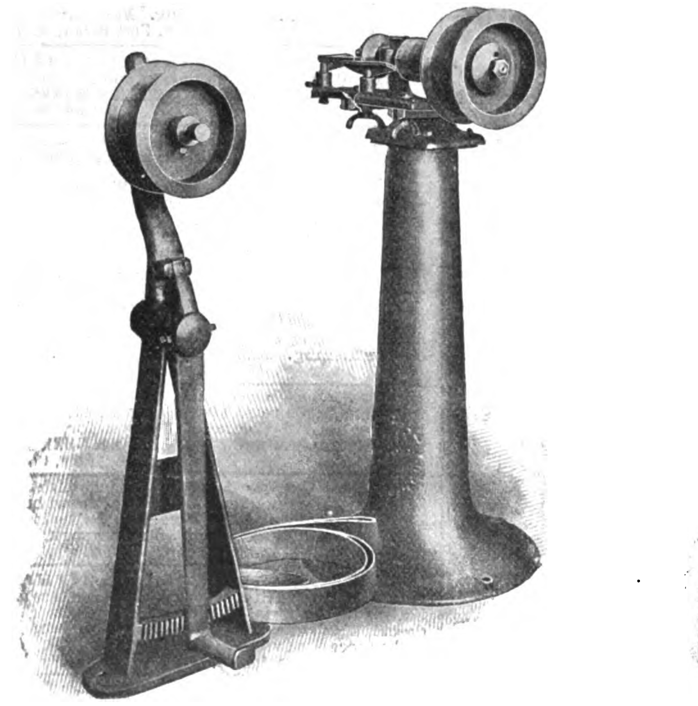
A HANDSOME CATALOGUE comes from the Remy Electric Company, Anderson, Ind., attractively illustrating and describing their Ignition Apparatus for gas and gasoline engines. The catalogue will be of interest to all engine users and will be forwarded upon application to the makers.

CHICAGO WHEEL & Manufacturing Company, 42 W. Randolph Street, Chicago, Ill., forward their descriptive catalogue of Standard Canvas Cloth Polishing Wheels for plow, machine, implement and general polishing purposes. Illustrations, descriptions and prices are given. This folder will be forwarded free upon request.

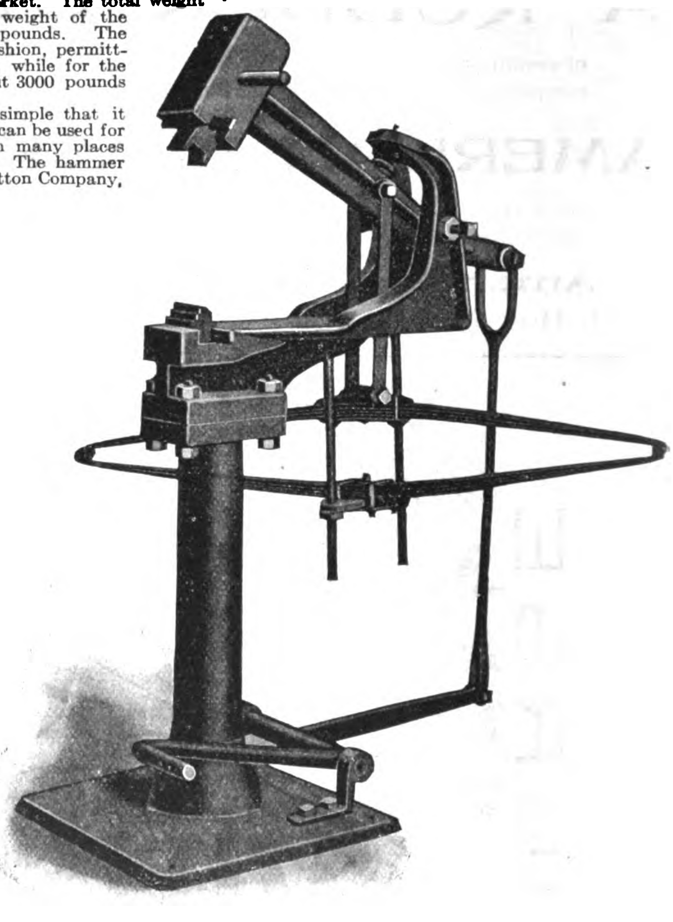
CATALOGUE No. 19, Weber Gas & Gasoline Engine Company, P. O. Box V1114, Kansas City, Mo., is devoted to a description of the construction and operation and economies of the George J. Weber Suction Charcoal Gas Producer. With this apparatus charcoal, coke, anthracite coal, peat, tan bark, saw dust, etc., may be used for producing gas for driving a gas engine. Using good charcoal, the cost of maintaining one horsepower twenty-four hours is given at six cents. These producers are manufactured in from five to 300 horsepower units.

A NEW POWER HAMMER.—The accompanying engraving shows a foot power hammer recently put upon the market. The total weight is about 400 pounds, the weight of the hammer proper about 50 pounds. The elliptic spring acts as a cushion, permitting a light, elastic blow, while for the other hand a blow of about 3000 pounds can be struck with it.

The construction is so simple that it needs no description. It can be used for forging or forming and in many places does away with a helper. The hammer is made by The C. E. Sutton Company, Toledo, O., whose advertisement appears in this issue, page XII.



PATTERSON EMERY GRINDER WITH POLISHING BELT ATTACHMENT.



A NEW FORM OF FOOT-POWER HAMMER.

AN INTERESTING FOLDER in two colors is being issued by the Little Giant Punch and Shear Company, of Sparta, Ill., describing the Little Giant Combined Punch and Shear, which they build in three sizes, for hand power, to serve the purposes of blacksmiths, wagon builders, machine shops and metal workers. Free on application.

ROCHESTER SPECIALTY MANUFACTURING CO., Rochester, N. Y., are issuing a pamphlet illustrating and describing the working of their new Common Sense Paint and Varnish Strainer, which is described as filling a long-felt want in paint and varnish rooms; a good way to effect considerable saving in all painting operations. This folder will be sent free on request to any one interested.

TWO CIRCULARS recently issued by the Benedict Manufacturing Company, Delaware, Iowa, describe the advantages of their shoeing racks, and gives numerous testimonials from users of the same. These circulars will be interesting to any one contemplating the purchase of a horse rack, and will be sent free upon request.

McGOVERN TIRE SETTER CO., Cincinnati, O., send us the following letter from an Ohio buggy manufacturer, referring to their tire machines:

GENTLEMEN:—

Referring to your machine, which we have had in use in our factory for the past three years, will say that while the grade of work which we turn out made us very skeptical about adopting a tire setting machine, your machine was the only one that came to our notice that would at all interest us.

Now, since we have had it in use, we can scarcely understand how we ever got along without the use of the McGovern Tire Setting Machine. We find it saves us much time and labor and it certainly improves the uniformity of the dish of our wheels. We use it for either channel, cushion or plain tire setting and we regard it as one of the most profitable machines in our factory.

Wishing you the abundant success that your invention certainly merits, we beg to remain,

THE KAUFFMAN BUGGY CO.,
Miamisburg, Ohio.

A RECENT FOLDER issued by the Buffalo Forge Company, of Buffalo, N. Y., deals with two new types of geared hand blowers,—their No. 100 Blower, the latest and best machine, and their No. 99 Geared Hand Blower. These machines are described as being high power blowers for the blacksmith, embodying the latest improvements in machines of this kind. Other interesting forms of portable forges are shown in this folder, which will be mailed to anyone upon receipt of request.

TWO extremely handsome catalogues have just been received from the Arcade Mfg. Co., Freeport, Ill. The larger contains 139 pages with a complete index, listing and describing their large variety of wares. Fine, light gray iron castings are specialized. The smaller booklet is of strikingly neat design and contains a full list of the small wares manufactured by the company.

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NICHOLSON FILE COMPANY

NICHOLSON.

PROVIDENCE, R. I., U. S. A.,

MANUFACTURERS OF

THE K&F TRADE MARK

FILES AND RASPS

Blacksmiths Recommend our Rasps.

BECAUSE

Their Wearing Qualities Have Been Proven.

IT SAVES FIGURING

You will not have to stop to figure out this or that dimension on a piece of work if you have a copy of

FODEN'S MECHANICAL TABLES

This book gives Circumferences of Circles by eighth inches up to twenty feet, Weight of Rectangular Iron, Round and Square Bar Iron, Angle and Sheet Iron, and other miscellaneous tables. CLOTH BOUND. Sent to any part of the world postage prepaid.

Price, 50 cents

American Blacksmith Company

Drawer 974 *Buffalo, N. Y.*

THE FOWLER NAIL COMPANY, SOLE MANUFACTURERS, SEYMOUR, CONNECTICUT.

Prices Current—Blacksmith Supplies.

The following quotations are from dealers' stock, Buffalo, N. Y., July 23, 1904, and are subject to change. No variations have taken place since last month's quotations.

All prices, except on the bolts, are per hundred pounds. On bars and flats prices are in bundle lots.

Bars—Common Iron and Soft Steel.

1/4 in.,	round or square;	Iron, $2.30;	Steel, $2.30
3/8 in.,	" "	" 2.40	" 2.40
1/2 in.,	" "	" 2.20	" 2.20

Flats—Bar and Band.

1/4 x 1 in.,	Iron $2.20;	Steel $2.20
1/4 x 1½ in.,	" 2.10;	" 2.10
5-16 x 1½ in.,	" 2.30;	" 2.30

Norway and Swedish Iron.

1/4 in., round or square	$4.90
3/8 in., " "	4.50
1/2 in., " "	4.30
1/4 x 1 in.	4.30
1/4 x 1½ in	4.20

Horseshoe Iron.

For No. 1 shoe, 3/8 x 1/2 in	$3.30
For No. 2 shoe, 1/2 x 5/8 in	2.90
For No. 3 shoe, 5/8 x 3/4 in	2.30
For No. 4 shoe, 5/8 x 7/8 in	2.30

Toe Calk Steel.

1/2 x 3/8 in. and larger $3.00

Spring Steel.

5/8 to 1½ in. Rounds.	Op. Hearth $3.00,	Crucible $5.00
1¼ to 6 in. by No. 4 gauge to 1/2 in. Flats	" 3.00,	" 5.00

Carriage Bolts. (Net Price per Hundred).

1/4 x 2 in.	$0.54	3/8 x 2½ in.	$0.82
1/4 x 2½ in.	.58	3/8 x 3½ in.	.96
1/4 x 3 in.	.62	3/8 x 6 in.	1.31
5-16 x 2 in.	.65	1/2 x 4 in.	1.70
5-16 x 3 in.	.75	1/2 x 6 in.	2.10

PADDOCK-HAWLEY IRON CO.

Iron, Steel, Carriage and Heavy Hardware, Trimmings and Wood Material. . . . .

ST. LOUIS, MO.

CUMMINGS & EMERSON

Blacksmith and Wagon Makers' Supplies,

PEORIA, ILL

WANTED AND FOR SALE.

Want and for sale advertisements, situations and help wanted, twenty-five cents a line. Send cash with order. No charge less than fifty cents.

KEROSENE ENGINES—are safe and reliable. WALLACE COMPANY, Toledo, O.

POWER TIRE SETTER FOR SALE.—$550.00. Will set tires up to 1x5 and 60 in. diam. Address, GREAT LAKES ENGINEERING WORKS, Detroit, Mich.

FOR SALE.—Blacksmith shop at Waupaca. Selling on account of old age. For further information address, JACOB NELSON, Waupaca, Wis.

FOR SALE—Old established blacksmith business in 20 x 40 shop or will rent to right man and put in an engine. Work for two, and high prices. E. H. JONES, Stratton, Neb.

FOR SALE—House, four lots, well-improved Blacksmith Shop and tools, doing a good business. Reason for selling, poor health. $1,000 for all, $600 without tools. A. BRUTON, Hill City, Kan.

FOR SALE—Blacksmith and wagon shop, located in the best irrigated part of Colorado. Good location. Business $4,000 to $5,000 per year. Correspondence solicited. L. BENGE, Sterling, Colo.

FOR SALE—A good paying Blacksmith and Woodworking Shop including business and building. Also carrying farm machinery. Good wide-awake town and plenty of work. For particulars address, BOX 311, Lemoore, Cal.

I CAN SELL YOUR BLACKSMITHING BUSINESS (with or without real estate) no matter where it is or what it is worth. Send description, state price, and learn my wonderfully successful plan. W. M. OSTRANDER, 109 North American Bldg., Philadelphia.

BLACKSMITHS—be master mechanics by using Toy's Treatise on New Steels, with 75 modern methods of forging and welding. All difficult jobs made easy. Make your welding compound—every heat a solid weld. Thermite welding explained, also scientific tempering with colored charts, all for $1.00. Valuable samples free. Forty years an expert. W. M. TOY, Sidney, Ohio.

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Trade Literature and Notes.

SPECIAL ATTENTION is directed to the advertisement on the rear cover, Cray Brothers, Cleveland, advising that the prices are such as should in themselves command notice from the trade.

EXCEPTIONALLY attractive is the little folder of the Canedy–Otto Manufacturing Co., Chicago Heights, Ill., Price List No. 7. It catalogues their large and complete line of Forges, blowers and drills.

A UNIQUE FOLDER from the Chicago Flexible Shaft Co., LaSalle & Ontario Sts., Chicago, Ill., testifies in a striking way of the advantages of their Stewart Gas Blast Furnaces for tool making and other heating purposes.

HAY-BUDDEN MANUFACTURING CO., Brooklyn, N.Y., makers of the well-known Hay-Budden Anvils, inform us that the State University of Nebraska have placed a second order for their anvils, making a total of fifty of them in use there.

LAMBERT Gas and Gasoline Engine Company, Columbus Ave., Anderson, Ind., have issued a new catalogue of pleasing design, listing their line of gas engines. Many pithy hints are given herein as to the general care and capabilities of the gas engine, which will be found useful to any one running an engine.

CATALOGUE "G" of the Lennox Machine Co., Marshalltown, Iowa, is well worth the consideration of the gas engine user or prospective buyer. Corn shellers, wood sawing apparatus, and several other contrivances useful to the smith who is desirous of turning his power into side lines, are among the specialties listed.

FOOS GAS ENGINE CO., Springfield, Ohio have just issued a neat four-page pamphlet, giving 98 points of advantage to be found in the Foos Engine as manufactured by them. This descriptive pamphlet is unique in its way, explicitly describing the engine in all its parts from A to Z. It will be mailed free upon request.

STRIKINGLY HANDSOME is the well-printed and profusely illustrated 32-page catalogue just received from the Motsinger Device Manufacturing Company, Pendleton, Ind., relating to their Auto-Sparker for gas engine igniting purposes. This catalogue contains much of interest to all engine users and will be forwarded free upon request.

THE COLUMBUS MACHINE CO. of Columbus, Ohio, have opened an office in Cincinnati, Ohio, at No. 227 West 5th Street. They will carry a stock of engines at this point, and the office will be in charge of Mr. F. Van Dusen, who will be pleased to receive his old customers and friends, and any prospective buyers of gas engines, as he will have engines in operation to show the merits of the Columbus.

CHAMPION TOOL CO., Conneaut Lake, Pa., forward folders illustrating new tools recently added to their line, among which may be mentioned an assortment of hot and cold chisels, hardies, straight lipped blacksmith's tongs, bolt tongs, gad tongs, carpenters' pincers, blacksmiths' hand hammers, plow hammers. These circulars with complete catalogue will be forwarded upon request to the above company.

A FANCIFUL COVER contains the new booklet of the West Tire Setter Co., Rochester, N.Y. Within will be found much interesting matter about the West tire setter, with a full-page engraving of the portrait of Mr. Jonathan B. West the original inventor of the cold tire setting machine. Eleven and a half pages of names of people who use the West machines are appended.

"TWENTY-FIVE DOLLARS a-Day Saved" is the headline on the cover of a little square red book just issued by Buob and Scheu, Cincinnati, Ohio, and just beneath is a curtain-like opening with the words "Articles of Merit" upon it. This booklet will be found very useful to the carriage repair man.

A larger catalogue from the same firm gives complete lists and descriptions of their carriage wares.

TWO HANDSOME BOOKLETS have come to this office for review, entitled, "Buffalo Disk Wheels" and "Buffalo Improved Ventilator." The former deals with fans of the disk wheel type for ventilating and air moving purposes, the latter with different styles of sheets. Metal ventilators for buildings, chimneys, and flues of all kinds. They are unusually fine catalogues. Free on request to the Buffalo Forge Company, Buffalo.

NOTICE has been given that the partnership heretofore existing under the firm name of "The Koch Manufacturing Co." has been dissolved by mutual consent. A. A. Koch retires from the business. The business will be continued under the firm name of "Grinnell Manufacturing Co." a partnership consisting of H. W. Spaulding, J. C. Goodrich and John W. Fitzgerald. All obligations in favor of the old firm are the property of and payable to the new firm and the new firm assumes all obligations of the old.

THOMPSON'S EXTENSION FIRE TUYERE IRON, manufactured by the Thompson Tuyere Iron Co., 2209 M. N. Jersey St., Indianapolis, Ind., is described in a recent circular issued by that company, which will be sent to any address free upon request. By means of this tuyere, the company states, an intense, even heat of any length from two to fourteen inches can be obtained at will with proportionally less consumption of coal. The grate is kept cool and a greater amount of work may be done with it. An 18-inch mould may be heated without moving it along in the fire. Eight shoes may be heated for calking at one time or a full set of harrow teeth. A 3 by ¾-inch wagon tire may be heated for setting as easily as a buggy tire. These are some of the advantages claimed for this special tuyere.

J. H. ATWATER, Chattanooga, Tenn., and H. Atwater, Vacaville, Cal. manufacturers of the H. Atwater Tire Puller, send us the two following testimonials from users of their machine.

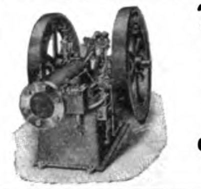
T. I. Wilson, Chattanooga, Tenn., says: "I never had a machine for the money that has been so useful as the H. Atwater Tire Puller. We could not do without it and it is with a very great pleasure that I recommend this tool to every blacksmith doing even a small amount of Tire Setting."

The Chattanooga Buggy Co., Chattanooga, Tenn.: "We find the H. Atwater Tire Puller one of the most convenient tools in our shop. We would not be without it for five times its cost."

Once Used, Always Wanted—

A Hardening Compound for steel, but especially for plow lays. Will neither warp nor crack them, making them hard as glass and still tough. Guaranteed or money refunded. Price **$3.50** per box. Enough for 48 gallons of water.

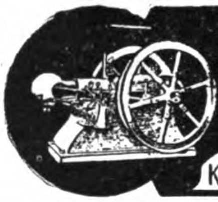
J. M. PRAZAK, Evansville, Minn.



THE DICKINSON

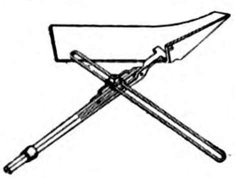
Will do everything that any other engine will do, and will do things that no other engine will. We'll tell you the secret if you write us.

CENTRAL MACHINE & TOOL CO., Ltd.
Battle Creek, Mich.



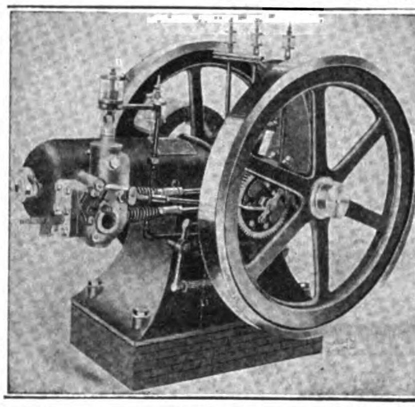
LIGHTNING GASOLINE ENGINE

NEW AND IMPROVED FEATURES SAVING EXPENSE
INCREASING POWER ALL SIZES WRITE FOR CATALOGUE
KANSAS CITY HAY PRESS CO 482 MILL ST KANSAS CITY MO.



HOLDS THE SHARE RIGID So that it cannot warp or spring out of shape while being sharpened. There is nothing like **Graves' Plow Tong** on the market. Weight always balanced. Does away entirely with all the strain caused by a single tong. Adjustable and reversible for all sizes and shapes of shares, rights or lefts. Address

O. B. GRAVES, 310 E. 11th St., Coffeeville, Kansas.



Model Gas and Gasoline Engines

Water or Oil Cooled

The most economical and simplest engine on the market. No cylinder head packing to blow out, and with our automatic sensitive governor, absolute regularity of speed. Stationary, Portable, Horizontal, Vertical Hoists, Pumping and Marine. Send for Catalogue No. 11.

We build the best launch engine of 3 and 6 H. P., with Reversible Bronze Propeller Wheel and Ideal Muffler.

If interested, send for circular.

CENTRAL CITY IRON WORKS
STEVENS POINT, WIS.

"R. Mushet's Special Steel"

The Original Air-Hardening Steel

and STILL UNAPPROACHABLE in general excellence.

Thirty Years' Experience in Engineering Works in all parts of the World has proved Beyond all Doubt that this Steel is in every respect

THE BEST TOOL STEEL

YET MANUFACTURED

Uniformity of Quality in Every Bar. A Great Saving in Steel, Time and Wages, and Easy to Work. There are no difficulties to contend with in forging R. Mushet's Special Steel into tools and no loss in reheating. The best all-round Steel.

R. Mushet's HIGH-SPEED Steel.

If a fast-cutting steel is required, this is the best and most reliable of this grade. It will do more work than any other known steel, and every bar is uniform and free of the "Cracking" so generally a feature in steels of this grade.

The "R. Mushet's" Steels are manufactured only by **SAMUEL OSBORN & CO,** Clyde Steel & Iron Works. Sheffield, England.

Sole Representatives in the United States, Canada and Mexico:

B. M. JONES & CO.

159 Devonshire St., BOSTON. 143 Liberty St., NEW YORK.

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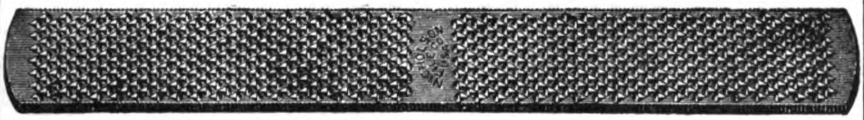
NICHOLSON FILE COMPANY

NICHOLSON.

PROVIDENCE, R. I., U. S. A.,

MANUFACTURERS OF

THE K&F TRADE MARK.



FILES AND RASPS

Blacksmiths Recommend our Rasps.

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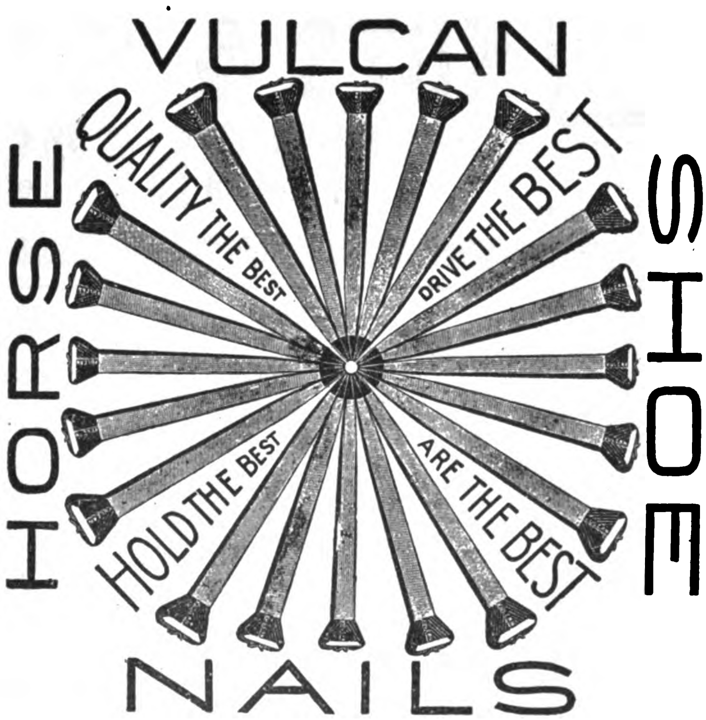
FODEN'S MECHANICAL TABLES

This book gives Circumferences of Circles by eighth inches up to twenty feet, Weight of Rectangular Iron, Round and Square Bar Iron, Angle and Sheet Iron, and other miscellaneous tables. CLOTH BOUND. Sent to any part of the world postage prepaid.

Price, 50 cents

American Blacksmith Company

Drawer 974 *Buffalo, N. Y.*



THE FOWLER NAIL COMPANY, SOLE MANUFACTURERS, SEYMOUR, CONNECTICUT.

Prices Current — Blacksmith Supplies.

The following quotations are from dealers' stock, Buffalo, N. Y., Aug. 22, 1904, and are subject to change. No variations have taken place since last month's quotations.

All prices, except on the bolts, are per hundred pounds. On bars and flats prices are in bundle lots.

Bars—Common Iron and Soft Steel.

¼ in., round or square;	Iron, $2.80;	Steel, $2.80
⅜ in., " "	" 2.40	" 2.40
½ in., " "	" 2.20	" 2.20

Flats—Bar and Band.

¼ x 1 in.,	Iron $2.20;	Steel $2.20
¼ x 1¼ in.,	" 2.10;	" 2.10
3-16 x 1½ in.,	" 2.80;	" 2.80

Norway and Swedish Iron.

¼ in., round or square	$4.90
⅜ in., " "	4.50
½ in., " "	4.30
¼ x 1 in.	4.30
¼ x 1½ in	4.20

Horseshoe Iron.

For No. 1 shoe, ⅜ x ½ in	$3.30
For No. 2 shoe, ½ x ⅝ in	2.90
For No. 3 shoe, ⅝ x ¾ in	2.80
For No. 4 shoe, ⅝ x ⅞ in	2.80

Toe Calk Steel.

½ x ⅜ in. and larger	$3.00

Spring Steel.

⅝ to 1½ in. Rounds.	Op. Hearth $3.00,	Crucible $5.00
1¼ to 6 in. by No. 4 gauge to ½ in. Flats	" 3.00,	" 5.00

Carriage Bolts. (Net Price per Hundred).

¼ x 2 in	$0.54	⅜ x 2½ in	$0.82
¼ x 2½ in	.58	⅜ x 3½ in	.96
¼ x 3 in	.62	⅜ x 6 in	1.31
5-16 x 2 in	.65	½ x 4 in	1.70
5-16 x 3 in	.75	½ x 6 in	2.10

PADDOCK-HAWLEY IRON CO.

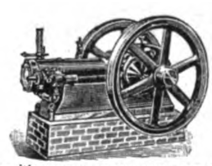
Iron, Steel, Carriage and Heavy Hardware, Trimmings and Wood Material. . . . .

ST. LOUIS, MO.

CUMMINGS & EMERSON

Blacksmith and Wagon Makers' Supplies,

PEORIA, ILL



OUR gas or gasoline engines are just the thing to run your plant. *Highest efficiency, lowest cost of operating, 15 sizes, Vertical or Horizontal.* Lowest prices. Thousands in operation. Highest award at every exposition shown. We are positive we can save you money. Write us and we will be glad to send you proper catalogue and prices. Mention sizes you will need or the number of machines you wish to operate.

LAZIER GAS ENGINE CO.

Ellicott Square, Buffalo, N. Y.

WANTED AND FOR SALE.

Want and for sale advertisements, situations and help wanted, twenty-five cents a line. Send cash with order. No charge less than fifty cents.

FOR SALE—Blacksmith Shop and House. For further information, address A. SCHUMACHER, Manchester, Mo.

POWER TIRE SETTER FOR SALE.—$550.00. Will set tires up to 1x5 and 60 in. diam. Address, GREAT LAKES ENGINEERING WORKS, Detroit, Mich.

FOR SALE—A good paying Blacksmith and Woodworking Shop including business and building. Also carrying farm machinery. Good wide-awake town and plenty of work. For particulars address, BOX 311, Lemoore, Cal.

I CAN SELL YOUR BLACKSMITHING BUSINESS (with or without real estate) no matter where it is or what it is worth. Send description, state price, and learn my wonderfully successful plan. W. M. OSTRANDER, 109 North American Bldg., Philadelphia.

BLACKSMITHS—be master mechanics by using Toy's Treatise on New Steels, with 75 modern methods of forging and welding. All difficult jobs made easy. Make your welding compound—every heat a solid weld. Thermite welding explained, also scientific tempering with colored charts, all for $1.00. Valuable samples free. Forty years an anvil ringer. W. M. TOY, Sidney, Ohio.

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Directory of Gas Engine Manufacturers.

Giving Size and Type of Engines up to Twenty Horse-power.

Bates & Edmonds Motor Co., Lansing, Mich., 1½, 2½, 4, 6, 8, 10 HP., vertical, 4 cycle.

Bauer Machine Works Co., Kansas City, Mo., 1½, 3, 4½, 6, 8, 10, 12, 15 and 20 HP., horizontal, 4 cycle.

Beaver Manufacturing Co., Milwaukee, Wis., 2, 3, 5, 6 and 8 HP., vertical, 4 cycle.

Central City Iron Works, Stevens Point, Wis., 2 and 4 HP., vertical, and 2, 4, 6, 8, 10, 13, 16, 18 and 20 HP., horizontal, all 4 cycle.

Central Machine & Tool Co., Battle Creek, Mich., 2, 4, 5, 8, 12, 15, and 20 HP., horizontal, 4 cycle.

Chicago Water Motor & Fan Co., Chicago, Ill., 1 to 20 HP., horizontal.

Columbus Machine Co., Columbus, Ohio, 3 HP., vertical, 4, 6, 8, 10, 12, 15, 17 and 20 HP., horizontal, 4 cycle type.

Cushman Motor Co., Lincoln, Neb., 1½, 3 and 6 HP., all horizontal, 2 cycle type.

C. H. A. Dissinger & Brother, Wrightsville, Pa., 2½, 3, 4, 6, 8, 10, 12, 14, 16 and 20 HP., horizontal, 4 cycle.

Fairbanks, Morse & Co., Chicago, Ill., 2, 3, 4, 6, 9 and 12 HP., vertical; 5, 8, 10, 12, 15 and 20, horizontal, all 4 cycle.

Gemmer Engine Co., Marion, Ind., 1½, 3, 4, 6, 8, 12, 16 and 20 HP., horizontal, 4 cycle.

Howe Scale Agency, Chicago, Ill., 2, 3, 5 to 20 HP., all horizontal, 4 cycle.

Kansas City Hay Press Co., Kansas City, Mo., 4, 5, 6, 8, 10, 12, 15 and 18 HP., horizontal, 4 cycle.

C. P. & J. Lauson, Milwaukee, Wis., 2, 2½ and 4 HP., vertical; 4½, 6, 8, 12, 15, and 20 HP., horizontal, 4 cycle.

Lazier Gas Engine Co., Buffalo, N. Y., 3½ light, 3½ heavy, 7 and 18 HP., vertical; 2½, 5, 7½, 10 and 15 HP., horizontal, all 4 cycle.

Lennox Machine Co., Marshalltown, Iowa., 2 and 3 HP., vertical; 4, 6, 8, 10, 13, 16 and 20 HP., horizontal, 4 cycle.

G. G. McLaughlin, Boston, Mass., 1½ to 20 HP., horizontal.

August Mietz, New York City, 1, 2, 4, 6, 8, 10, 15 and 20 HP., all horizontal, 2 cycle.

Milwaukee Machinery Co., Milwaukee, Wis., 2, 3½, 4½, 6, 8, 12, 14 and 16 HP., horizontal, 4 cycle.

Myrick Machine Co., Olean, N. Y., 2, 3, 4 and 5 HP., vertical; 5, 10, 12, 15 and 20 HP., horizontal.

National Engine Co., Rockford, Ill., 2 and 3 HP., vertical.

New Era Gas Engine Co., Dayton, Ohio, 1, 2½ and 4 HP., vertical; 4, 6, 8, 10, 12, 14, 16, 18, and 20 HP., horizontal, 4 cycle.

Otto Gas Engine Co., Philadelphia, Pa., 2 and 3½ HP., vertical; 3½, 5, 8, 12, 15 and 20 HP., horizontal, all 2 cycle.

Peerless Motor Co., Lansing, Mich., 3, 6, 8 and 12 HP., vertical, 4 cycle.

Temple Pump Co., Chicago, Ill., 2, 4, 6, 8, 10, 12 and 16 HP., two-cylinder.

Waterloo Motor Works, Waterloo, Iowa, 1½ and 3 HP., vertical, and 3½, 6, 9, 12 and 17 HP., horizontal, 4 cycle.

F. M. Watkins Manufacturing Co., Cincinnati, Ohio, 2, 3, 4, 6, 8, 12, 15 and 18 HP., all horizontal and 4 cycle type.

Weber Gas & Gasoline Engine Co., Kansas City, Mo., 2½, 5, 6, 8, 10, 12, 14, 16 and 18 HP., horizontal, 4 cycle.

Trade Literature and Notes.

THE THOMPSON FOOT POWER VISE with steel anvils for forming, sharpening and welding calks on horseshoes and for bending and shaping hot iron is claimed by the makers to be a great time-saver. Shoes can be made square or sharp for winter or summer use, and the dies are so shaped that the calks are better formed than in the ordinary way, and three times as many can be made in the same time. Write Thompson Tuyere Iron Company, 2209 N. N. Jersey St., Indianapolis, Ind., for further information.

BLACKSMITH DRILLS is the subject of an exceptionally attractive folder just issued by the Sidney Tool Company, Sidney, Ohio. This is a new firm and their advertisement appears on this page. They are manufacturing a complete line of hand and power drills for blacksmiths and wagon builders, some of which are illustrated and described in the folder. It will be sent free to any address.

A HANDSOME COVER in colors adorns the latest catalogue of the Electric Wheel Company, of Quincy, Ill. It is a book of 48 pages, containing many interesting illustrations. It is a catalogue and price list of steel wheels for anything on wheels, and handy wagons for anything that is hauled. This catalogue is a good illustration of how interesting such a publication as this can be made. The same can be had upon request to the manufacturers.

REMOVAL ANNOUNCEMENT.—The Champion Tool Company, of Conneaut Lake, Pa., have just announced their removal to Meadville, Pa., cor. Pine and South Main streets, where with their greatly enlarged factory facilities and improved shipping arrangements, they will be in better position than ever before to take care of their many customers. They state that in building and equipping their new building they have spared neither time nor money to make it complete in every detail, and that they now have one of the most complete factories in the world for the manufacture of Farriers' and Blacksmiths' tools.

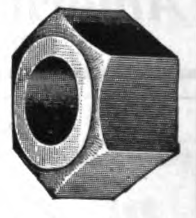
BADGER PUNCHES AND SHEARS.—The new machine shown in the advertisement of The Rock River Machine Company, of Janesville, Wis., on page xxvii, is only one of a large line which they manufacture. It has been their aim to place a tool on the market for general blacksmithing and repair shops which is powerful, convenient and at the same time very reasonable in price.

On this tool will be noticed the triple gear, where the lever bar operates, with which device, the makers state, ONE man can EASILY handle the machine up to its capacity, punching 5-8 x 1-2, shearing 4 x 5-8 flats, 10 x 1-4 band iron, 1-inch round iron. The machine weighs 800 pounds and they furnish three sets of punches and dies and lever bar. Catalogue and prices cheerfully furnished on application to the makers.

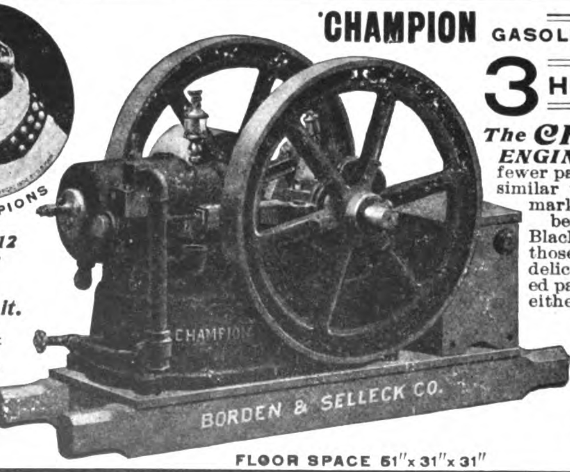
HEMPHILL'S
NEW
SHOEING STOCKS
The best
Stocks made. Neat and Strongly built.
Have shod horses weighing 2200 lbs.
Very quick to operate.
Easy for both man and horse
Frames turn either way to wall. No strain whatever on building.
Latest improvements.
No others have automatic felt-lined cuff.
Write me for descriptive circular and prices. Fully guaranteed.
M. L. HEMPHILL
Rensselaer, Ind.

YOU CAN DRIVE
THEM BY HAND OR POWER
For blacksmith, wagon building and repair shops, there is nothing equal to the
DEFIANCE DRILLS


They are simple.
They are built for service.
They have heavy solid bearings.
The automatic feed is new and efficient.
They have more fine points than can be described here.
Handsome Folder tells all about them.
FREE—SEND FOR IT.
THE SIDNEY TOOL CO.
SIDNEY, OHIO.



NUTS & WASHERS

CHAMPION GASOLINE ENGINE
3 H. P. ENGINE

Our Bulletin 12 gives a lot of information.
Write for it.
Shipping Weight 780 Lbs.
FULLY GUARANTEED
FLOOR SPACE 51″ x 31″ x 31″
The CHAMPION ENGINE is built with fewer parts than any other similar type now on the market. It is therefore better adapted for Blacksmith Shops than those engines of more delicate and complicated parts. Furnished either Water or *OIL COOLED.*
Borden & Selleck Co.,
51 and 53 Lake St.,
CHICAGO

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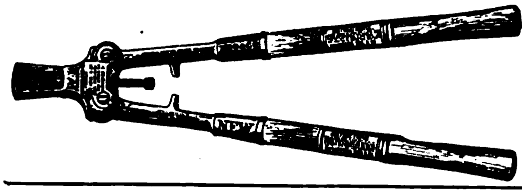
A Book for Practical Smiths

MODERN BLACKSMITHING, RATIONAL HORSESHOEING and WAGON MAKING. By J. G. Holmstrom.

WITH RULES, TABLES AND RECIPES.

A necessity for Blacksmiths, Horseshoers, Wagon-makers, Mechanics and Apprentices.

$1.00 POST-PAID. *American Blacksmith Company* P. O. DRAWER 974. BUFFALO, N. Y.



BOLT CLIPPERS.

CHAMBERS BROS. CO.,
N. FIFTY-SECOND STREET,
PHILADELPHIA, PA.

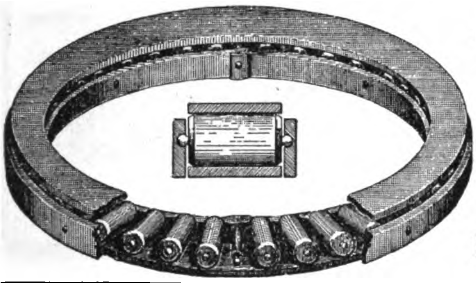
EACH ONE GUARANTEED.

The Merkhofer Electrical Works Co.

MANUFACTURERS OF AND DEALERS IN ELECTRICAL SUPPLIES.
GENERAL AGENTS FOR THE AMERICAN GAS ENGINE COMPANY.
. . . Manufacturers of . . .

GAS AND GASOLINE ENGINES

THE MERKHOFER ELECTRICAL WORKS CO.
104 E. Court Street, *CINCINNATI, OHIO.*

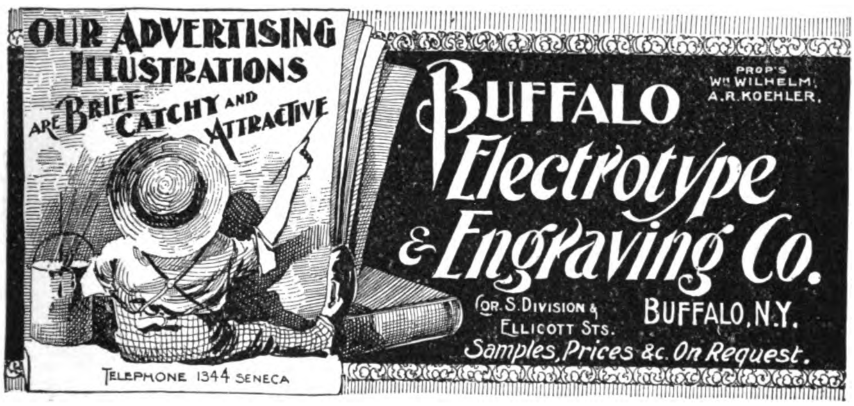


KING OF ALL
The Empire Roller Fifth Wheel.

Practical, Durable, Best, Cheapest. | The only one guaranteed to wear as long as the wagon.

GIVES SATISFACTION.
Catalogue and prices upon request.

Empire Roller Fifth Wheel Works,
QUINCY, ILL.



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THE HORSE WORLD

BUFFALO, N. Y.

Founded 1888. Every Friday $2.00 Per Year in advance.

ALL THE NEWS. Reliable reports of Horse Market. Thousands of Horsemen believe this to be the best horse paper published.

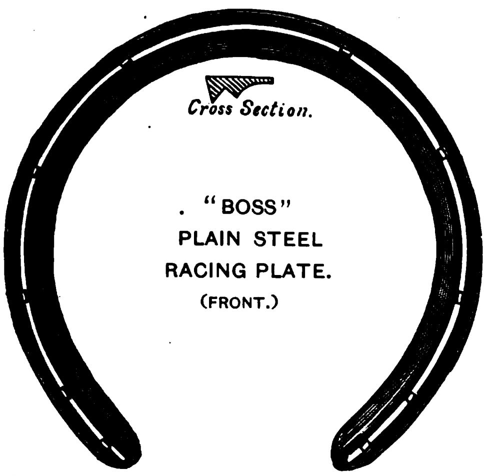
SAMPLE COPY FREE.

"The Australasian Coachbuilder & Wheelwright."

A Monthly Illustrated Technical Journal circulating amongst Coachbuilders, Wheelwrights and Blacksmiths throughout the Commonwealth of Australia, New Zealand and South Africa.

Advertising and subscription rates on application to

J. E. BISHOP & CO.,
65 MARKET STREET,
Sydney, Australia.



PRICE, PER SET, POST-PAID 75 CENTS.

SPECIALTIES
of the
BRYDEN HORSE SHOE COMPANY
CATASAUQUA, PA.,
are
Racing, Training and Trotting Plates, Racing Plate Steel in the bar, and B. & M. Ribbed Steel.

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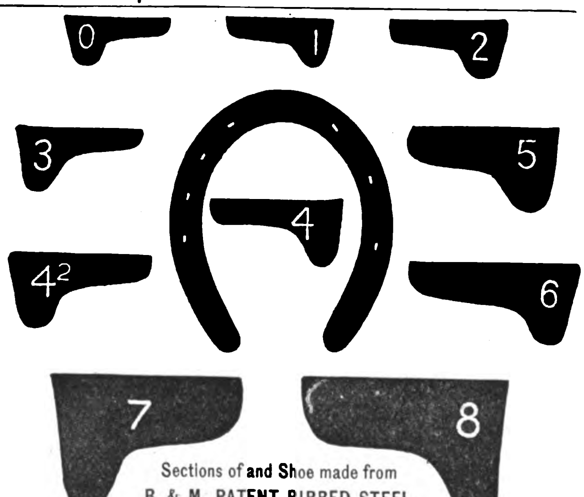

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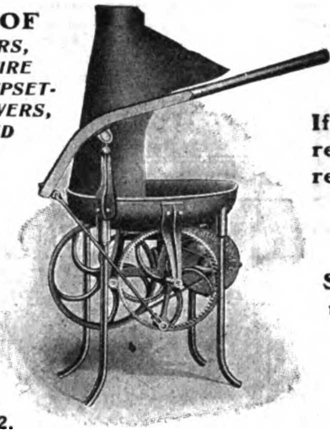
Buffalo Portable Forges

SIXTY TYPES AND SIZES FOR ALL REQUIREMENTS

Old Reliable Blacksmith Forge.

COMPLETE LINES OF
PUNCHES, SHEARS, BAR CUTTERS, TIRE BENDERS, TIRE UPSETTERS, HAND BLOWERS, POWER and HAND DRILLS.

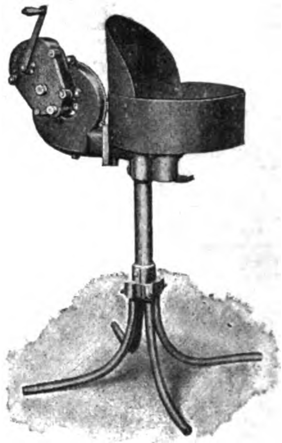
Write for Latest Catalogue
JUST OUT



No. 01 BLACKSMITH FORGE.

OUR GUARANTEE

The guarantee of the Buffalo Forge Company has always been, If any forge or blower is not as represented and perfectly satisfactory return AT OUR EXPENSE. That is why they have always been recognized as the Standard of the World.



No. 45 Blacksmith Outdoor Forge.

A WORD OF PRAISE

FAC-SIMILE OF LETTER RECEIVED

BUFFALO FORGE CO. Centertown, Ky., September 6, 1902.
BUFFALO, N. Y.

GENTLEMEN:

Please send me by mail one pinion, or small gear, No. 178, for Blacksmith Forge, No. 01. I have used the Forge nearly seventeen years.

Enclosed, forty-five cents.

Yours truly,
A. B. ROW.

ALL BUFFALO TOOLS AND FORGES GIVE THE SAME . . . SATISFACTION . . .

BUFFALO FORGE COMPANY

BUFFALO, N. Y.

Hay-Budden

Solid Wrought

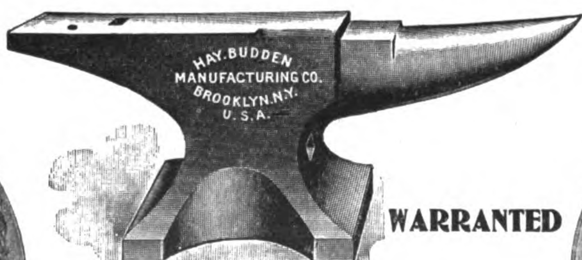
ANVILS

THE GOLD MEDAL ANVIL

HIGHEST AWARD

OMAHA, 1898 *PAN-AMERICAN, 1901*

OVER 70,000 IN USE. Experience has proved their worth and demonstrated that "Hay-Budden" Anvils are Superior in Quality, Form and Finish to any on the Market.



WARRANTED

PATTERNS—Regular Blacksmith, Farriers', Farriers' Clip Horn, Plow Makers', Double Horn, Saw Makers', Instrument Makers', Chain and Axe Makers', Etc., Etc., Etc.
Send for Descriptive Circular.

WEIGHTS FROM 10 TO 800 LBS.

Every Genuine "Hay-Budden" Anvil is made of the best *American Wrought Iron* and faced with best *Crucible Cast Steel.* Every Genuine "Hay-Budden" Anvil is made by the latest improved methods.

HAY-BUDDEN MFG. CO.

254-278 N. Henry St., Brooklyn, N. Y.

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VOLUME 2 — NUMBER 2

THE AMERICAN BLACKSMITH

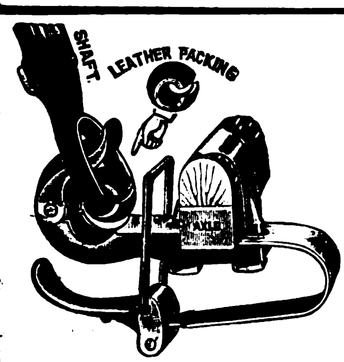
BUFFALO N.Y. U.S.A.

A PRACTICAL JOURNAL OF BLACKSMITHING

NOVEMBER 1902

$1.00 A YEAR
10¢ A COPY

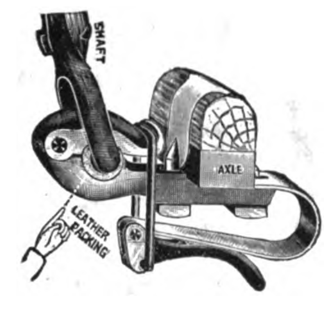
THE BRADLEY SHAFT COUPLING



OPEN

ALL STEEL
ALL RIGHT
ALL THE TIME

IT IS a thoroughly practical, quick shifting, ball bearing and absolutely noiseless Carriage Shaft Coupling, complete in itself, with no loose parts or pieces, and always ready.



CLOSED

ONE HAND Is the Only Tool Required to Operate It

IT AUTOMATICALLY takes up its own wear, and with it shafts and pole may be exchanged in 10 SECONDS. It is made entirely of STEEL, by skilled workmen, is amply strong and will outwear any vehicle to which it is attached.

IT HAS BEEN ON THE MARKET 10 YEARS, and there are over 500,000 Pairs of them in use and giving perfect satisfaction. They are made in four sizes to suit vehicles with axles from ¾ to 2¼ inches in diameter.

THE best carriage makers everywhere use and endorse them. Blacksmiths can make a good profit by attaching them to old or new vehicles. Sold by the leading jobbers in carriage goods throughout the country. We will be pleased to send you printed matter and prices on request.
"Quality and Advantages considered, the Bradley Shaft Couplings are the cheapest on the market."

C. C. BRADLEY & SON, SYRACUSE, N. Y.

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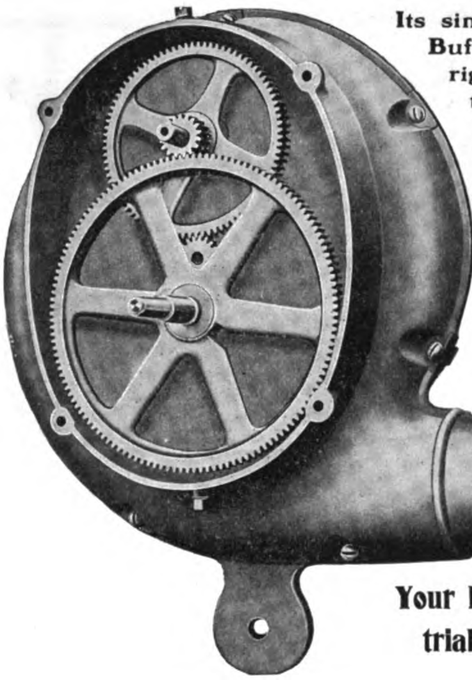
AMERICA'S BEST

Buffalo Geared Hand Blower

The Most Improved and Powerful Hand Blower Made



Its simplicity of design and durability of construction has made the Buffalo Blower a leader. The blower is supported on a rigid, cast iron standard, and so fastened as to allow the mouth of the blower to be turned to any angle of discharge.

OUR GUARANTEE

The Guarantee of the Buffalo Forge Company has always been: If any Blower or Forge is not as represented and perfectly satisfactory, return at our expense. That is why they have always been recognized as the standard of the world. . . . . . .

Your Dealer will send one on trial if desired—Ask him.

No Complicated Machinery to Get Out of Order

Don't be deceived by illuminated advertisements; ask any millwright or machinist about wear of spiral gears—we don't use them.

Buffalo Blowers are built with machine cut gears enclosed in a dust-proof frame. The frame is made perfectly tight so that the oil may be maintained at the bottom of the case. In this the largest of the gear wheels constantly revolves, throwing the oil thoroughly over the parts and affording ample lubrication to all bearing surfaces.

SIMPLE!
COMPACT!
DURABLE!
EFFICIENT!

Air Blast Strong and Uniform
—
Action Smooth
—
Operation Easy
—
No Lost Motion

WRITE FOR LATEST CATALOGUE JUST OUT.

BUFFALO FORGE COMPANY

BUFFALO, N. Y.

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VOLUME 2 NUMBER 3

THE AMERICAN BLACKSMITH

BUFFALO N.Y. U.S.A.

A PRACTICAL JOURNAL OF BLACKSMITHING

DECEMBER, 1902

$1.00 A YEAR
10¢ A COPY

Weber Gas and Gasoline Engines

Built Right! Look Right!

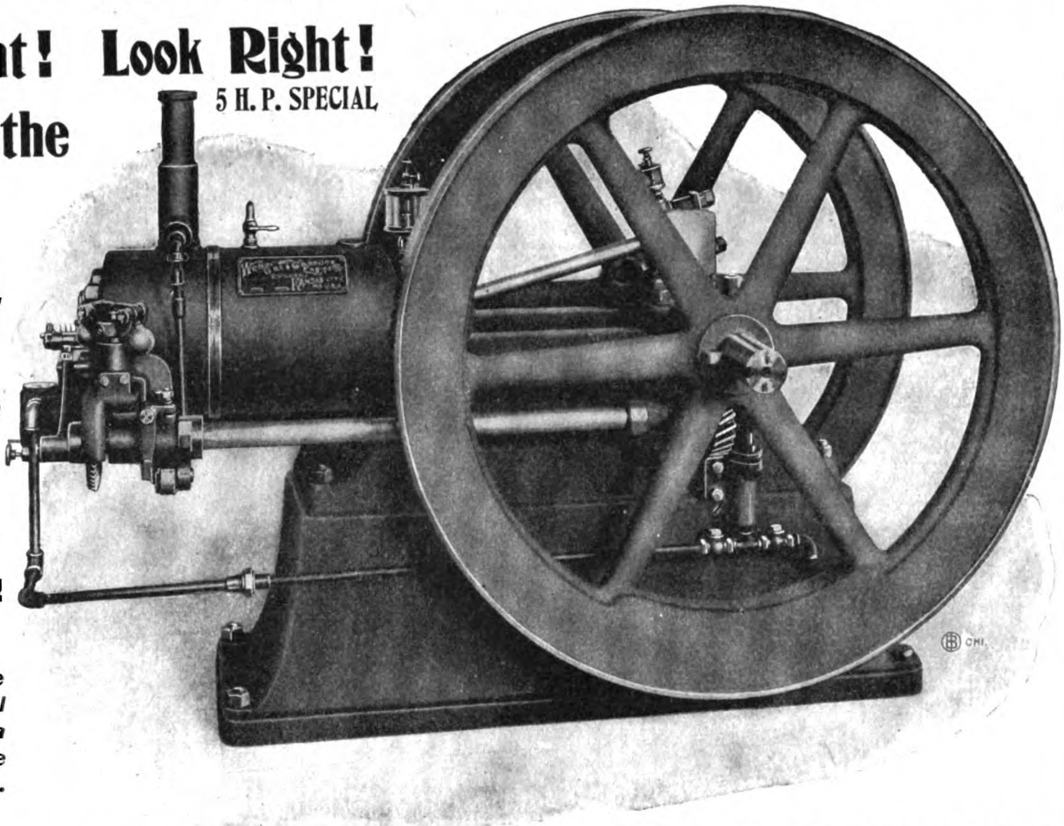
Right All the Time!

It's the real thing to make a shop a payer.

VERY SIMPLE! VERY GOOD!

Requires but little attention and small space. It will last a lifetime with a little care . . . . . .

5 H. P. SPECIAL

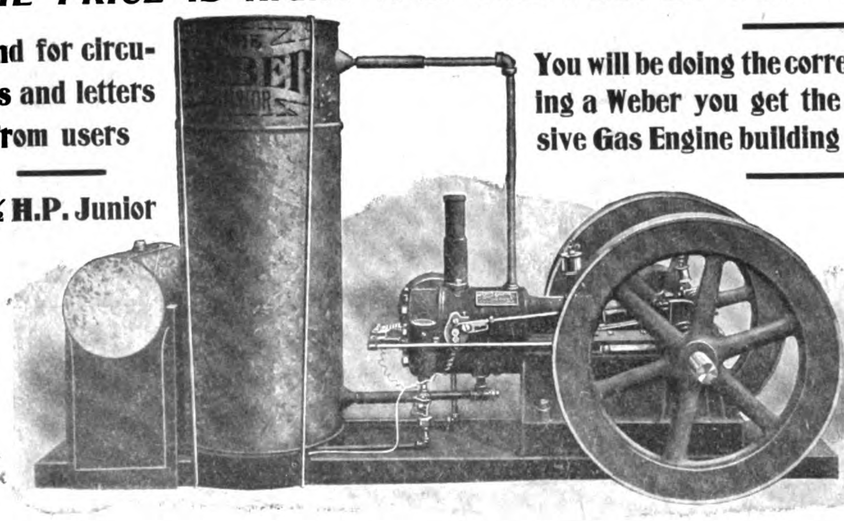


THE PRICE IS RIGHT AND THE PEOPLE WHO BUILD IT ARE RIGHT.

Send for circulars and letters from users

You will be doing the correct thing to put in one and in buying a Weber you get the benefit of our 17 years' exclusive Gas Engine building; that's worth your looking into.

2½ H.P. Junior



ADDRESS—

Weber Gas AND GASOLINE Engine Co.
Kansas City, Mo.

P. O. BOX, V 1114.

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CONTENTS.

Hand Forged Butcher Knives

Ground, Tempered and all ready for the handles, either round or riveted, for ***15 cents each*** or ***$1.50 a dozen.*** All sizes from 5-inch to 8-inch. These Blades are made from Sanderson Steel and ***warranted.*** Will replace any imperfect knife with two new ones. Handles all ready to put on, ***one cent each.*** . . . .

Try a sample. ***Hundreds of 'Smiths are using these blades and make money and friends selling them. Liberal discount in quantities. Address***

WOODWORTH KNIFE WORKS, - NUNDA, N. Y.

ESTABLISHED IN 1876.

THE

"Sure Step" Horse Shoe

THE ONLY RUBBER HORSE SHOE THAT CAN BE FITTED HOT

Consists of an iron body provided with a rubber tread. Prevents stumbling, slipping and interfering.

HOW TO FIT THE SHOE Take out rubber, heat shoe to a dull cherry red, shape to hoof. Then allow shoe to cool slowly. Replace rubber, clinch well all around inside of shoe, also two pegs at toe. This shoe can also be shaped cold, as metal will give to widen or narrow same. Run in Regular Sizes, 1 to 7.

GET OUR PRICES

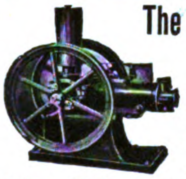
THE MOST REASONABLE, AS WELL AS MOST DURABLE RUBBER SHOE ON THE MARKET

MANUFACTURED BY

THE HAHN MANUFACTURING CO.

Be Sure and Send for Free Illustrated Circular

360-362 GRAND ST. . . . NEW YORK



The Mietz & Weiss Engine

GAS OR KEROSENE

Safe, Simple, Economical, Automatic, Direct Coupled or Belted to Generator; for all Power Purposes. 1 to 60 Horse Power.

Highest Award for Direct Coupled Engine and Generator, Paris Exposition, 1900. Gold Medal, Pan-American Exposition, 1901. Gold Medal, Charleston, S. C. Exposition, 1902.

Send for catalogue.

A. MIETZ, 128-138 Mott St., New York.

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THAT EVERY HORSEMAN SHOULD HAVE

Ed. Geers' Experience with the Trotters and Pacers

Bound in Fine Cloth; 146 Pages. Price $2.00, Postpaid.

Em. Pierce's Poems of the Turf

Elegant Binding. Just the Book for a Christmas Present. Price $2.00, Postpaid.

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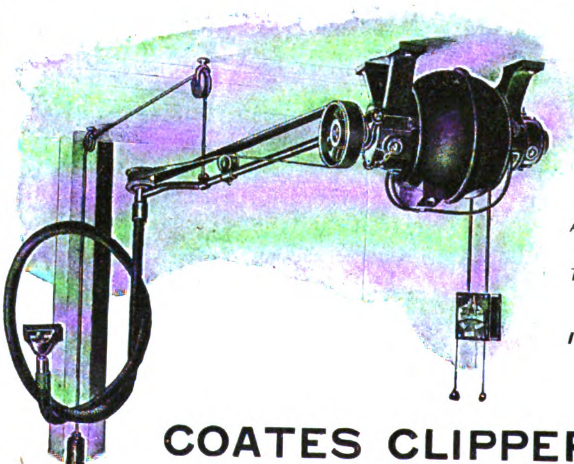
By Mail or Express, Prepaid.

THE HORSE WORLD

BUFFALO, N. Y.

COATES CLIPPERS



Clip Your Horses
Groom Your Horses
Drill Holes

in handy or unhandy places QUICK

All with the same machine.

A machine that can be used every day in the year.

The new head throws six teeth; all other heads throw only two or three teeth.

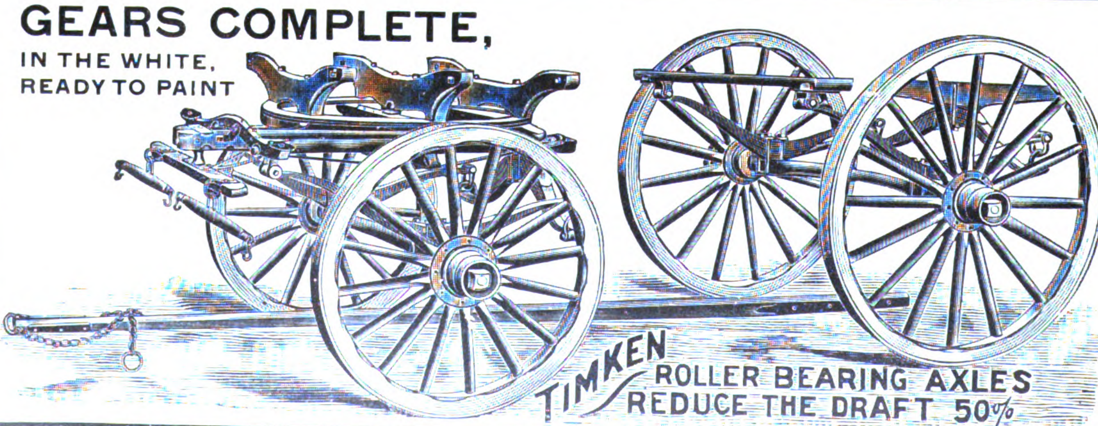
It works easier, clips twice as fast.

Send for Catalogue A. J.

COATES CLIPPER MFG. CO.
WORCESTER, MASS.

GEARS COMPLETE,

IN THE WHITE,
READY TO PAINT



FOR LIGHT AND HEAVY

Delivery Wagons

ALSO FOR

Ice, Brewery and Transfer Wagons

THE SELLE GEAR CO.,

SOUTH HIGH ST.

AKRON, OHIO.

In writing for prices give full specifications and description of what is wanted, so as to enable us to make prompt quotations.

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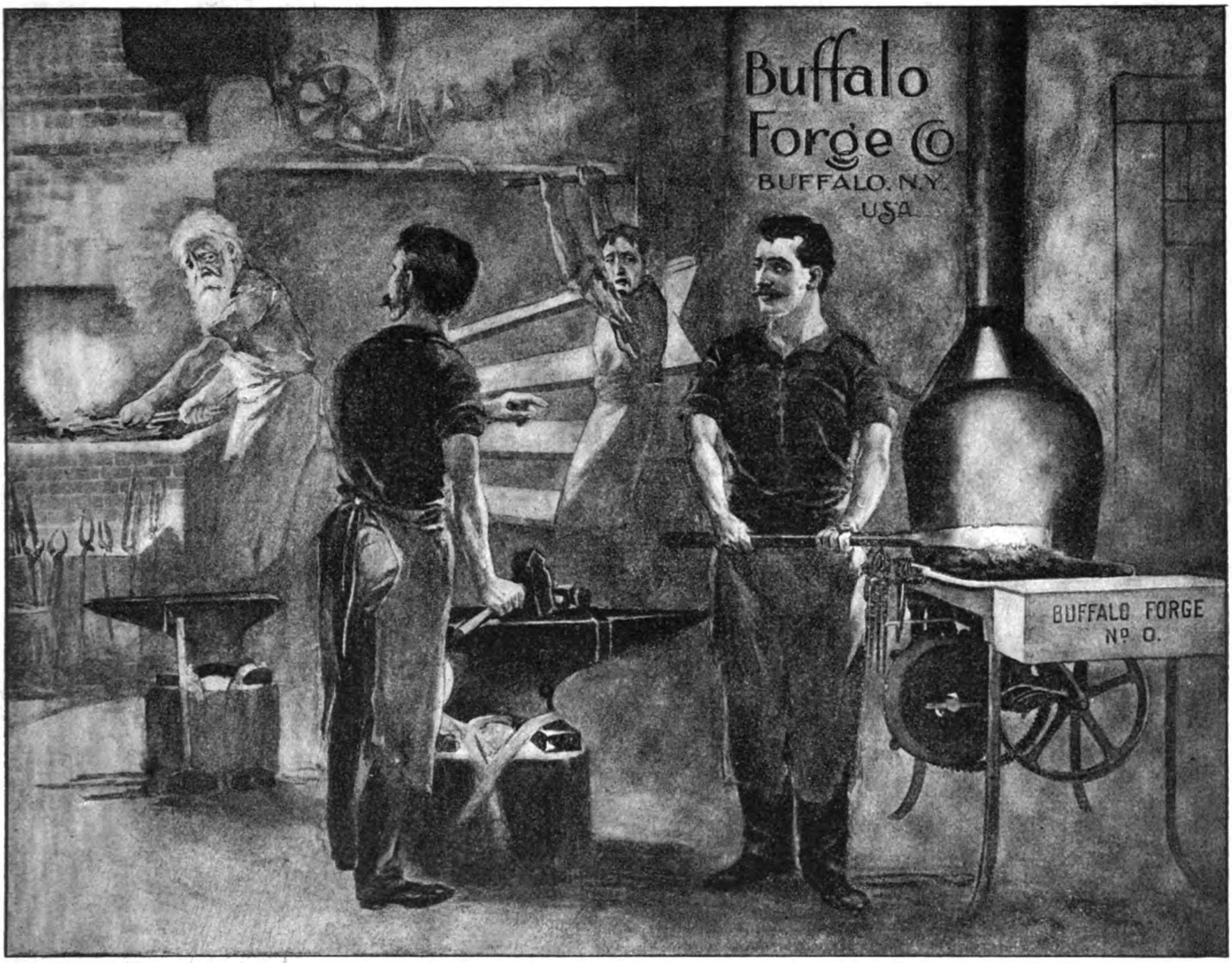
VOLUME 2. NUMBER 4

THE AMERICAN BLACKSMITH

BUFFALO N.Y. U.S.A. A PRACTICAL JOURNAL OF BLACKSMITHING $1.00 A YEAR

JANUARY, 1903 10¢ A COPY



Poor Old Onceuponatime!

His strength is gone and he's quite worked out,
Though he's only fifty or thereabout;
And the young 'prentice scowls as he toils away,
While the customers chafe under long delay.
Oh, slow is the fire that the bellows blow,
In the forge as it stood thirty years ago.

Prosperous Neighbor Uptodate!

The good 'smith's countenance beams with health,
And his heart is glad, for he's coining wealth.
A clean, bright shop and a clean, bright fire—
The 'prentice declares that he'd never tire.
Oh, his work's first-class and his custom's large;
For he uses a Buffalo blower and forge.

Send name and address on a postal card for a handsome reproduction in six colors of the above picture

BUFFALO FORGE CO., BUFFALO, N.Y.

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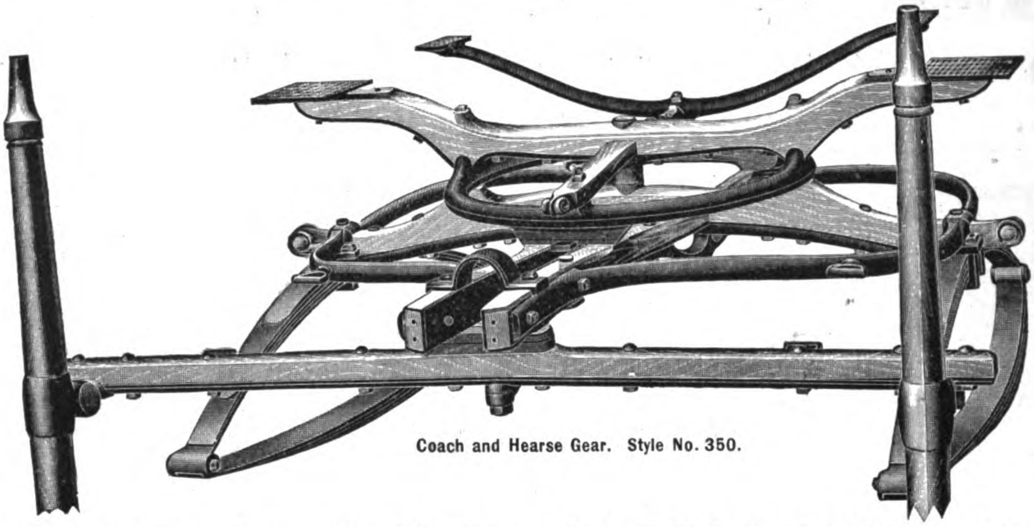
SELLE

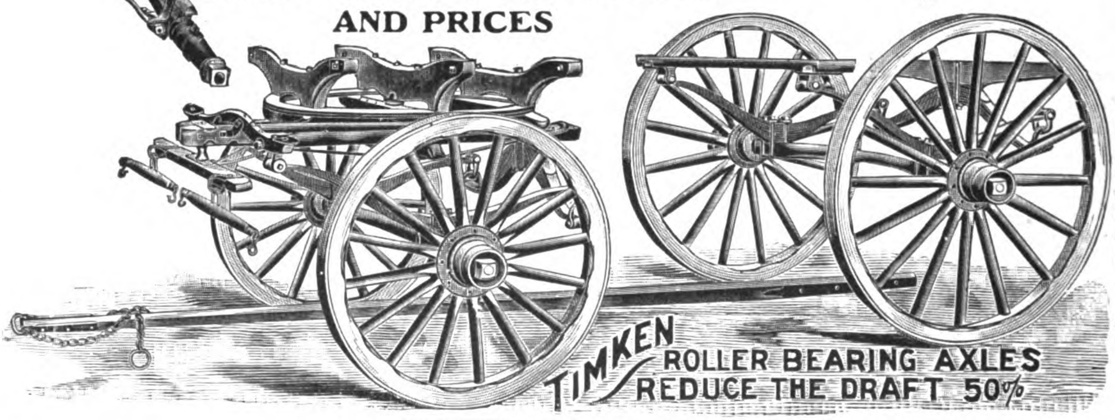

Coach and Hearse Gear. Style No. 350.

GEARS with or without Springs and Axles Welded and Clipped, with Top Gear and Spring Bars ready to receive Body. Also Wheels, Shafts, Poles and Eveners, Ironed Complete, a Specialty.

WROUGHT IRON SPRING BLOCKS
and other forgings of our make for sale by all Dealers in Carriage and Wagon Hardware.


Concord Three-Spring Express Gear. Styles No. 301 to 306.

SEND FOR No. 7 CATALOGUE AND PRICES



THE SELLE GEAR CO.
SOUTH HIGH STREET, AKRON, OHIO, U.S.A.
Cable Address: "Sellegear, Akron." Use Western Union and Manufacturers' Export Codes.
MANUFACTURERS OF COACH, HEARSE AND SPRING WAGON
GEARS AND WAGON SPECIALTIES

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VOLUME 2 | NUMBER 5

THE AMERICAN BLACKSMITH

BUFFALO N.Y. U.S.A.

A PRACTICAL JOURNAL OF BLACKSMITHING

FEBRUARY, 1903

$1.00 A YEAR 10¢ A COPY

FOR

$2.50

We will send by mail, POSTAGE PAID, to any Blacksmith
. . . . in the United States . . . .

ONE No. 16

Goodell-Pratt Company

DRILL CHUCK

Furnished with ½-inch or $\frac{41}{64}$-inch Shank. ½-inch sent unless otherwise ordered

JUST THINK OF IT!

A Chuck that will hold any Twist Drill from the very smallest up to ½-inch. If you have been using drills with ½-inch shanks, you can buy this Chuck and hereafter buy straight shank drills, and save the cost of the Chuck in less than a month.

This offer good only until MARCH 1st, 1903.

GOODELL-PRATT COMPANY

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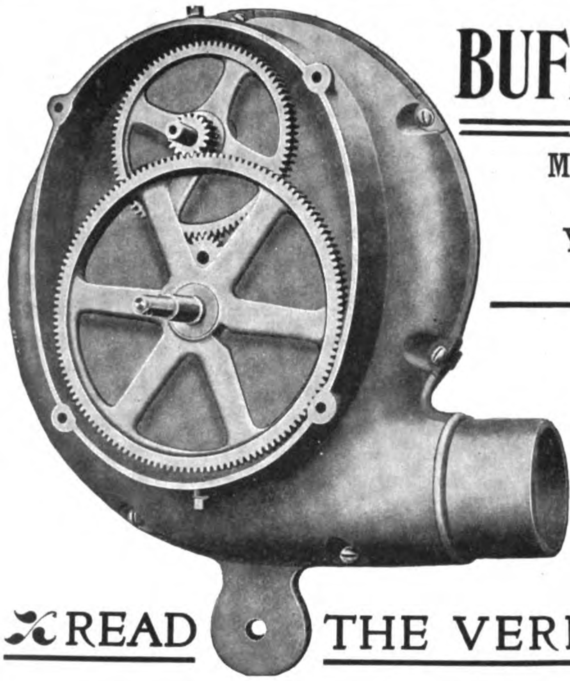

BUFFALO HAND BLOWERS

Most Improved and Powerful Hand Blowers Made.

—RUNS IN OIL—

Your Dealer will Send One on Trial if Desired.

—ASK HIM—

—ONLY—

4

GEARS

READ THE VERDICT!

J. R. HUNZINGER.

General Blacksmithing | Repairing of All Kinds Promptly Done. | Practical Horse Shoeing

Olathe, Kansas, Dec 2nd 1902.

BUFFALO FORGE COMPANY, BUFFALO, N. Y.

GENTLEMEN:

I have your hand blower up and have tried it two weeks. Am perfectly satisfied with the blower, and enclosed please find an order and draft for the second one. I have tred several different kinds of blowers and find your No. 99 hand blower superior to them all. I tried the XXX, the XXXXX, the XXXXXXX, the XXXXX, the XX, the XXX, the XXXX, the XXX, the XXXXX and the Old Reliable XXXX, that sucks ashes and cinders when it happens to be turned backward by accident or by a stranger. I will guarantee yours not to do this, as it works either way better than any of them in every respect, and recommend the Buffalo Blower to any blacksmith of any class that needs a good blower.

Yours Respectfully
J. R. Hunzinger.

P. S.—I have had 35 years of experience. Box 598.

SIMPLE!

COMPACT!

DURABLE!

EFFICIENT!

Air Blast Strong and Uniform.

Action Smooth.

Operation Easy.

No Lost Motion.

BUFFALO BLOWER No. 99.

Write for Latest Catalogue, Just Out.

Buffalo Forge Company

BUFFALO, N. Y.

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VOLUME 2 — NUMBER 6

THE AMERICAN BLACKSMITH

BUFFALO N.Y. U.S.A. — A PRACTICAL JOURNAL OF BLACKSMITHING — $1.00 A YEAR 10¢ A COPY

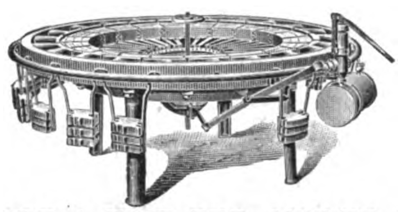
MARCH, 1903

The Hercules Hydraulic Tire Setter

IS THE

BEST ON EARTH.

HAND OR POWER MACHINES. FOR MANUFACTURERS OR REPAIRERS.



It is made on SCIENTIFIC PRINCIPLES and is of the best MECHANICAL WORKMANSHIP.

It is SIMPLE, STRONG and SUBSTANTIAL. It does PERFECT WORK QUICKLY.

IT WILL SET A TIRE PER MINUTE BY HAND.

MADE IN SEVERAL SIZES. PRICES REASONABLE.

—MANUFACTURED BY—

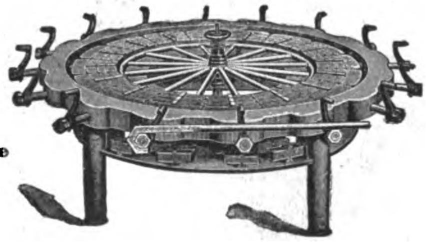
NATIONAL MACHINE COMPANY

KEOKUK - - IOWA.

The Vehicle Repairers' Best Friend...

IS THE

HENDERSON HAND POWER TIRE SETTER



BECAUSE it has made and will make MORE MONEY for its owner than any machine of similar cost.

BECAUSE it sets tires cold, keeps the DISH JUST RIGHT and tightens all joints in a wheel.

Endorsed by Seven Hundred Purchasers.

WRITE FOR PRICES AND TERMS

STANDARD TIRE SETTER COMPANY

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Lathes and Drill Presses

Especially for Blacksmiths and Machinists, also Hand and Power Planers and Shapers and Machinists' Supplies.
Catalogue M.

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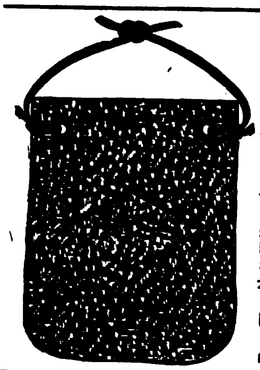

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Sold by all Jobbers in the United States and Canada. . . .

Miniature "Aprons" showing material and how made, mailed upon application. . . . .

Sole Manufacturer
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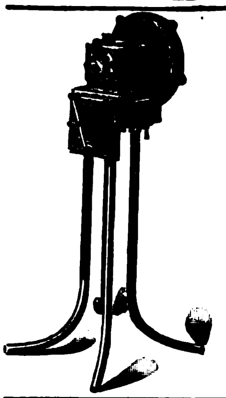

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ELECTRIC FORGE BLOWER ON THE MARKET

Send for Descriptive Circular and Prices.

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OF ALL DESCRIPTIONS.

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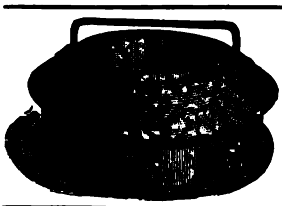

DOWD'S Tire Heater

burns any kind of fuel. Can be used in or out doors. Holds up to 10 sets of tires at a time.

PRICE, ONLY $15.

MADE ONLY BY
P. C. NIELSON,
451-3 PEARL ST.,
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HERE'S A BOOK YOU HAVE PROBABLY BEEN LOOKING FOR

FODEN'S MECHANICAL TABLES

Giving Circumferences of Circles by eighth inches up to twenty feet, Weight of Rectangular Iron, Round and Square Bar Iron, Angle and Sheet Iron, and other miscellaneous tables. . .

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PRICE, - - 50c., Postpaid

American Blacksmith Company
P. O. DRAWER 974
BUFFALO, N. Y., U. S. A.

The Coolidge Wrench. A Patent Adjustable Bit-Brace Wrench.

Instantaneous Perfect Adjustment. Always Holds. Saves Time. Saves Wrenches. Works where others will not. Indispensable to Every Blacksmith. Retail Price, $1.00 Each.

Manufacturers and Proprietors,
N. W. FARLEY & CO. HANCOCK, N. H.

THE "BUSH" Low-down Handy Wagon

with 4-inch tire steel wheels.

We make any size wheels to fit any skein.

WRITE TO **C. BUSH,**
QUINCY, ILL.
(MENTION THIS PAPER.)

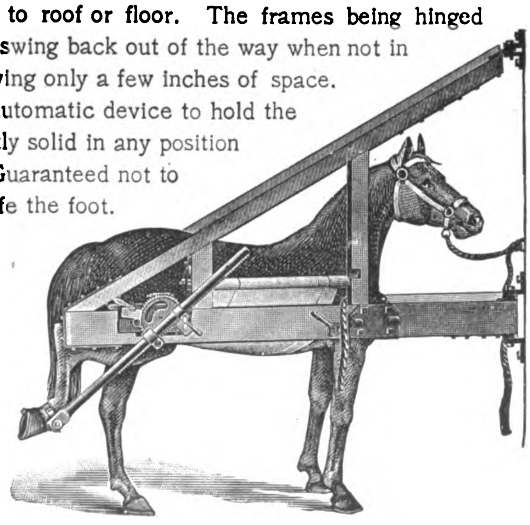
Over 500 Sold Last Year

That's a pretty good testimonial for

Barcus Horse Stocks.

The most easily operated. The simplest, best principle and perfect in every detail.

No block and tackle with ropes to get tangled and break. No bracing to roof or floor. The frames being hinged to the wall swing back out of the way when not in use, occupying only a few inches of space. A perfect automatic device to hold the foot perfectly solid in any position desired. Guaranteed not to skin or chafe the foot.

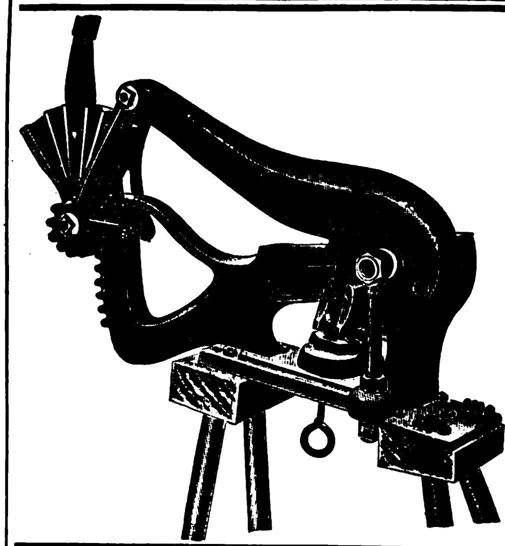


Not the Cheapest But the Best

CORRESPONDENCE SOLICITED.

GEORGE BARCUS. RENSSELAER, INDIANA.

Attention, Blacksmiths!



The Sears Blacksmiths Device Guaranteed satisfactory free from every objection, with points of excellence found in no other machine on the market. Will last a life time with proper care. It only requires one man to operate this machine.

In using it the operator stands in front of the device and can with ease handle the machine with one hand, leaving the other hand free to place the work before cutting or punching same.

DESCRIPTION.

It will shear 3 x ¾, 4 x ⅝, 5 x ½-inch cold iron, and will also trim plow points, etc. It will cut any size bolt or bar up to ¾ inch. It will punch ½-inch holes in ⅛-inch iron and is provided with the following size punches, $\frac{3}{16}$, ¼, $\frac{5}{16}$, ⅜, $\frac{7}{16}$, ½, and these are furnished with each machine.

For sale by all jobbers. Send for catalogue.

GEO. SEARS & CO.,
CLINTON, IOWA.

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VOLUME 2 NUMBER 7

THE AMERICAN BLACKSMITH

BUFFALO N.Y. U.S.A.

A PRACTICAL JOURNAL OF BLACKSMITHING

APRIL, 1903

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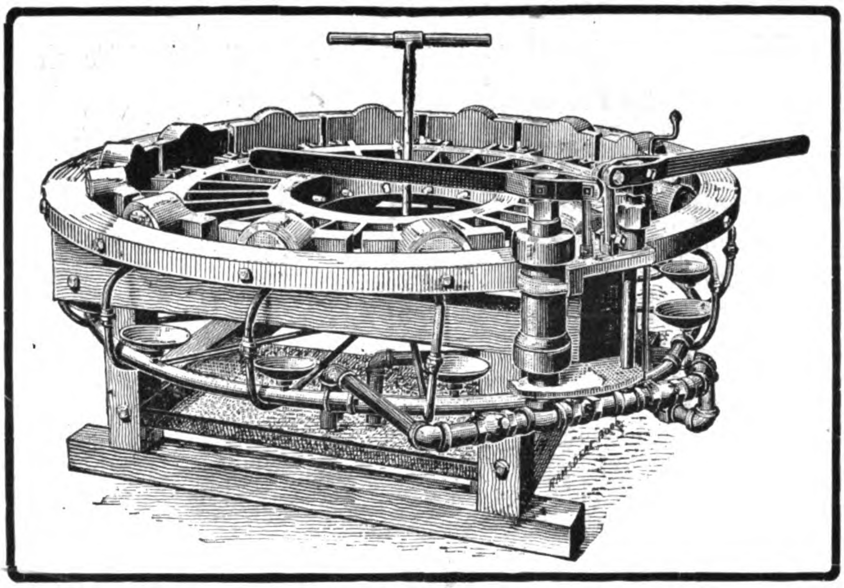
THE "WEST HYDRAULIC" TIRE SETTERS



are the result of THIRTY YEARS' EXPERIENCE IN "SETTING 'EM COLD." THEY DO THE WORK RIGHT, they are BUILT right and they STAY right. WE CAN REFER YOU TO CUSTOMERS WHO HAVE USED OUR MACHINES FOR MORE THAN TEN YEARS, and they are doing their work today as well as when first installed. NO OTHER MAKER OF TIRE SETTING MACHINES CAN GIVE A SIMILAR REFERENCE.

OUR MACHINES compress wheel and tire equally at all points, and tend to make the wheel ROUND. If we believed a wheel should be egg-shaped, or eight-sided, we would make our machines that way, but we don't. Wheels are intended to be ROUND, and every wheel tired in our machine comes out more nearly round than when put in, whether new or old. When necessary, tire can be set down to flat spot on old wheel, but usually it's better to make wheel ROUND, because a round wheel will stand longer and harder service. That's why they're made that way. Some have made mistakes in buying Tire Setters. Thought any old machine would do, and the price was cheap—so was the machine. Next time they will get a "West Hydraulic" and be happy. DON'T MAKE A MISTAKE. Give us the order now, and as the loose tires come rattling to your shop this summer, watch your pocket-book get fat—and the satisfied look of your customers. A "West Hydraulic" Tire Setter is "a joy forever." They are made by

CAUTION. On March 31, 1903, The West Tire Setter Company filed a bill in the United States Circuit Court, Southern District of Iowa, against the National Machine Company, of Keokuk for infringement of the West patents. USERS of infringing machines are warned that they are equally liable with the manufacturers.

THE WEST TIRE SETTER COMPANY

ROCHESTER, N. Y.

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A NEW IDEA WAGON JACK FOR WAGON MAKERS OR BLACKSMITHS DOING WAGON WORK.

Easy to operate and cheap to make. A wheel can be made as true by any one as in the largest factory. Impossible to operate so that spokes will not be true. I will send sketch and directions how to make machine for two dollars ($2.00). Any mechanic can make Jack from my sketch and printed directions. Send P. O. money order or draft in remitting.

Address **Gustav A. Beltz** RENVILLE, MINN. BOX 315.

Lathes and Drill Presses

Especially for Blacksmiths and Machinists, also Hand and Power Planers and Shapers and Machinists' Supplies.

Catalogue M.

SHEPARD LATHE CO., 132 W. 2d St., Cincinnati, O.

$ A GOOD INVESTMENT $

is an order for The American Blacksmith. That's what all readers say.

One dollar brings the paper for a year. Send it this month and you get "The Village Smithy" picture, and a hoof knife or pocket level, too.

$ AMERICAN BLACKSMITH CO. BUFFALO, N. Y. $

Leather Aprons

Sold by all Jobbers in the United States and Canada. . . .

Miniature "Aprons" showing material and how made, mailed upon application. . . . .

Sole Manufacturer

Edmund C. Beckmann
712 North 4th St.
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LETTER HEADS, STOCK CERTIFICATES, BONDS, CHECKS, CATALOGUE COVERS, CARDS

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The Coolidge Wrench.

A Patent Adjustable Bit-Brace Wrench.

Instantaneous Perfect Adjustment. Always Holds. Saves Time. Saves Wrenches. Works where others will not. Indispensable to Every Blacksmith and Wheelwright. Retail Price, $1.00 Each. Manufacturers and Proprietors,

N. W. FARLEY & CO. HANCOCK, N. H.

Alligator Shears

Cuts 1½-inch cold Iron Bolts and Bars 1 x 4 inches. . . . 48 x 80 inches floor space. .

W. W. CRANE FOUNDRY & MACHINE WORKS
122 and 124 CLARK ST., AUBURN, N. Y., U. S. A.

HERE'S A BOOK *YOU HAVE PROBABLY BEEN LOOKING FOR*

FODEN'S MECHANICAL TABLES

Giving Circumferences of Circles by eighth inches up to twenty feet, Weight of Rectangular Iron, Round and Square Bar Iron, Angle and Sheet Iron, and other miscellaneous tables. . .

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PRICE, - - 50c., Postpaid

American Blacksmith Company
P. O. DRAWER 974
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CUT SHOWS A

No. 5 Combined Punch and Shear

with 12-in. throat for punching $\frac{1}{16}$ in., and a 12-in. blade for cutting No. 8 gauge metal, 2 x ⅜ in. bars, ⅝ in. round, weight 525 lbs. Made in 18 different sizes, from 240 to 2,200 lbs. We make a specialty of shears, punches and rolls. Tools for shearing, punching and bending sheet metal, bar iron and angle iron

BERTSCH & CO.
CAMBRIDGE CITY, IND., U. S. A.

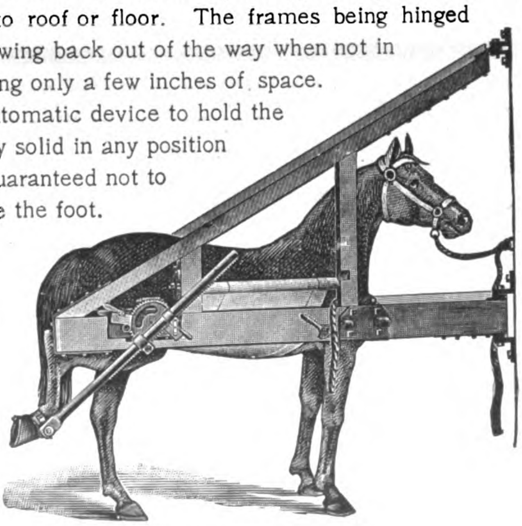
Over 500 Sold Last Year

That's a pretty good testimonial for

Barcus Horse Stocks.

The most easily operated. The simplest, best principle and perfect in every detail.

No block and tackle with ropes to get tangled and break. No bracing to roof or floor. The frames being hinged to the wall swing back out of the way when not in use, occupying only a few inches of space. A perfect automatic device to hold the foot perfectly solid in any position desired. Guaranteed not to skin or chafe the foot.



Not the Cheapest But the Best

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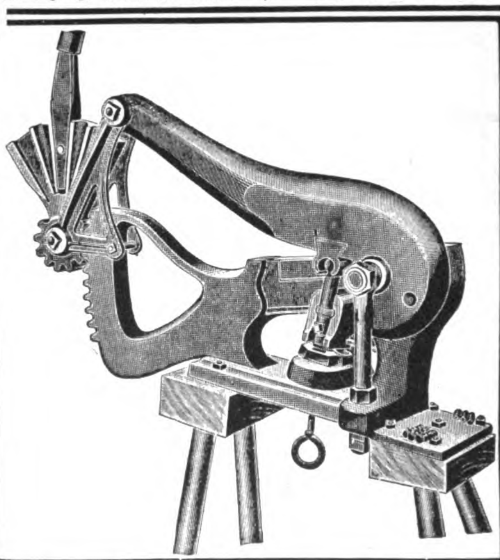
GEORGE BARCUS, RENSSELAER, INDIANA.

Attention, Blacksmiths!



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For sale by all jobbers. Send for catalogue.

GEO. SEARS & CO.,
CLINTON, IOWA.

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VOLUME 2 NUMBER 8

THE AMERICAN BLACKSMITH

A PRACTICAL JOURNAL OF BLACKSMITHING

BUFFALO N.Y. U.S.A. MAY, 1903 $1.00 A YEAR 10¢ A COPY

TWO SPECIAL SPRING OFFERS

FIRST—YOU CAN GET A HANDSOME PREMIUM free by securing a new subscriber or two for THE AMERICAN BLACKSMITH. Look over the following liberal rewards for getting a friend to take the journal. We wish each of our readers to send *one new name* and we will *repay them* for their effort.

Send us $1.00 for one new subscriber and we will give you a copy of "*The Village Smithy,*" carefully packed, and your choice of a neat pocket *bench level*, or a farrier's *hoof knife* as a premium.

Send $2.00 and two new names, and get the fine gold *fountain pen* which we offer, and also "*The Village Smithy.*"

Induce a friend or brother smith to subscribe. He gets the paper and "The Village Smithy." You get the premium and "Village Smithy" too.

This shows the handsome reliable bench level, 8¼ inches long, that we give for one new subscription. You can find use for it every day.

OUR PREMIUM LIST

Get some new subscribers for us and receive a premium as below. Include your own name if not already on our lists. No premiums on renewals. Send for full particulars and cash commission offers. Anyone can profit by them.

FOR ONE NEW SUBSCRIBER
A handy 8¼-inch pocket bench level, or
A serviceable crucible steel hoof knife.

FOR TWO NEW SUBSCRIBERS
A fine gold fountain pen,
A 2-foot steel blacksmith's rule, or
A 16-inch crucible steel horseshoer's rasp.

FOR THREE
An 8-inch steel hack saw, complete.

FOR FIVE
A graduated tire measuring wheel, or
A 26 x 34-inch blacksmith's apron.

FOR EIGHT
A Giant hoof parer.

FOR TWELVE
A set of Little Giant screw plates.

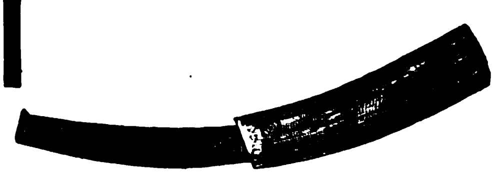
For two new subscribers we give the fountain pen shown here, full size. It is made of the best hardened Para rubber, with pen of 14-k. gold, fitted with the best iridium tips, carefully ground. Ink will not corrode it. The feed is very simple and has no complicated parts to get out of order. This pen is a well-made, serviceable article from the factory of one of the largest pen concerns in the country.

SECOND—If you are not already a subscriber, send $1.00 and we will mail you the *journal* for one year, together with *the April issue* and *The Village Smithy*, free of charge. Also we will give you your choice of the *bench level* or *hoof knife*, as a premium. An exceptional opportunity to get an up-to-date paper on blacksmithing, horseshoeing and wagon building.

THE VILLAGE SMITHY is a handsome and faithful reproduction of a splendid picture painted expressly for us by Raphael Beck. It has a canvas finish and makes a fine picture for framing.

How to get a duplicate of The Village Smithy. Send us the names and addresses of 25 live blacksmiths, horseshoers and wagon builders, OR send us 25 cents in stamps and we will mail you The Village Smithy, postage prepaid and carefully packed to avoid crushing.

NOTE. The above offers will be cancelled when our supply of Village Smithy pictures is exhausted. The supply is limited. Send now to be in time. Be sure to address the premium department.



This Farrier's Hoof Knife, which we give as a premium for one new subscriber, is made of special refined crucible steel, carefully tempered. A serviceable tool.

No premiums given for renewal subscriptions.
Remit by Money Order, Express Order, Registered Letter or Stamps. Do not send Checks.

American Blacksmith Company

Premium Department, P. O. Drawer 974, BUFFALO, N. Y., U. S. A.

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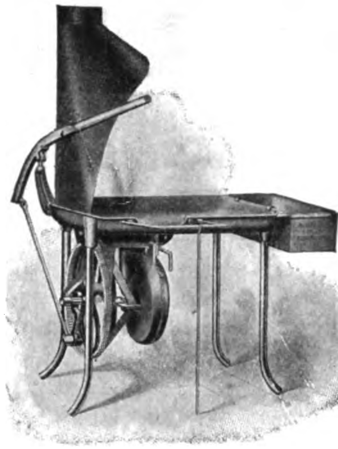
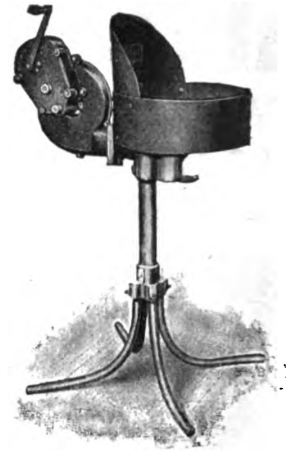
Buffalo Forge, No. 3.



Old Reliable Blacksmith Forge.



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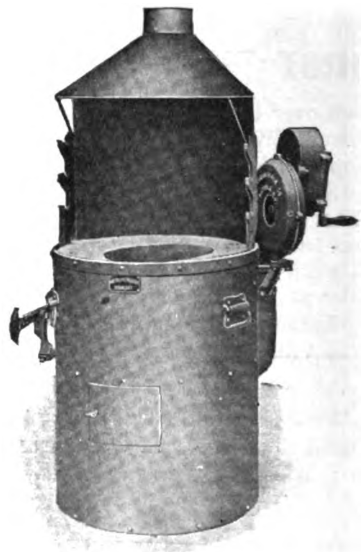
Buffalo Forge, No. 2.

If Your Requirement
IS A BLACKSMITH FORGE
=We Can Meet It=

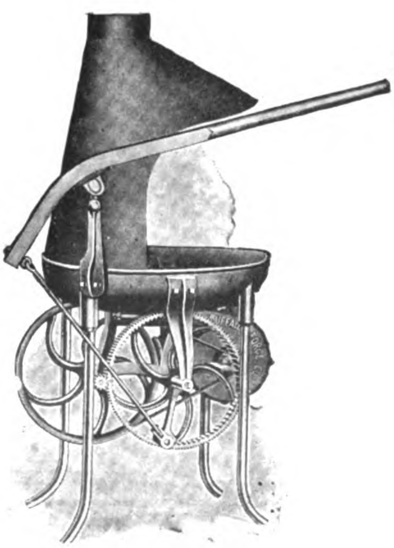
OUR NEW BLACKSMITH
MACHINERY CATALOGUE
ILLUSTRATES AND DESCRIBES
62 TYPES AND SIZES
WRITE FOR IT

GUARANTEE—Our complete line of Blacksmith Forges, Blowers and Tools are fully guaranteed and if not perfectly satisfactory, and as represented, can be returned at our expense . . . .

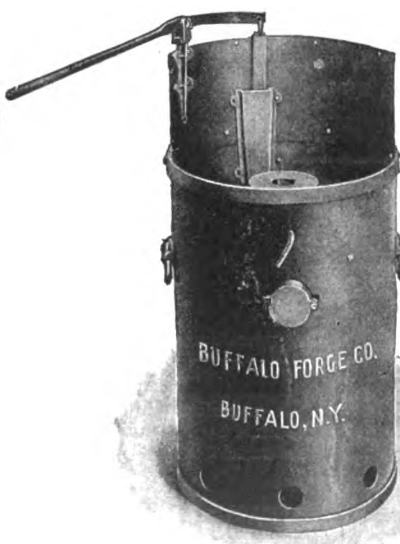
BUFFALO FORGE COMPANY
Buffalo, N. Y.



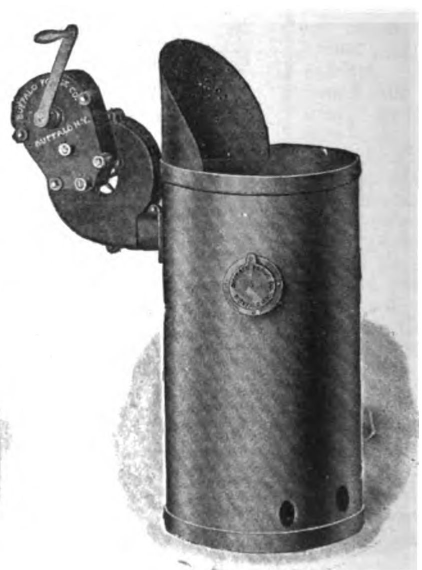
Buffalo Forge, No. 47.



Buffalo Forge, No. 1.



Buffalo Forge, No. 12.



Buffalo Forge, No. 17.

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VOLUME 2 NUMBER 9

THE AMERICAN BLACKSMITH

BUFFALO N.Y. U.S.A.

A PRACTICAL JOURNAL OF BLACKSMITHING

JUNE, 1903

$1.00 A YE[AR] 10¢ A COP[Y]

Weber

Over 7,500 Weber Junior Engines now in use

OUR NEW CATALOGUE

Just out—gives much interesting information. Over 100 endorsements of the WEBER from blacksmiths and others.

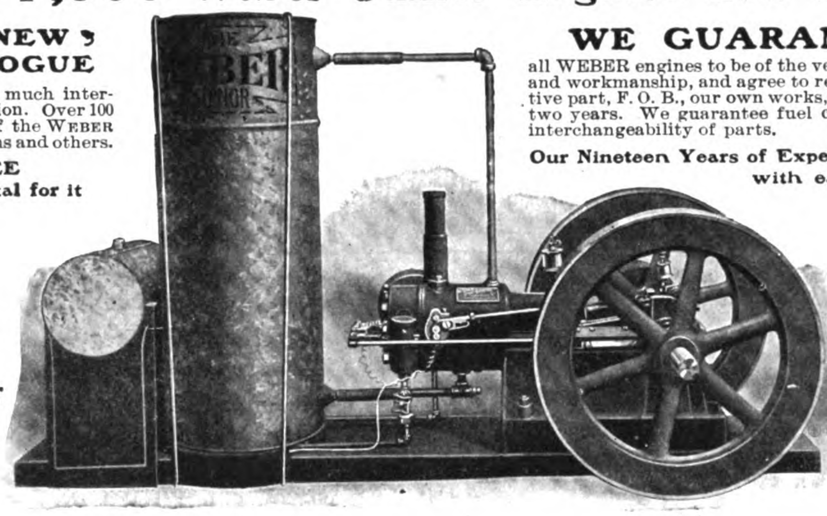
FREE
Send Postal for it

WE GUARANTEE

all WEBER engines to be of the very best material and workmanship, and agree to replace any defective part, F. O. B., our own works, without cost for two years. We guarantee fuel consumption and interchangeability of parts.

Our Nineteen Years of Experience goes with each "Weber"

Every Blacksmith and Wagon Builder should have it.



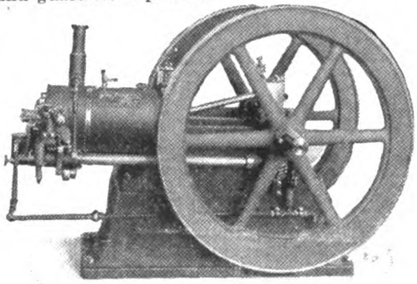
All Sizes Built up to 300 Horsepower

The 2½-Horsepower WEBER JUNIOR as it appears at work.

The Junior is shipped (crated) with all fixtures attached ready to set up and run, requiring no pipe fitting or connections.

Weber Engines operate on one-tenth of one gallon of gasoline per horsepower per hour.

5 H. P. Webers are being bought by blacksmiths all over the country. Just the engine for those who need more power than 2½ horsepower. Have electric and tube igniters, gasoline pump, underground tank and latest improvements. Each engine critically tested and guaranteed perfect.



5 H. P. WEBER.

Every User of a WEBER is an Endorser.

BRANFORD, CT.

GENTLEMEN:—I am the owner of the BEST and CHEAPEST gasoline engine built—the WEBER JUNIOR. I have never spent a penny for repairs. Can start or stop in five seconds. She is driving a drill press, emery grinder, blower, trip hammer and heavy punching press. JOHN DONNELLY.

COFFEYBURG, MO., April 19, 1903.

GENTLEMEN:—I have a 2½ horsepower Weber Gasoline Engine, and it is a dandy. I run a 12 in. x 2½ in. emery wheel, a 12 in. polishing wheel for polishing plow shares and other work, a grindstone, a table for 14 in. rip and cut-off saws, a shaper which carries a 5-in. cutter head, a jig saw, a spoke tenoning and felloe boring machine combined, a No. 2 Bailey power drill, and I have just put in a power blower for four fires. This little engine will run all of these machines at once, except the shaper, which takes more power. It will run it and any other one of the machines. I also have a wood turning lathe. The engine takes off much of the hard work attached to our trade. I doubt if there is any better engine made for power than the Weber. It is safe and simple. S. G. MOONEY.

NOTE.—This is an unsolicited testimonial; see page 180 of this paper.

PRICES owing to our exceptional facilities and the large quantities going through our factory, we are able to make the prices, like the engine . . . **RIGHT**

Weber Gas and Gasoline Engine Company

POST OFFICE BOX V 1114 KANSAS CITY, MISSOURI

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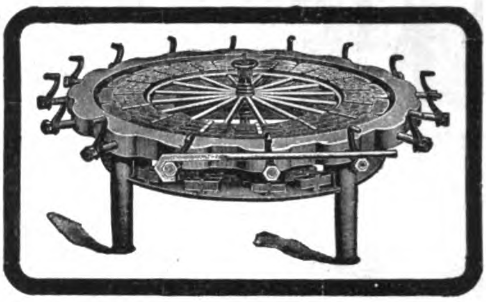
It Sets them Cold by Hand.

The Vehicle Repairer's Best Friend is the

Henderson Hand Power Tire Setter



Because it Sets Tires Cold, Keeps the Dish Just Right and Tightens all Joints in a Wheel.

The Greatest Labor-Saving and Money-Making Machine ever Offered Blacksmiths and Wagon Men.

Made $32 in One Day.

STAPLES, TEXAS, Nov. 19, 1901.

Gentlemen: The machine has done all and more than you claim it to do. It has been a money-maker for us. Has increased our trade and gave our customers perfect satisfaction. We could not do business without it. It is a great thing over the old way of setting tires; it has more than paid for itself. One day we made $32 with the machine and I think it is one of the grandest things that was ever invented for blacksmithing. Respectfully,

LAWMAN & WILSON.

You don't have to remove any bolts or worry about the dish.

No complicated parts to get out of order. A thousand users endorse the Henderson.

The machine will draw trade, give you control of the tire setting business in your neighhorhood, and MAKE MONEY FOR YOU.

Write for descriptive circulars and prices

STANDARD TIRE SETTER COMPANY

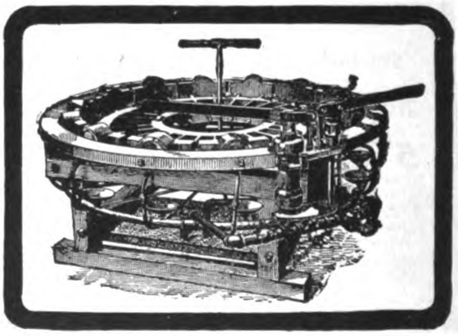
KEOKUK, IOWA, U. S. A.

What They Think of Their "West" Tire Setter

NEW BEDFORD, MASS., *April 15, 1903.*

TO THE WEST TIRE SETTER COMPANY.

GENTS:—We have worked your Tire Setter for six years, and it has given us good interest on money invested, and has given entire satisfaction to every one of our customers, as it worked good on every job we have done with it. We have set tires 6 in. x 1 in., 5 in. x 1¼ in., 5½ in. x 1 in., steel tires and all smaller sizes, the first year, and which are, and have been, in use up to date every day carting rocks over good and bad roads without any sign yet of getting or being loose. We have set tires also on invalid chairs with ⅜-in. round spoke, the wheels just fitting inside the ends of rams and did a very nice, good job, to the disappointment of eight spectators, who were present to see the little wheels get smashed by the big powerful machine, but "nit," as the machine has in all those six years NEVER hurt a spokc, rim or hub in any way.



The time we bought this machine we looked at the sum of money it cost as enormous (you know we have very few millionaire blacksmiths) but after sixteen months we had principal, interest and expenses back again, which is not found in every investment, besides saving a good many drops of sweat by not having to work so hard as the old way, let alone the time we saved. We don't advertise this machine in newspapers and other places, but let the machine do it by better work and less time, which counts for our customers as well.

If anyone in our section should want to see the machine work, or wants any information about it, you are at liberty to refer same to us, as we are willing to help them; we are ready and willing to live and let live. Yours,

FICHTENMAYER & FLYNN.

CAUTION. On March 31, 1903, The West Tire Setter Company filed a bill in the United States Circuit Court, Southern District of Iowa, against the National Machine Company, of Keokuk, for infringement of the West patents. USERS of infringing machines are warned that they are equally liable with the manufacturers.

The West Tire Setter Co.

ROCHESTER, N. Y.

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MY 8 24

VOLUME 2 — NUMBER 10

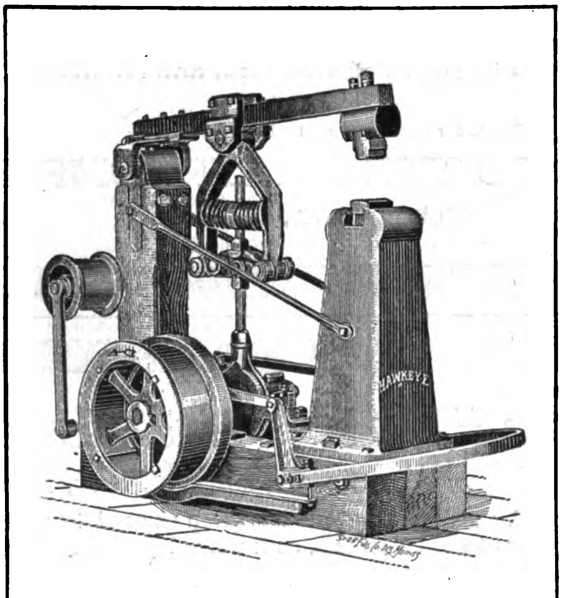
THE AMERICAN BLACKSMITH

A PRACTICAL JOURNAL OF BLACKSMITHING

BUFFALO N.Y. U.S.A. — JULY, 1903 — $1.00 A YEAR 10¢ A COPY

THE HAWKEYE Power Hammers

ARE STANDARD AND THE LEADING MACHINES IN THEIR CLASS.



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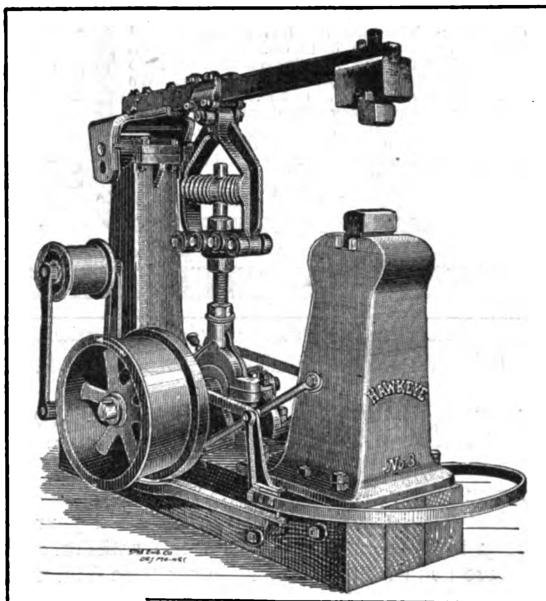

No. 3.

THEY HAVE BEEN ON THE MARKET FOR YEARS AND ARE FULLY GUARANTEED.

THINK OF THE LABOR THEY WILL SAVE.

NOW IS THE TIME TO BUY FOR SUMMER AND FALL WORK.

Mr. A. G. Boylan of Milo, Iowa, writes that he would not do plow work without the Hawkeye Hammer. In three days he sharpened forty-nine plow lays and made two new ones alone and our No. 3 hammer saves labor in proportion on heavy work.

REMEMBER THAT OUR HAMMERS ARE GUARANTEED TO STRIKE ONE-THIRD HEAVIER BLOW THAN ANY OTHER TRIP HAMMER WHICH IS SOLD AT THE SAME PRICE . . . .

Write for Prices and Full Information.

HAWKEYE MANUFACTURING CO.

TAMA, IOWA

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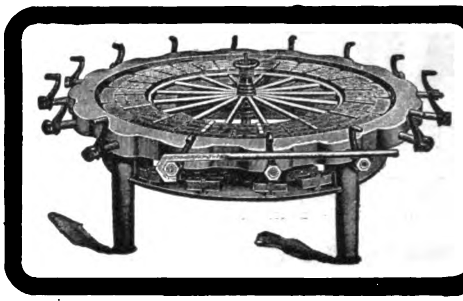
It Sets them Cold by Hand.

The Vehicle Repairer's Best Friend is the

Henderson Hand Power Tire Setter



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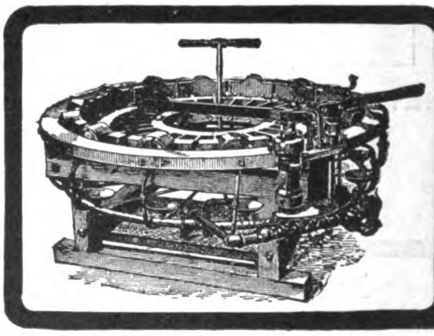

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If anyone in our section should want to see the machine work, or wants any information about it, you are at liberty to refer same to us, as we are willing to help them; we are ready and willing to live and let live. Yours,

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USERS of infringing machines are warned that they are equally liable with the manufacturers.

The West Tire Setter Co.

ROCHESTER, N. Y.

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MY 8 '28

VOLUME 2 THE NUMBER 11

THE AMERICAN BLACKSMITH

BUFFALO N.Y. U.S.A.

A PRACTICAL JOURNAL OF BLACKSMITHING

AUGUST, 1903

$1.00 A YEAR
10¢ A COPY

The Brooks Tire Machine Co.

(INCORPORATED)

The Brooks Cold Tire Setter is the Original Edge Grip Machine and is

IMPROVED RIGHT UP TO DATE.

We Lead and Others Follow.

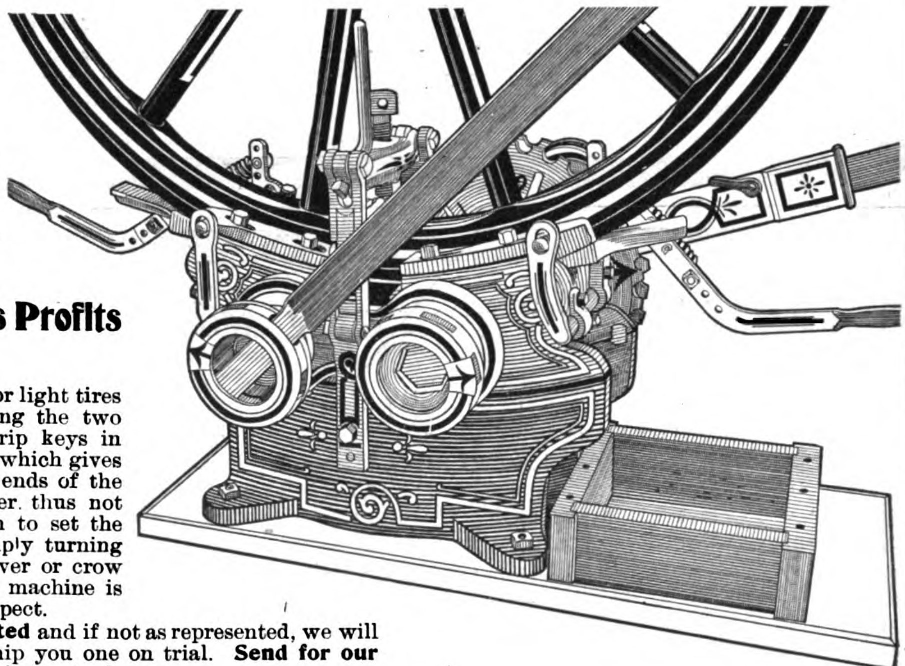
CAPITAL STOCK, $100,000.

Why is it that there has been more of these sold in the past two years than any other two machines manufactured? First of all, because the

WORK PLEASES The BLACKSMITH'S CUSTOMERS,

and they advise their friends to take their work to him and

His Business as well as his Profits begin to Grow.



It has two speeds and powers, one for light tires and one for heavy tires. By pushing the two short levers down, you force the grip keys in against the tire with a tension spring which gives additional pressure against the inner ends of the keys forcing them to operate together, thus not having to use a hammer and punch to set the keys. The machine is opened by simply turning one eccentric. No prying with a lever or crow bar to open the machine, in fact the machine is mechanically constructed in every respect.

Shipped on trial and fully warranted and if not as represented, we will pay the freight both ways. Let us ship you one on trial. **Send for our terms and descriptive circular.** Write us to-day.

Azuza, California, July 23, 1902.
Brooks Tire Machine Co., Wichita, Kansas.
Gentlemen: Having had one of your No. 2 Cold Tire Setters in use in my shop the past four months, we have set a great many tires with it. The work was done to the entire satisfaction of our patrons. I also find that the machine has been a great advertisement for the shop, bringing work from quite a distance. In fact, we do not know how we could run the shop without your machine, after having once used it. It is the only machine that I have found that shrinks the tire without compressing the whole wheel into a smaller circle, thus saving the wheel from being crushed at every joint and putting an unnecessary dish into the wheel. Wishing you success in your business and thanking you for the truthful way in which you have represented your machine to me, I am Very truly,
R. M. SIPPLE.

Red Hook, N. Y., July 16, 1902.
Brooks Tire Machine Co., Wichita, Kansas.
Dear Sirs: In reference to my opinion of your Tire Machine, will say I had meant to answer earlier, but have been rushed with work and it was deferred from day to day. Another reason was, I wanted to be fully satisfied by trying all kinds of tires before committing myself, and now I can say for the Brooks Tire Machine, that I think it the best machine on the market and does all you claim for it and very quickly. I can set a tire with it better than any other way. I have between $2,000 and $3,000 worth of machines in my shops, and I would rather part with any of them than with my Tire Setter.
Wishing you success, I remain, yours truly,
GEO. W. STORMES.

The Brooks Tire Machine Company

121 North Wichita Street, - WICHITA, KANSAS.

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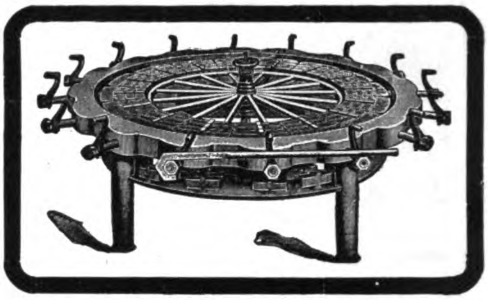
Henderson Hand Power Tire Setter



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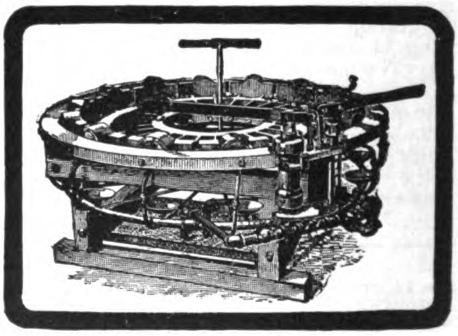

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The West Tire Setter Co.

ROCHESTER, N. Y.

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5 MY 8 24

VOLUME 2 | THE | NUMBER 12

THE AMERICAN BLACKSMITH

BUFFALO N.Y. U.S.A.

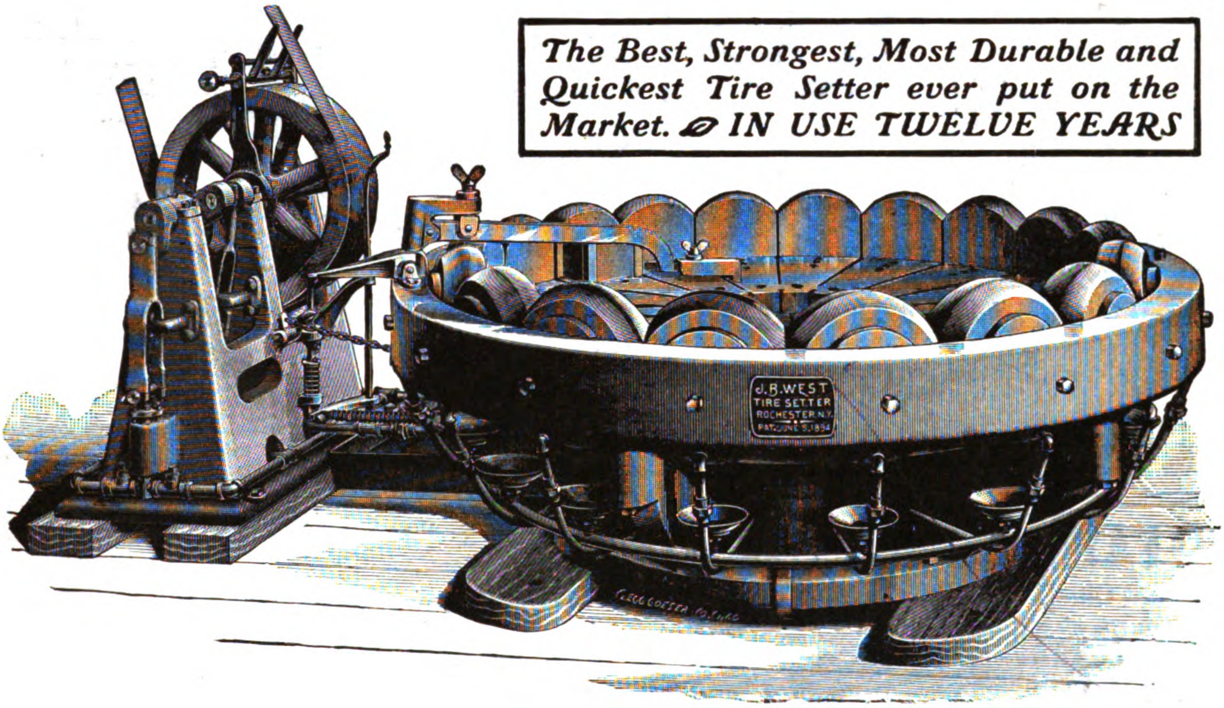
A PRACTICAL JOURNAL OF BLACKSMITHING

SEPTEMBER, 1903

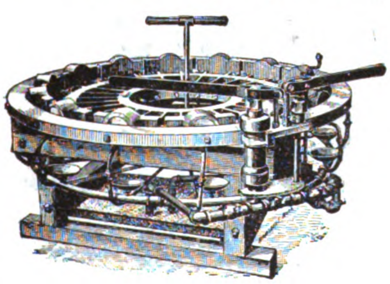
$1.00 A YEAR
10¢ A COPY

THIS represents our Power Hydraulic Tire Setter, which we make in various sizes suitable for handling tires from 9 inches wide down to ¾ inch. Used in nearly all European countries, India, South Africa and other remote points, and by hundreds of the best known manufacturers and repairers in the United States, Canada and Mexico.

The Best, Strongest, Most Durable and Quickest Tire Setter ever put on the Market. IN USE TWELVE YEARS



THIS cut shows our Hand "Hydraulic Junior" Tire Setter, designed for use by manufacturers and repairers who have no power or cannot afford to put in one of our large machines. Not so heavy as the power machine, but embodies many of its principles, and worth many times its cost where there is work for it to do. Encircles the wheel and tire, distributing the compression around circumference—the only proper way to set a tire cold. The founder of our Company invented, patented and manufactured "edge-grip" machines when the "West" Tire Setters were the only ones on the market, and if the principle had proved right we should still be making that kind—but we are not, we have something better. Write us and we will tell you more about it.



CAUTION. Having brought suit for infringement against the National Machine Co. of Keokuk, Iowa, we take this means of reminding the trade that users of infringing machines are equally liable with the manufacturers : : :

The West Tire Setter Co.

ROCHESTER, N. Y.

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ROYAL

WESTERN CHIEF

ROYAL In Every Sense

Reliable
Our Choice
Your Choice
America's Choice
Leads Them All

The ROYAL FIRE POT
NO CLAY

HANDSOMEST: Because its constructive design is symmetrical, attractive and beautiful.

SIMPLEST: Because fan case and column stand (2 parts only) is about all there is of it.

BEST: Because made of the best material, by the best workmen and best mechanical experience that can be obtained.

SUPERIOR POINTS.

No Belts, no Clutches, no Rachets.

The blower case oscillates on its bearing, permitting nose of case to point **down** or **out** or **up**, as may be desired; meeting any angle of blow pipe, thereby saving one elbow and 10 per cent. of blast force; besides valuable room occupied by other blowers.

The crank turns **forward** or **backward**, as suits the operator.

The gears are Phosphor Bronze and Steel, cut on the most scientific principle; they are **flat**, and **straight cut** (no spiral or worm gears); which combined with Steel Shafts and Composition Bearings made and assembled perfectly, run noiseless, and makes this the best blower in the world.

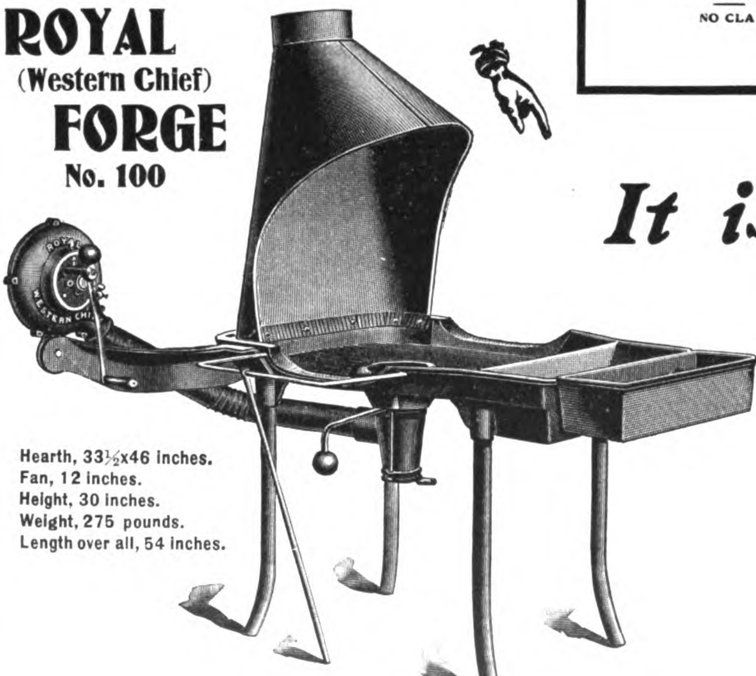
The Gear Case is oil tight and dust proof, permitting gears to run in a bath of oil.

The Blast is very powerful, and as positive and steady as a power blower, and takes less labor to operate than others. The after blast is strong and lasting.

The Column Stand and Iron Base give a solid, non-trembling foundation.

The room it takes is less than any other blower.

ROYAL
(Western Chief)
FORGE
No. 100



Hearth, 33½x46 inches.
Fan, 12 inches.
Height, 30 inches.
Weight, 275 pounds.
Length over all, 54 inches.

It is the way they are built that pleases so

MADE BY	SOLD BY
Canedy-Otto Mfg. Co.	**First-Class Dealers**
CHICAGO HEIGHTS, ILL.	EVERYWHERE

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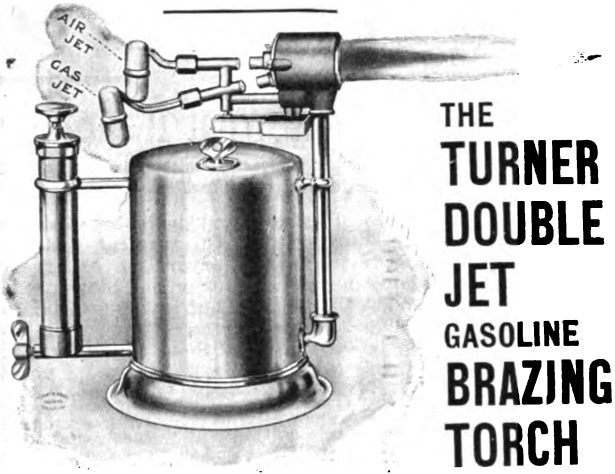
Hottest in the World!



THE
TURNER
DOUBLE
JET
GASOLINE
BRAZING
TORCH

Is over 1,000 degrees hotter than any other gasoline torch on the market and is unexcelled for

BRAZING, TEMPERING, DRAWING TEMPER, ANNEALING, FUSING, SOLDERING

and all other work requiring heat.

THERE IS NOTHING BETTER FOR BRAZING RETAINING WIRES IN SOLID RUBBER TIRES

WRITE FOR INFORMATION AND CATALOGUE

The Turner Brass Works

63 NORTH FRANKLIN ST., CHICAGO

We Make Good Wheels

ARE YOU WITH US?

We fill Orders at once from Stock.

Special Price on Rubber Tires.

REX BUGGY COMPANY

CONNERSVILLE, IND.

You Are ALL RIGHT When you Buy a

PETER WRIGHT

WHILE other makers recognize the Peter Wright as the Standard Anvil of the World by claiming that theirs is "just as good," this anvil has never before been warranted, for the reason that the makers cannot make a better anvil under a guarantee than they have always made without. The guarantee which will hereafter go with every Peter Wright Anvil is designed to satisfy the most exacting of customers.

If any inherent defect is hereafter discovered in a Peter Wright Anvil, report the nature of it to the dealer from whom you purchased it, or to your regular dealer, and he will see that your claim is promptly investigated.

You are cautioned in buying to see that each Anvil is stamped with the full Trade Mark on one side and has the Green Label affixed to the other. These celebrated Anvils may be obtained from all the

PRINCIPAL HARDWARE DEALERS.

A GUARANTEE

Now goes with every

PETER WRIGHT

Patent, Solid Wrought

ANVIL

With Special Steel Face.

WIEBUSCH & HILGER, LTD.

Agents for the Manufacturers. 9 to 15 Murray Street, New York City.

99 BUFFALO 99

Do You Know What It Means?

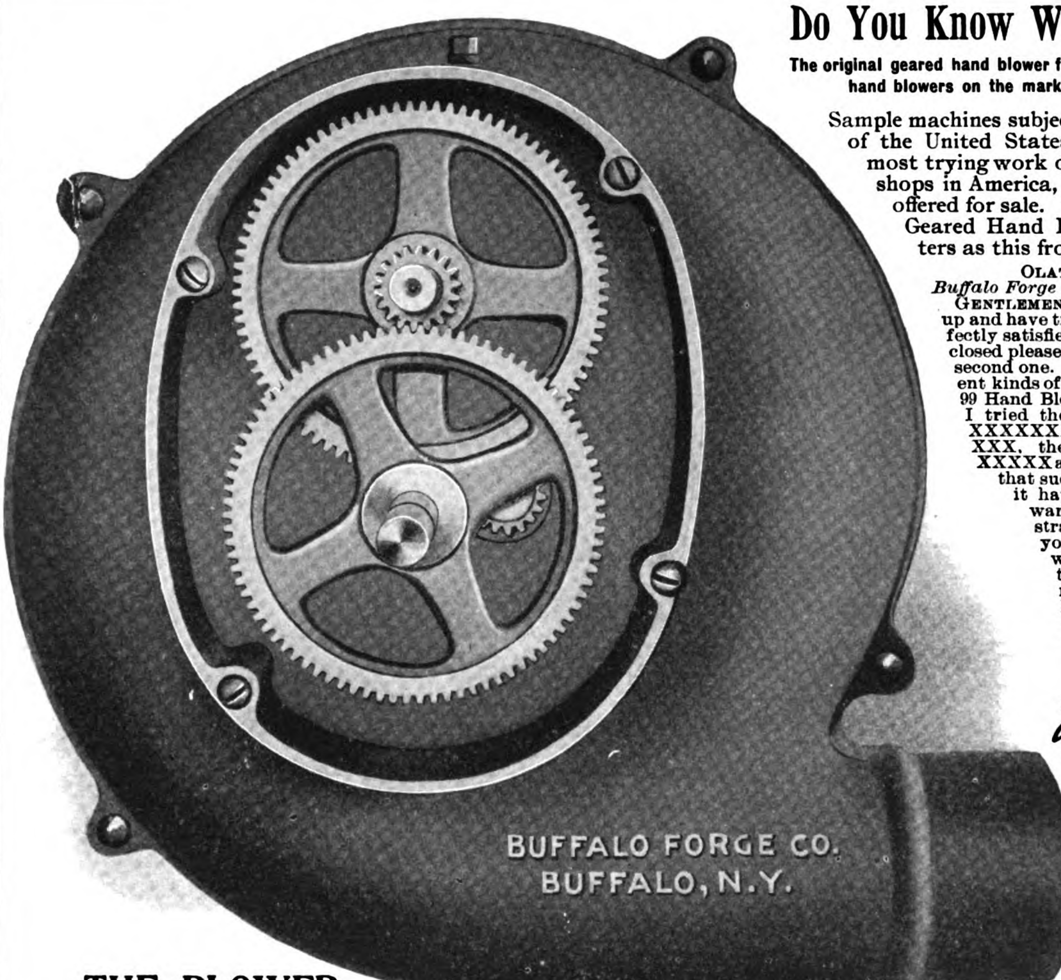
The original geared hand blower from which all imitation geared hand blowers on the market have been modeled.

Sample machines subjected to the heaviest use of the United States Government and the most trying work of several of the largest shops in America, before one blower was offered for sale. That is why 99 Buffalo Geared Hand Blowers bring such letters as this from those who use them.

OLATHE, KANSAS, Dec. 2, 1902.
Buffalo Forge Company, Buffalo, N. Y.
GENTLEMEN:—I have your hand blower up and have tried it two weeks. Am perfectly satisfied with the blower, and enclosed please find an order and draft for second one. I have tried several different kinds of blowers and find your No. 99 Hand Blower superior to them all. I tried the XXX, the XXXXX, the XXXXXXX, the XXXXX, the XX, the XXX, the XXXX, the XXX, the XXXXX and the Old Reliable XXXX, that sucks ashes and cinders when it happens to be turned backward by accident or by a stranger. I will guarantee yours not to do this, as it works either way better than any of them in every respect, and recommend the Buffalo Blower to any blacksmith of any class that needs a good blower.
Yours respectfully,
J. R. Hanzinger.

P. S.—I have had 35 years of experience.

Make no mistake, get the original. Your dealer will place one in your shop for free trial upon request, absolutely without cost to you. Try one and see how you like it. Return if not satisfactory.



THE BLOWER

is supported on a cast iron standard, the mouth of the blower may be turned so as to discharge at angle desired.

SIMPLICITY

Only four gears are used. No complicated machinery to get out of order.

LUBRICATION

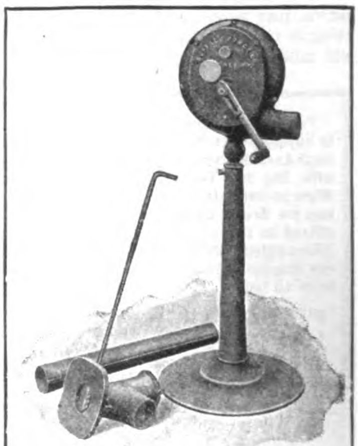
The four gears are enclosed in a dust-proof case. Oil to the depth of one inch may be kept at the bottom of it. In this the lower gear wheel constantly revolves, throwing the oil over the parts and giving ample lubrication to all bearing surfaces.

THE GEARS

The two main gears are machine cut. Absolutely no lost motion and little or no friction. The two small pinions are of special composition, perfectly cut and adjusted.

OPERATION

The operation of the blower is smooth and noiseless. The crank can be worked in either direction to suit the operator. The air blast is strong and uniform and with but ordinary turning will deliver blast sufficient to produce a welding heat on 4-in. iron in ten minutes.



Buffalo Geared Hand Blower, No. 99.

BUFFALO FORGE COMPANY

BUFFALO, N. Y.

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VOLUME 3 — THE — NUMBER 2

THE AMERICAN BLACKSMITH

BUFFALO N.Y. U.S.A.

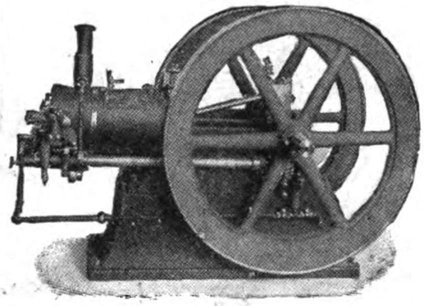
A PRACTICAL JOURNAL OF BLACKSMITHING

NOVEMBER, 1903

$1.00 A YEAR
10¢ A COPY

We are selling

immense quantities of 2½ horse-power Weber Junior and 5 horse-power Weber Engines to blacksmiths and wagon builders all over the country. Why? Because



WEBER ENGINES

Are built right
Run right and
The price is right

And then, too, every purchaser swears by them, because they need no repairs, and require such a little fuel to operate on.

Weber Engines operate on one-tenth of one gallon of gasoline per horse-power per hour

Every Engine Sold is an Advertisement. Every User of a WEBER is an Endorser.

CUNNINGHAM, KAN., Sept. 13, 1901.

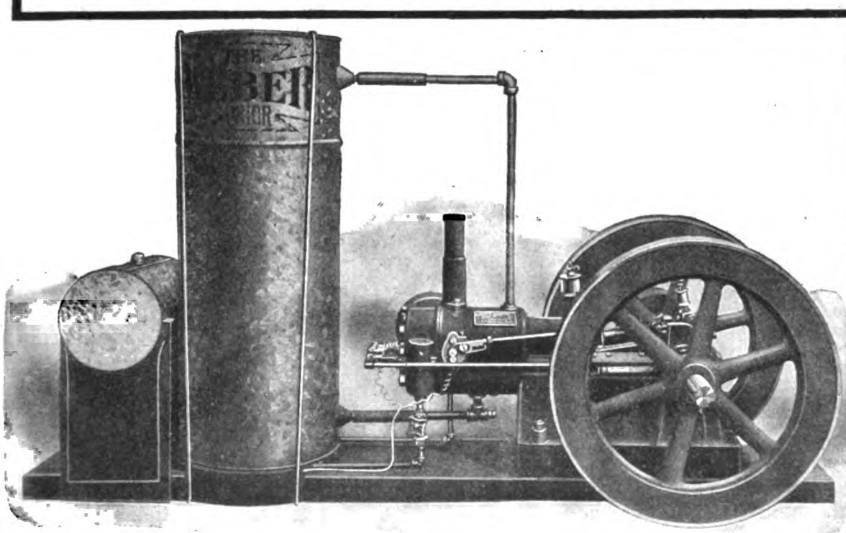
TO BLACKSMITHS: If you are thinking of putting in power in your shop let me say to you, BUY A WEBER 2½ H. P. ENGINE! Don't be afraid about the power—it has all you want to run anything in a blacksmith shop, with power to spare. I had run my shop with a 4 H. P. steam engine for nine years, but I recently changed to the 2½ H. P. Weber, and find it has plenty of power. I run a power hammer, emery grinder, drill, bolt cutter, spoke tennoning machine, wood lathe, iron lathe, and expect to put in two saw machines, all up-to-date tools. I say again, DON'T BE AFRAID OF THE 2½ WEBER.

GEORGE G. SIMONSON.

OVER 7,500 WEBER JUNIOR ENGINES NOW IN USE!

SIMPLE — DURABLE
SOLID — POWERFUL
STRONG — ECONOMICAL

The Junior shown below is shipped (crated) with all fixtures attached ready to set up and run, requiring no pipe fitting or connections—it is HORIZONTAL not Vertical. A horizontal engine is stiffer, safer, stronger and will last longer than any vertical engine on earth.



OUR NEW CATALOGUE

gives much interesting and valuable information about gas engines. Also over one hundred endorsements of the WEBER from blacksmiths and others. FREE. Send postal for it.

EVERY SMITH SHOULD HAVE IT

We Guarantee

all WEBER engines to be of the very best material and workmanship, and agree to replace any defective part, F.O.B., our own works, without cost for two years. We guarantee fuel consumption and interchangeability of parts

All sizes built up to 300 Horse-power

Our nineteen years of experience goes with each "Weber."

Weber Gas and Gasoline Engine Company

Post Office Box V 1114
Kansas City, Missouri

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NOTE.—The Royal Blower is made by the Canedy-Otto Manufacturing Company, Chicago Heights, Illinois. This concern has won a most enviable reputation in the manufacture of FORGES, BLOWERS and DRILLS, and their name on an article is of itself a full guarantee. Wherever civilized man is engaged in construction work, there also will be found the "Royal" and "Western Chief" Forges, Blowers and Drills of these people helping to lighten labor. Their product may be found on sale with the principal dealers everywhere, or a request to them direct for Catalogue will bring full information.

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VOLUME 3 NUMBER 3

THE AMERICAN BLACKSMITH

BUFFALO N.Y. U.S.A.

A PRACTICAL JOURNAL OF BLACKSMITHING

DECEMBER, 1903

$1.00 A YEAR 10¢ A COPY

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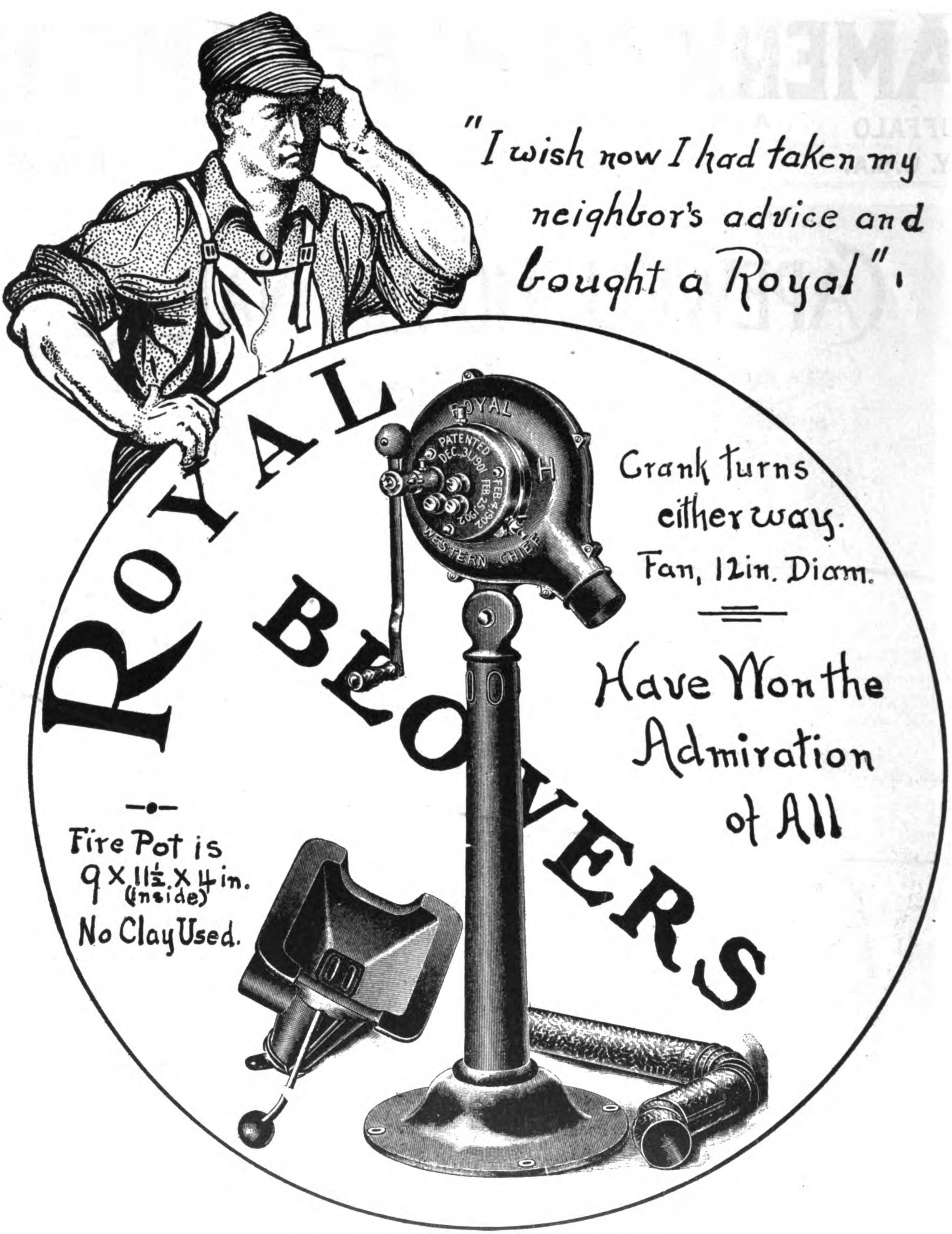

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VOLUME 3 NUMBER 4

THE AMERICAN BLACKSMITH

BUFFALO N.Y. U.S.A.

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JANUARY, 1904

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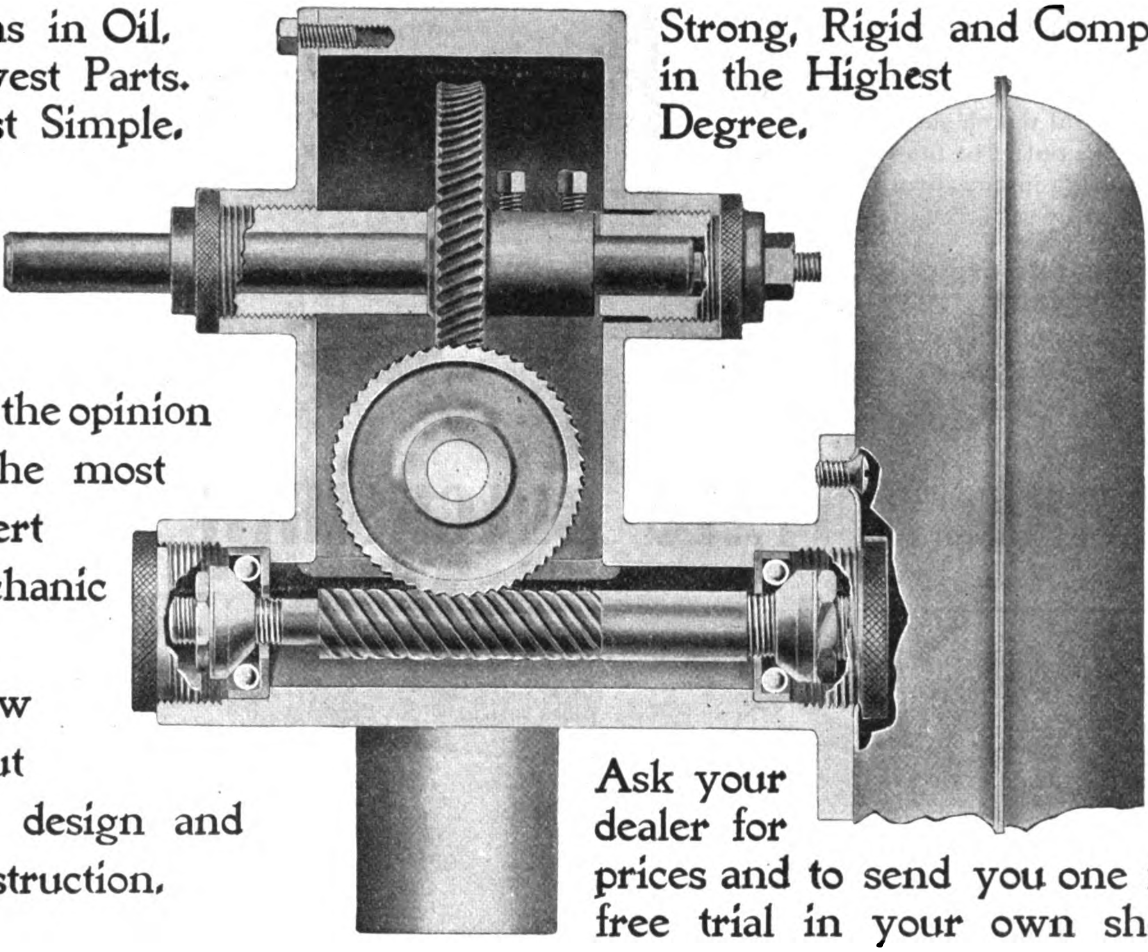
Buffalo Hand Blower No. 100

Runs in Oil.
Fewest Parts.
Most Simple.

Strong, Rigid and Compact in the Highest Degree.



Get the opinion of the most expert mechanic you know about this design and construction.

Ask your dealer for prices and to send you one for free trial in your own shop.

A glance at this cut at once convinces you of the Simplicity and Superiority of this mechanism for operating hand blowers. It is a marvel. The illustration on next page shows the blower complete.

BUFFALO FORGE COMPANY, BUFFALO, N.Y.

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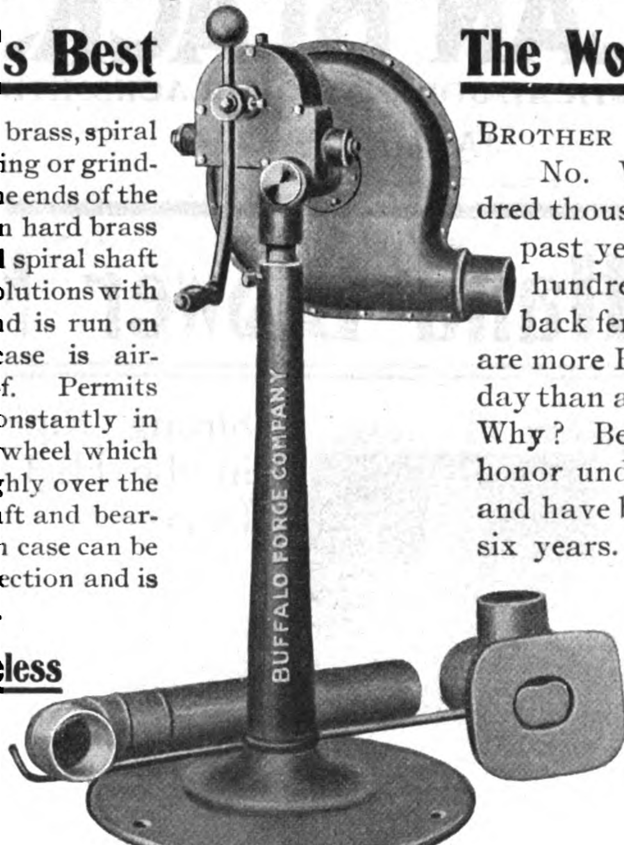
Buffalo Hand Blower No. 100

America's Best — The World's Standard



Spiral wheels of hard brass, spiral shafts of steel. No cutting or grinding can take place. The ends of the two upper shafts run in hard brass bushings. Blast wheel spiral shaft makes thirty-eight revolutions with one turn of crank, and is run on ball-bearings. Gear-case is air-tight and dust-proof. Permits lower shaft to run constantly in oil, feeds lower spiral wheel which throws the oil thoroughly over the upper spiral wheel, shaft and bearings. The outlet of fan case can be set pointing in any direction and is held firm by set-screw.

Absolutely Noiseless

Ask your dealer for prices and to send you one for free trial in your own shop.

Brother Blacksmith:

No. We haven't sold one hundred thousand hand blowers in the past year. Nor did we see those hundred black cats on your back fence. Did you? But there are more Buffalo blowers in use today than all other makes combined. Why? Because they are made on honor under one name, "Buffalo," and have been for the past twenty-six years.

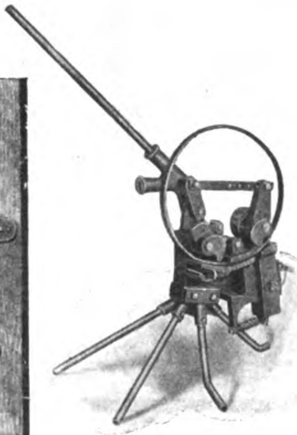
GUARANTEED

at all times and places.

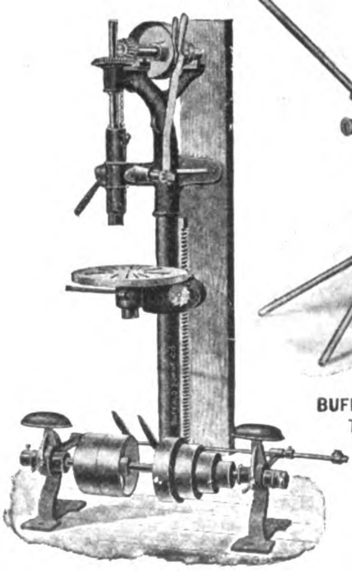
The Latest Design—but efficiency and durability fully established.

OTHER BUFFALO BLACKSMITH TOOLS

BUFFALO COMBINED PUNCH, SHEAR AND BAR CUTTER.

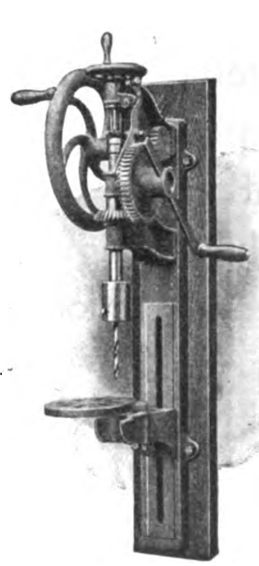


BUFFALO TIRE UPSETTER.



BUFFALO POWER DRILL, No. 87.

"OLD RELIABLE" BLACKSMITH'S FORGE, No. 0.



BUFFALO BLACKSMITH'S DRILL, No. 66.

BUFFALO FORGE COMPANY, BUFFALO, N. Y.

SMY 8 24

VOLUME 3 NUMBER 5

THE AMERICAN BLACKSMITH

BUFFALO N.Y. U.S.A.

A PRACTICAL JOURNAL OF BLACKSMITHING

FEBRUARY, 1904

$1.00 A YEAR 10¢ A COPY

BORAX-ETTE

Causes steel to weld like iron. It is a great advantage over other compounds, as it does not have to be applied between the laps, but is used the same as borax on the outer surface of the work.

IT HAS NO EQUAL

FOR WELDING STEEL TIRES, AXLES AND SPRINGS.

FOR PLOW WORK, TRY IT AND SEE.

We wish to send a Free Sample postpaid to every Blacksmith in the United States and Canada. Send name and address and receive sample.

For Sale by all Leading Dealers in Blacksmiths' Supplies.

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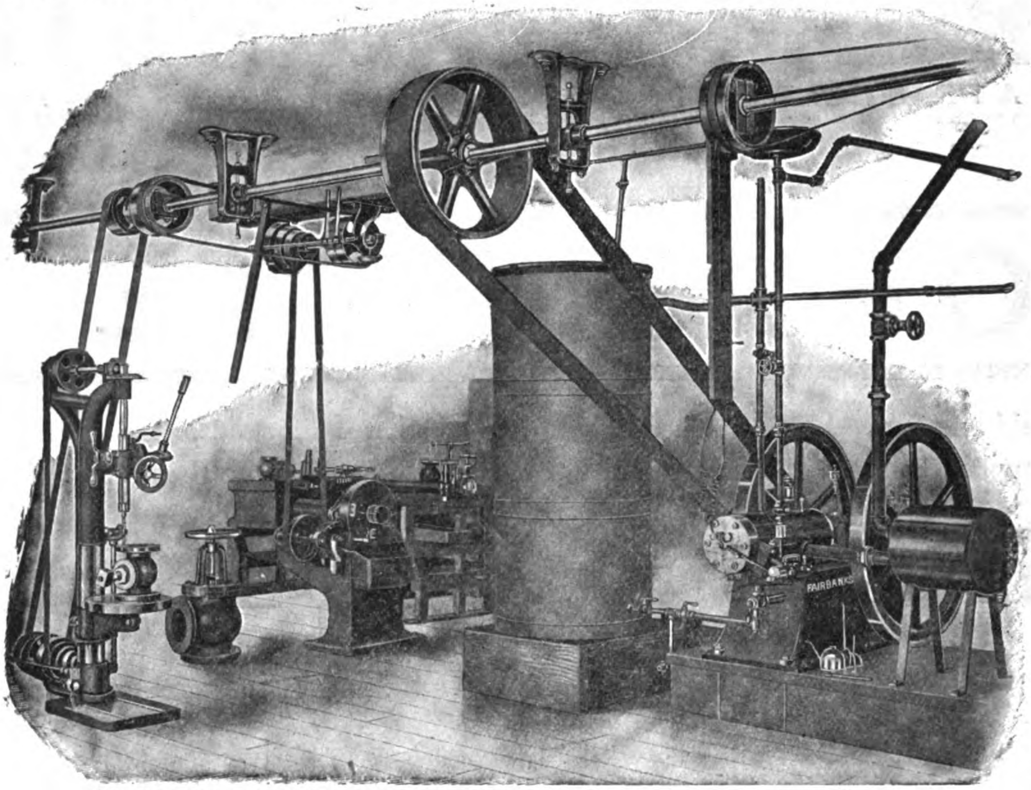
FAIRBANKS GAS and... GASOLINE ENGINES



Above illustration, taken from a photograph, shows one of our engines operating small shop.

Reliable
Efficient
and
Economical

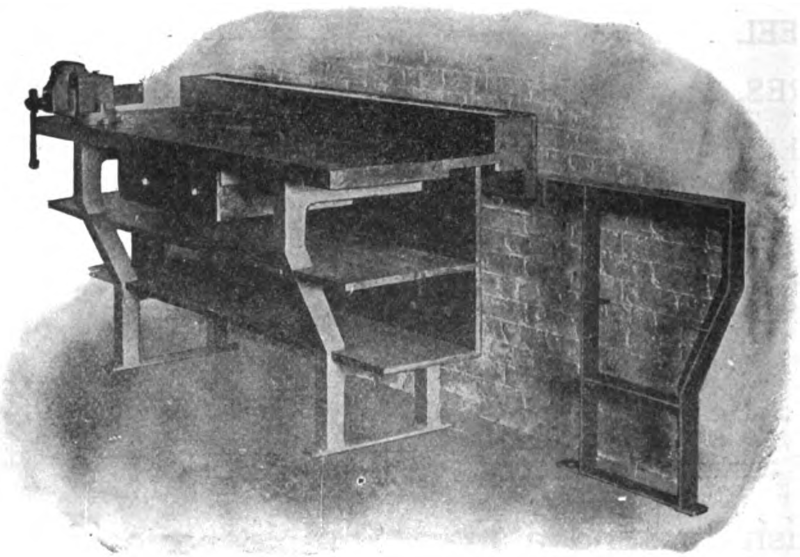
Horizontal
or
Vertical

ONE to
ONE HUNDRED
HORSE POWER

Catalogue 374 A
on application

The Fairbanks Improved Bench Leg

An Improved Work Bench for Wood or Metal Workers



This bench costs less and is better than the old-fashioned wooden bench.

Send for
Catalogue
374 B

We are selling a great many of these. They take well and the price is low. Let us quote you.

THE FAIRBANKS COMPANY

COR. BROOME AND ELM STREETS, NEW YORK

PHILADELPHIA BUFFALO ALBANY NEW ORLEANS BOSTON PITTSBURGH BALTIMORE
MONTREAL, P.Q. VANCOUVER, B.C. WINNIPEG, MAN. LONDON, ENG. HARTFORD, CONN. TORONTO, ONT.

We are the largest dealers in Scales, Valves, Gas Engines, Machine Tools and General Supplies.

SMY 8 24

VOLUME 3 NUMBER 6

THE AMERICAN BLACKSMITH

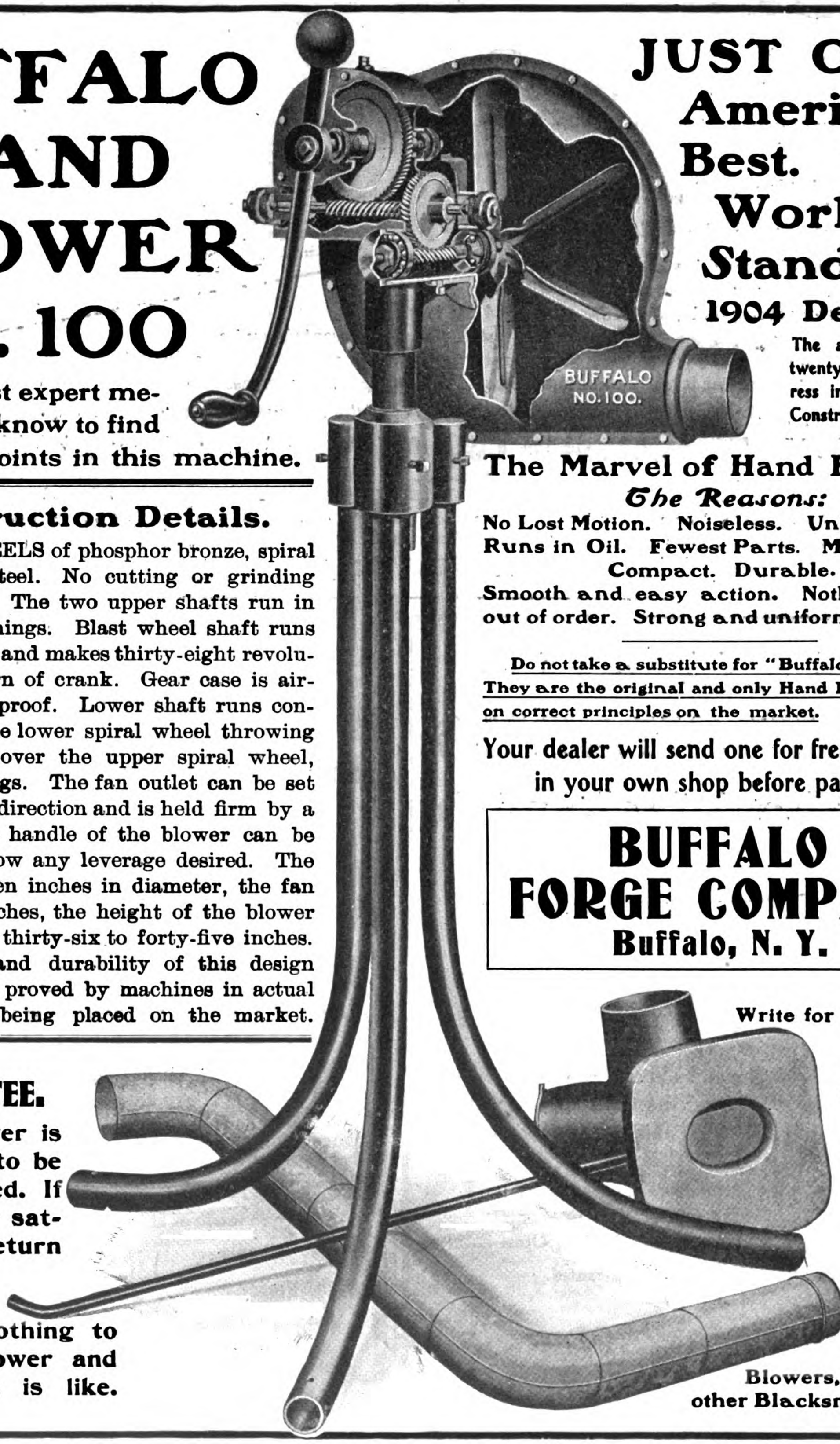
BUFFALO
N.Y. U.S.A.

A PRACTICAL JOURNAL OF BLACKSMITHING
MARCH, 1904

$1.00 A YEAR
10¢ A COPY

BUFFALO HAND BLOWER No. 100

Ask the most expert mechanic you know to find any weak points in this machine.



Construction Details.

SPIRAL WHEELS of phosphor bronze, spiral shafts of steel. No cutting or grinding can take place. The two upper shafts run in hard brass bushings. Blast wheel shaft runs on ball bearings and makes thirty-eight revolutions to one turn of crank. Gear case is airtight and dust proof. Lower shaft runs constantly in oil, the lower spiral wheel throwing oil thoroughly over the upper spiral wheel, shaft and bearings. The fan outlet can be set pointing in any direction and is held firm by a set screw. The handle of the blower can be adjusted to allow any leverage desired. The blast wheel is ten inches in diameter, the fan case fourteen inches, the height of the blower adjustable from thirty-six to forty-five inches. The efficiency and durability of this design have been fully proved by machines in actual service before being placed on the market.

GUARANTEE.

This blower is guaranteed to be as represented. If not perfectly satisfactory, return at our expense. It costs you nothing to test the blower and see what it is like.

JUST OUT
America's Best. The World's Standard.

1904 Design.

The achievement of twenty-six years' progress in Hand Blower Construction.

The Marvel of Hand Blowers

The Reasons:

No Lost Motion. Noiseless. Unbreakable. Runs in Oil. Fewest Parts. Most Simple. Compact. Durable. Smooth and easy action. Nothing to get out of order. Strong and uniform air blast.

Do not take a substitute for "Buffalo" machines. They are the original and only Hand Blowers built on correct principles on the market.

Your dealer will send one for free trial in your own shop before paying for it.

BUFFALO FORGE COMPANY
Buffalo, N. Y.

Write for Latest Descriptive Circular.

Gives Full Details.

Sent Free on Application.

Send also for our handsome new Catalogue of Forges, Blowers, Drills and other Blacksmith Tools.

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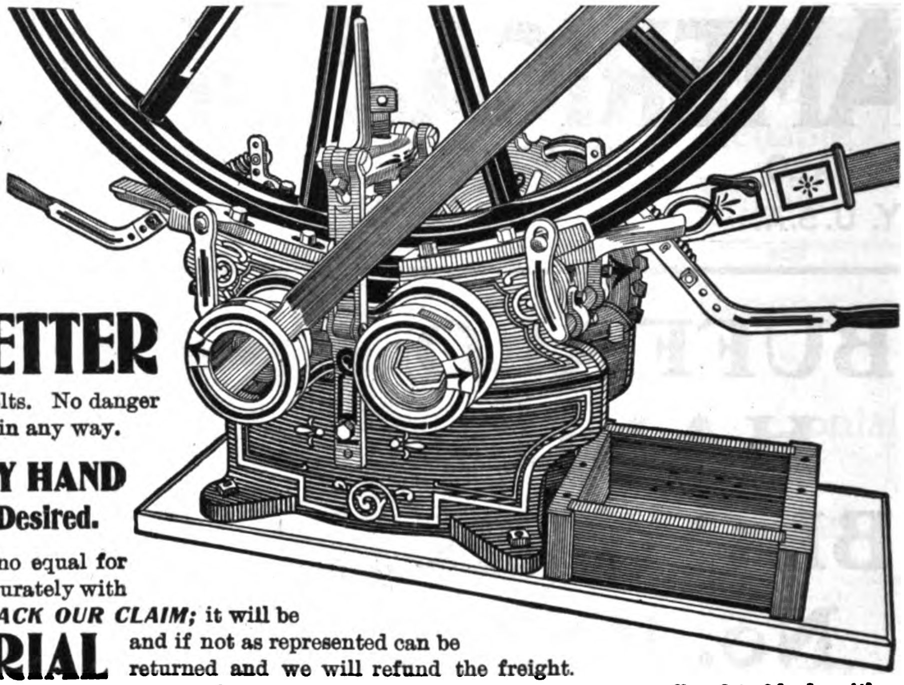
Five Minutes

at the most is all the time it takes to set a tire, heavy or light, with a

BROOKS COLD TIRE SETTER



You don't have to remove tire or bolts. No danger of overdishing or injuring the wheel in any way.

IT SETS TIRES COLD BY HAND

And Gives Just the Dish Desired.

We claim that this machine has no equal for doing the work rapidly, easily and accurately with less labor than any other, and ***WE BACK OUR CLAIM;*** it will be

SHIPPED ON TRIAL and if not as represented can be returned and we will refund the freight.

The Brooks Cold Tire Setter is without doubt the best trade bringer and greatest money maker ever offered to blacksmiths.

Are you prepared for spring trade? Write for further information today.

The BROOKS TIRE MACHINE CO., 121 North Water Street, Wichita, Kansas.

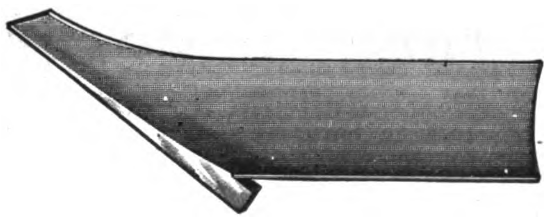
Saves Figuring You will not have to stop to figure out this or that dimension on a piece of work. Just refer to **Foden's Mechanical Tables**

This book gives Circumferences of Circles by eighth inches up to twenty feet, weight of Rectangular Iron, Round and Square Bar Iron, Angle and Sheet Iron, and other miscellaneous tables. CLOTH BOUND. PRICE, 50 CENTS. Sent to any part of the world postage prepaid.

American Blacksmith Company, DRAWER 974, BUFFALO, N.Y.

WELDED PLOW SHARES

For the Blacksmith



The Star "Quick Repair" Share is without doubt the most satisfactory welded share on the market. It is so made that it can easily and quickly be fitted to ANY PLOW.

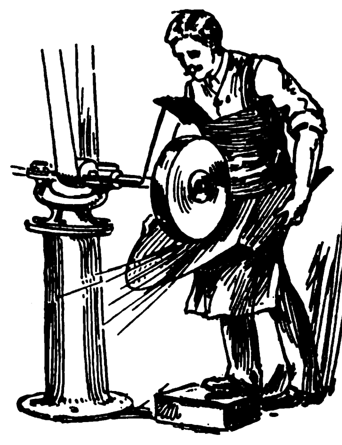
If you are not using these shares, order some from your Jobber. They are made in all sizes and qualities.

All STAR Shares have our heavy Patented Upset Shin.

All STAR goods fully warranted.

Star Manufacturing Co.,

Carpentersville, Ill.



"CHICAGO" EMERY WHEELS

CUT QUICK.

A wheel that will do the work in one-fourth to one-half less time is by far the cheapest in the long run. A wheel that will save only one hour per day during your busy season would pay for itself in full.

"CHICAGO" WHEELS save time.

They're made of stuff that cuts.

Emery Wheels,
Glue, Emery,
Polishing Wheels,
Grinding Machinery.

Made by Chicago Wheel & Mfg. Co.
42 W. RANDOLPH ST.
CHICAGO, U. S. A.

136 Page Catalogue for the Asking.

VOLUME 3 NUMBER 7

THE AMERICAN BLACKSMITH

BUFFALO N.Y. U.S.A.

A PRACTICAL JOURNAL OF BLACKSMITHING

APRIL, 1904

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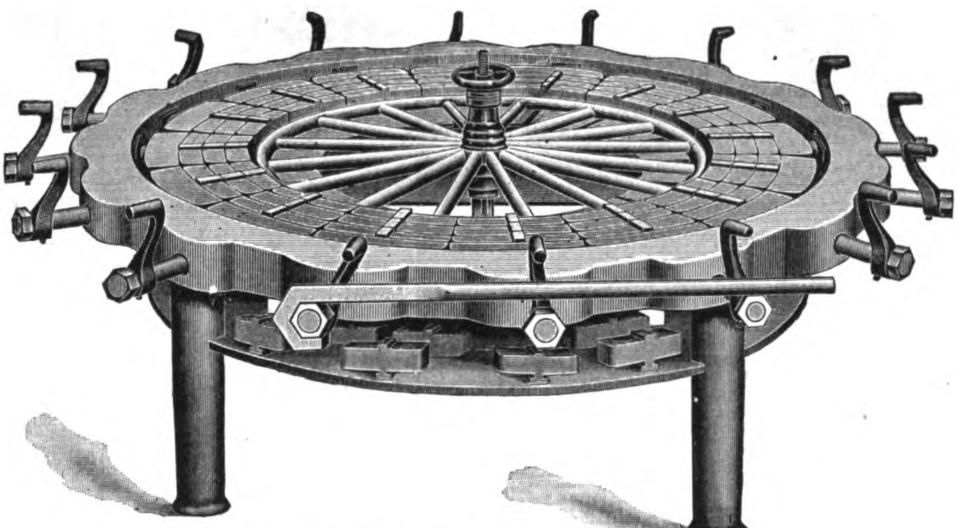
The HENDERSON Hand Power Tire Setter

Leads all others in Sales, in Effective Work, and in Money-Making Qualities. It was the PIONEER four years ago and IS the LEADER today.

Over 850 in use. The sun never sets on a Henderson. Jack Screws and Levers make it a very powerful machine.



It does the work in one fifth of the usual time.

It is COMMON SENSE to use a CIRCULAR MACHINE to repair CIRCULAR WHEELS. With the HENDERSON, tires are set perfectly, the dish is regulated absolutely and all parts of a wheel are trued up and made to fit SOLIDLY together, pressure being applied all around the wheel and especially where needed.

Buy the best machine, it is the cheapest. Buy a machine that has been thoroughly tested by use. Buy the machine that your fellow-workmen recommend. Buy a Henderson because you will make

FIVE TIMES MORE MONEY WITH IT THAN WITHOUT IT.

Write for circulars, prices and terms.

We have a new, Cheap Machine for buggy and spring wagon wheels which we will call the STANDARD. Get circulars and prices of it.

Standard Tire Setter Company

Keokuk, Iowa

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CARRIAGE MAKER and BLACKSMITH TOOLS

Hub Boxing Machines, Spoke Tenon Machines, Band Saws, sizes 20, 26, 32 and 36 inch, Forges, and a complete line of hand and light Power Drills, a 19-inch Post Drill and a 20-inch Round or Square Base Drill with Lever or Screw Feed. The last two drills are used extensively by Carriage Builders and others.

THE "ELITE" BLOWER

is correctly manufactured and is designed to meet the demands of hard service, together with the greatest possible efficiency, durability and convenience.

IT'S A MONEY MAKER.

Fig. 900, 12 inch.

Manufactured by

THE

SILVER MFG. CO.

365 BROADWAY

SALEM, OHIO

U. S. A.

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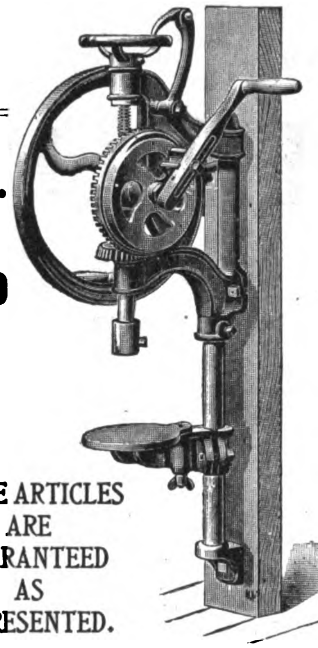

Fig. 731, No. 1.

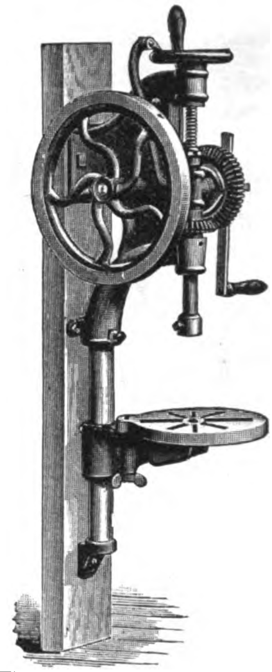

Fig. 742, No. 12.

Special prices are extended to Carriage Makers and Smiths if this paper is mentioned.

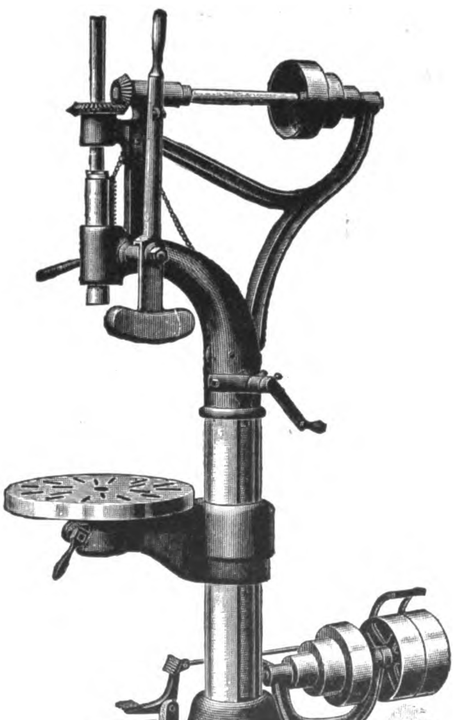

Fig. 850, 20 inch.

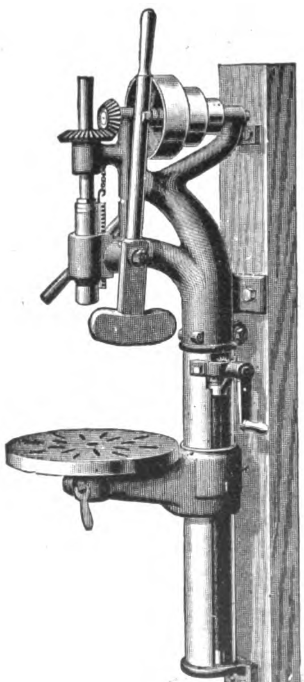

Fig. 727, 19 inch.

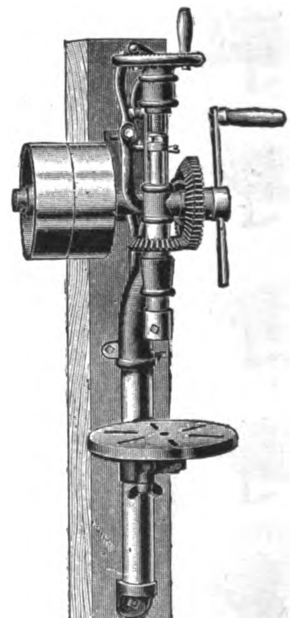

Fig. 746, No. 12.

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VOLUME 3 — NUMBER 8

THE AMERICAN BLACKSMITH

BUFFALO N.Y. U.S.A.

A PRACTICAL JOURNAL OF BLACKSMITHING

MAY, 1904

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BORAX-ETTE

CAUSES STEEL TO WELD LIKE IRON

FOR SALE BY LEADING DEALERS IN BLACKSMITH'S SUPPLIES

SAMPLE FREE

Cortland Welding Compound Co.

CORTLAND, N. Y.

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Carriage Maker and Blacksmith Tools

Fig. 900, 12 inches.

Special Prices to Carriage Makers and Blacksmiths if this paper is mentioned.

Fig. 900, "Elite," Silver Blower (*patent applied for*) is distinctive in design, has cut gearing and removable, interchangeable bronze bearings for gear pinions. The gearing is self contained and attached to side of fan case, has an outer bearing plate over it and is thus permanently secured so that there is no unnecessary friction or lost power. The gear covering is removable without disturbing the gearing or paddle spider. There is a light tuyere for clay lining and a heavy one to use without lining. All parts are interchangeable.

Fig. 822, Band Saws are made in sizes 20 and 26 inch for foot or belt power and 32 and 36 inch for belt power. They are admirably adapted to factory and repair work of every kind.

Fig. 718, Spoke Tenon Machine cuts tenons $\frac{7}{16}$ to 2 inches diameter up to 6 inches long and also bores the felloe.

Fig. 709, Taper Hub Boxing Machine is made as illustrated, on legs and also without legs to mount on bench. It bores tapering holes in the hubs for the boxes and cuts the recesses for nuts and collars.

Made also for hand and power.

Also Forges, and a complete line of Hand and Power Drills.

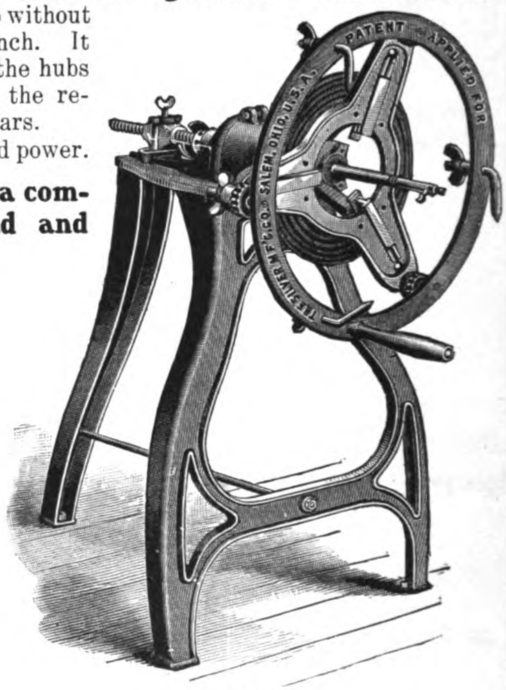

Fig. 709.

Manufactured by

THE SILVER MFG. CO.,

365 Broadway,

SALEM, OHIO.

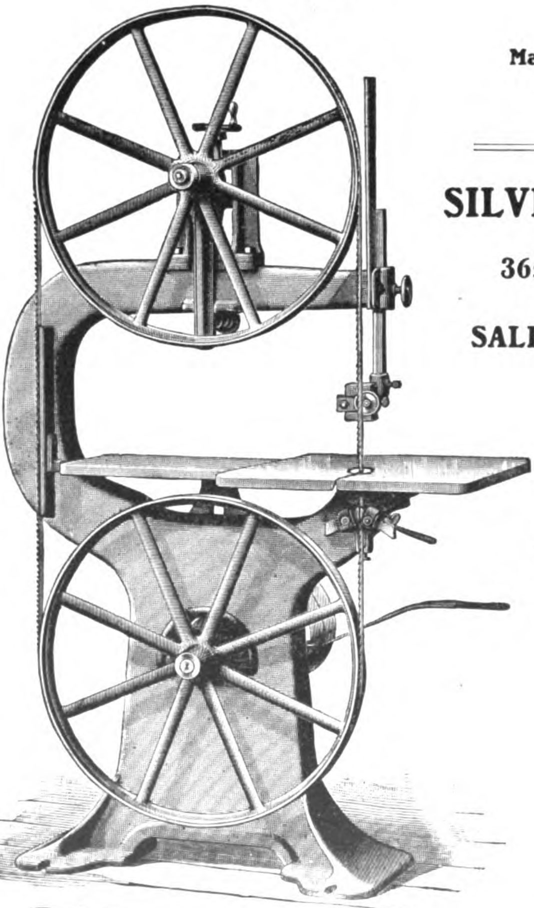
Fig. 822, 32 inch.

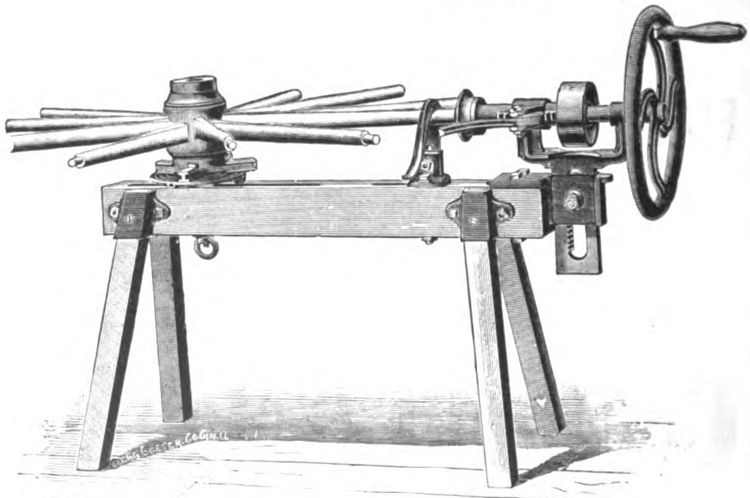
Fig. 718.

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VOLUME 3 — NUMBER 9

THE AMERICAN BLACKSMITH

BUFFALO N.Y. U.S.A.

A PRACTICAL JOURNAL OF BLACKSMITHING

JUNE, 1904

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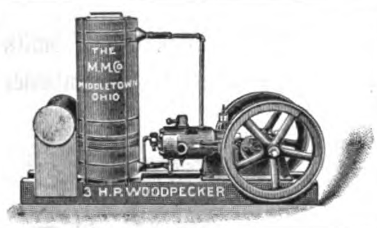
WOODPECKERS

SAVE ONE-THIRD IN PRICE
SAVE THE COST OF FOUNDATION
SAVE THE COST OF EXPERT SETTING
SAVE TWO-THIRDS IN ATTENDANCE
SAVE THREE-THIRDS OF TROUBLE
SAVE THREE-THIRDS OF SHUT DOWNS
SAVE CASH MONEY IN FUEL EXPENSE
SAVE THREE-THIRDS IN REPAIRS
SAVE THREE-THIRDS OF EDUCATIONAL EXPENSE

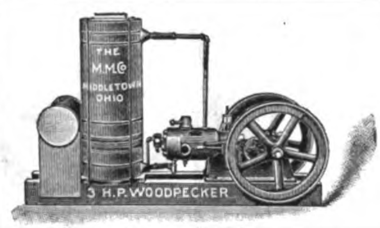
Direct from the Factory **To You** During June

ALL SIZES Shipped Complete with Tanks, Batteries, Etc., all self-contained. "Ready to Run." GAS OR GASOLINE.



May be set on dirt or board floor without foundation, or be placed on the bolsters of any wagon for portable work.

Will run your machinery one-half hour after you unload it.



GUARANTEED to be without an equal in style, finish, painting, design, workmanship, material, durability, fuel economy, regularity of speed under varying loads of commercial work of any kind, or for electric lighting. Will run without fastening down, without vibration. Will run anything that requires power. We are therefore able to guarantee these engines in every particular.

NET PRICES:

3-H. P.	$125.00
5-H. P.	271.25
6-H. P.	298.75
7-H. P.	327.50
8-H. P.	350.00
10-H. P.	413.00
11-H. P.	435.50
12-H. P.	458.00
13-H. P.	471.50
14-H. P.	500.00
15 H. P.	544.00
16-H. P.	578.75
18-H. P.	628.75

TERMS:

1/3 Check with order.
1/3 Draft with bill of lading.
1/3 90 days' time.

Money cheerfully refunded if you feel that the engine does not bear out all of the above after 30 days' trial.

REFERENCES:

The First National Bank, Middletown, Ohio.
The Merchants' National Bank, Middletown, Ohio.
The Oglesby and Barnitz Banking Co., Middletown, Ohio.
Dun or Bradstreet Agencies anywhere.

SEND ORDERS TO
THE MIDDLETOWN MACHINE CO.
MIDDLETOWN, OHIO
WOODPECKER DEPARTMENT

REMEMBER THAT OUR PRICES ARE NOT ON CHEAP ENGINES, CARLESSLY MADE, BUT UPON THE BEST MACHINES IT IS POSSIBLE TO PRODUCE AND MONEY SAVERS IN EVERY SENSE OF THE WORD.

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CARRIAGE MAKER and BLACKSMITH TOOLS

Hub Boxing Machines, Spoke Tenon Machines, Band Saws, sizes 20, 26, 32 and 36 inch, Forges, and a complete line of hand and light Power Drills, a 19-inch Post Drill and a 20-inch Round or Square Base Drill with Lever or Screw Feed. The last two drills are used extensively by Carriage Builders and others.

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is correctly manufactured and is designed to meet the demands of hard service, together with the greatest possible efficiency, durability and convenience.

IT'S A MONEY MAKER.

Fig. 900, 12 inch.

Manufactured by

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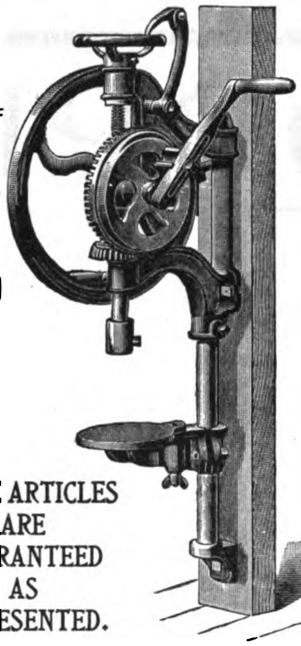

Fig. 731, No. 1.

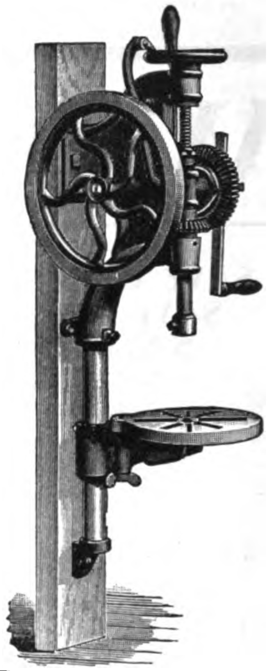

Fig. 742, No. 12.

Special prices are extended to Carriage Makers and Smiths if this paper is mentioned.

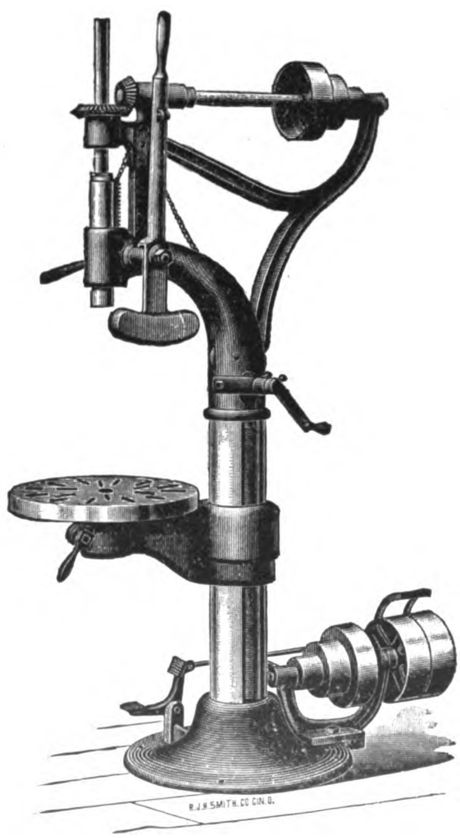

Fig. 850, 20 inch.

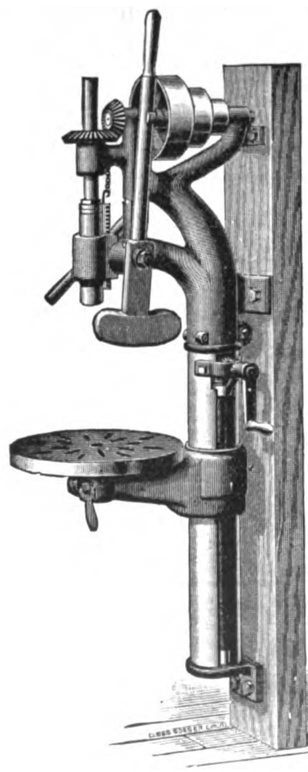

Fig. 727, 19 inch.

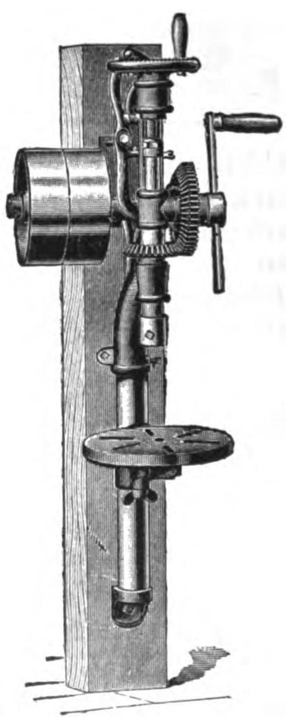

Fig. 746, No. 12.

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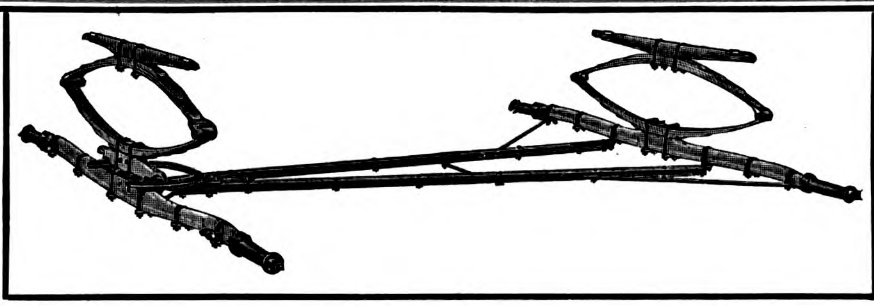
VOLUME 3 | NUMBER 10

THE AMERICAN BLACKSMITH

BUFFALO N.Y. U.S.A. | A PRACTICAL JOURNAL OF BLACKSMITHING | $1.00 A YEAR 10¢ A COPY

JULY, 1904

Elliptic Spring Buggy Gear



Catalog No. 214 b. Drop axles, $\frac{15}{16}$x6½ inches; half patented fantail swaged, springs, 1¼x3 inches, oil tempered, elliptic, double sweep, fifth wheel with rear king bolt; reaches, axle caps and spring bars of selected hickory. We carry this gear in stock for bodies 20, 22 and 24 inches wide, 52 and 54 inches long, and for either 4-foot 8-inch or 5-foot 1-inch track. We must have width and length of body and width of track.

This is not a high grade gear, but is the very best made for the money.

The size of shafts that should be used with this gear is 1⅜x1⅞.

The size of wheels: 1-inch spoke, 6½-inch hub, ¾-inch tread; or $1\frac{1}{16}$-inch spoke, 6½-inch hub, ⅞-inch tread.

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Carriage Maker and Blacksmith Tools

Special Prices to Carriage Makers and Blacksmiths if this paper is mentioned.

Fig. 900, 12 inches.

Fig. 900, "Elite," Silver Blower (*patent applied for*) is distinctive in design, has cut gearing and removable, interchangeable bronze bearings for gear pinions. The gearing is self contained and attached to side of fan case, has an outer bearing plate over it and is thus permanently secured so that there is no unnecessary friction or lost power. The gear covering is removable without disturbing the gearing or paddle spider. There is a light tuyere for clay lining and a heavy one to use without lining. All parts are interchangeable.

Fig. 822, Band Saws are made in sizes 20 and 26 inch for foot or belt power and 32 and 36 inch for belt power. They are admirably adapted to factory and repair work of every kind.

Fig. 718, Spoke Tenon Machine cuts tenons $\frac{7}{16}$ to 2 inches diameter up to 6 inches long and also bores the felloe.

Fig. 709, Taper Hub Boxing Machine is made as illustrated, on legs and also without legs to mount on bench. It bores tapering holes in the hubs for the boxes and cuts the recesses for nuts and collars.

Made also for hand and power.

Also Forges, and a complete line of Hand and Power Drills.

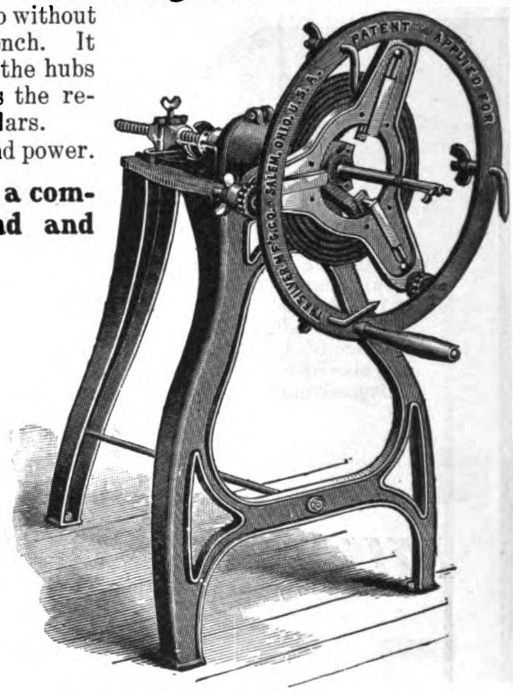

Fig. 709.

Manufactured by

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SALEM, OHIO.

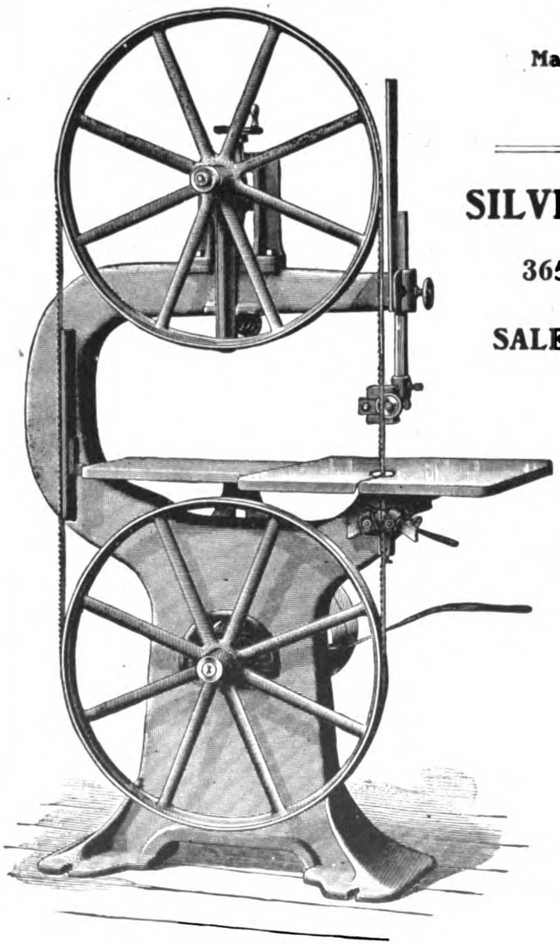

Fig. 822, 32 inch.

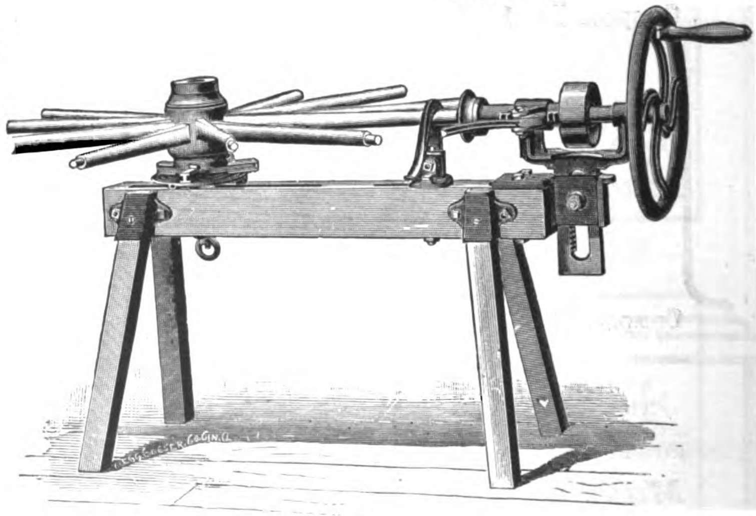

Fig. 718.

VOLUME 3 THE NUMBER 11

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BUFFALO N.Y. U.S.A.

A PRACTICAL JOURNAL OF BLACKSMITHING

AUGUST, 1904

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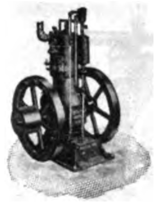
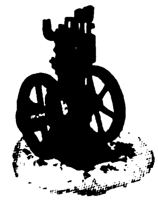

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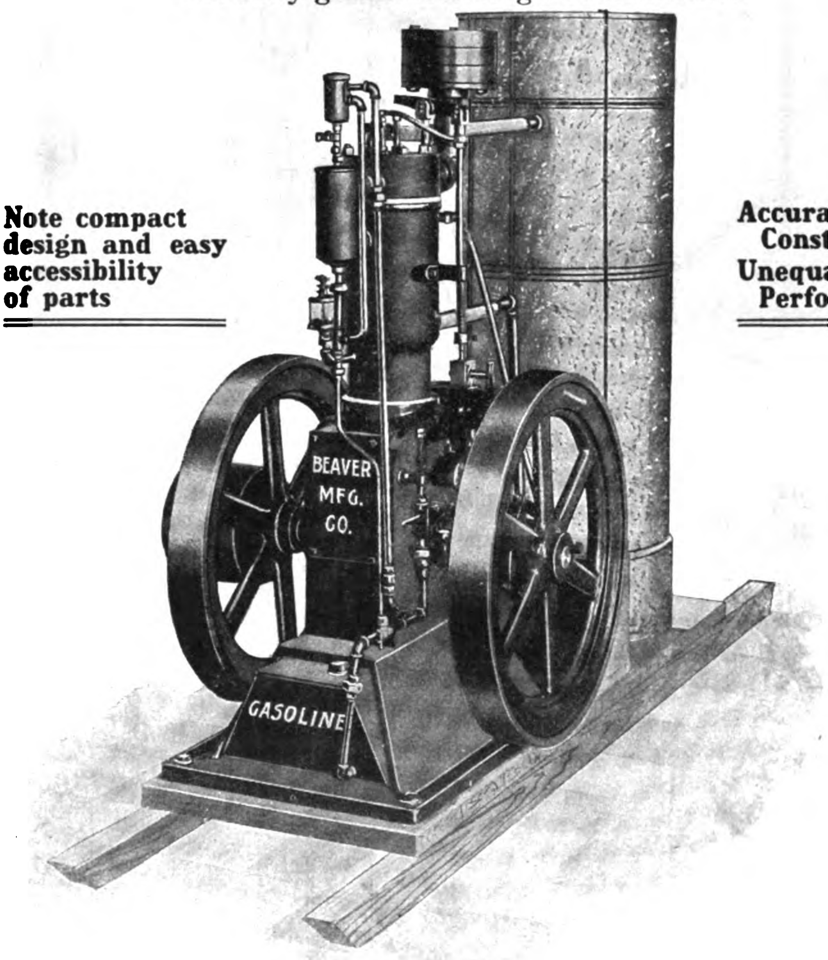

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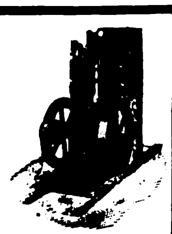
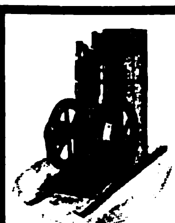

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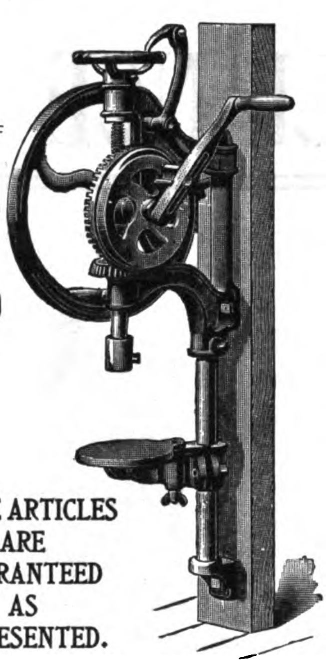

Fig. 731, No. 1.

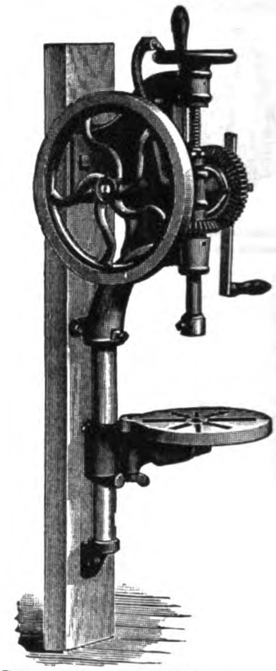

Fig. 742, No. 12.

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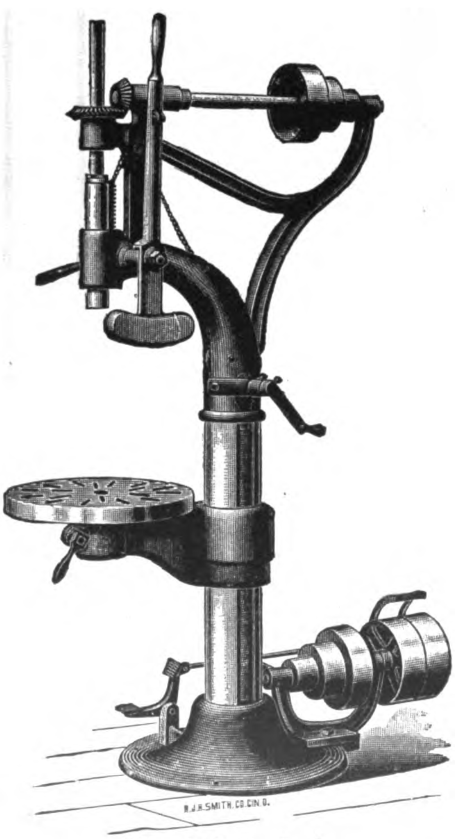

Fig. 850, [illegible] inch.

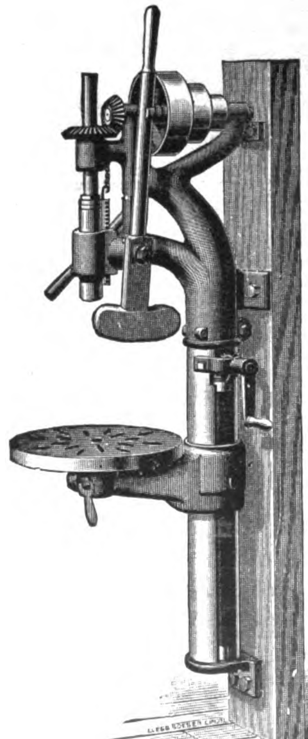

Fig. 727, 19 inch.

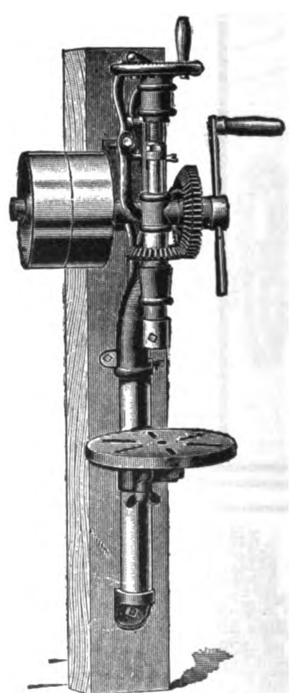

Fig. 746, No. 12.

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VOLUME 3 NUMBER 12

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Fig. 900, "Elite," Silver Blower (*patent applied for*) is distinctive in design, has cut gearing and removable, interchangeable bronze bearings for gear pinions. The gearing is self contained and attached to side of fan case, has an outer bearing plate over it and is thus permanently secured so that there is no unnecessary friction or lost power. The gear covering is removable without disturbing the gearing or paddle spider. There is a light tuyere for clay lining and a heavy one to use without lining. All parts are interchangeable.

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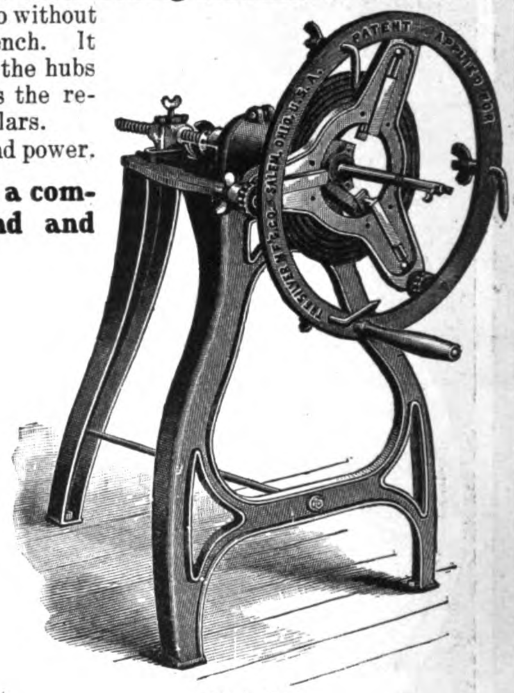

Fig. 709.

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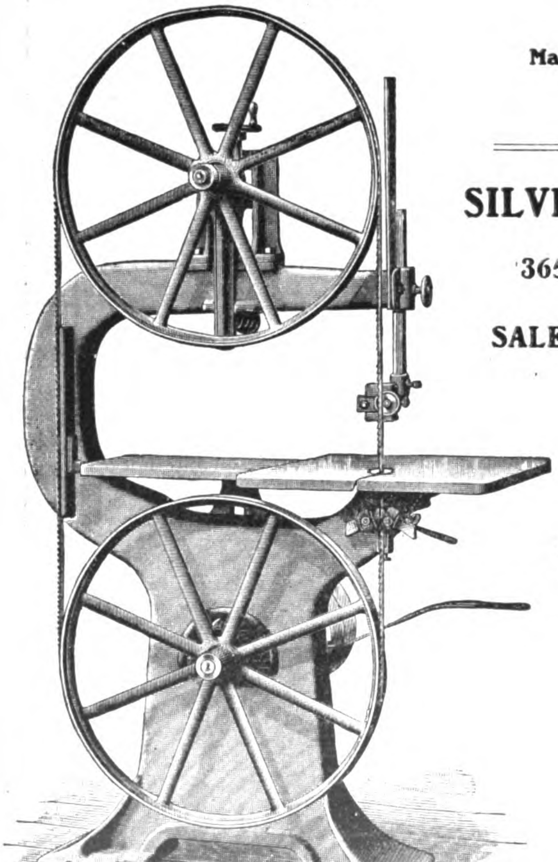

Fig. 822, 32 inch.

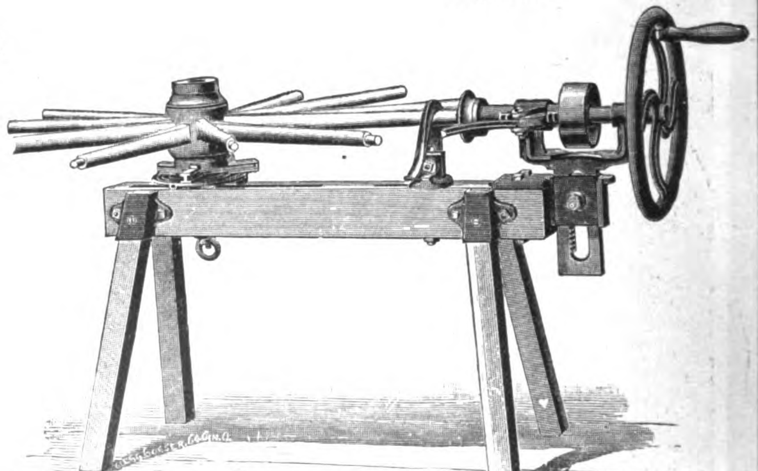

Fig. 718.

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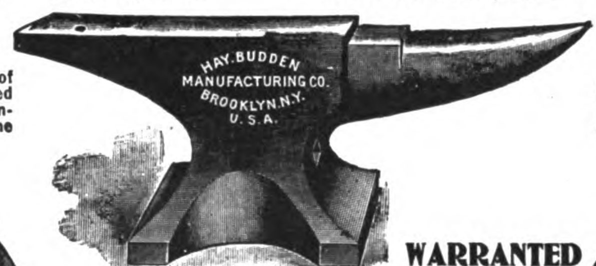

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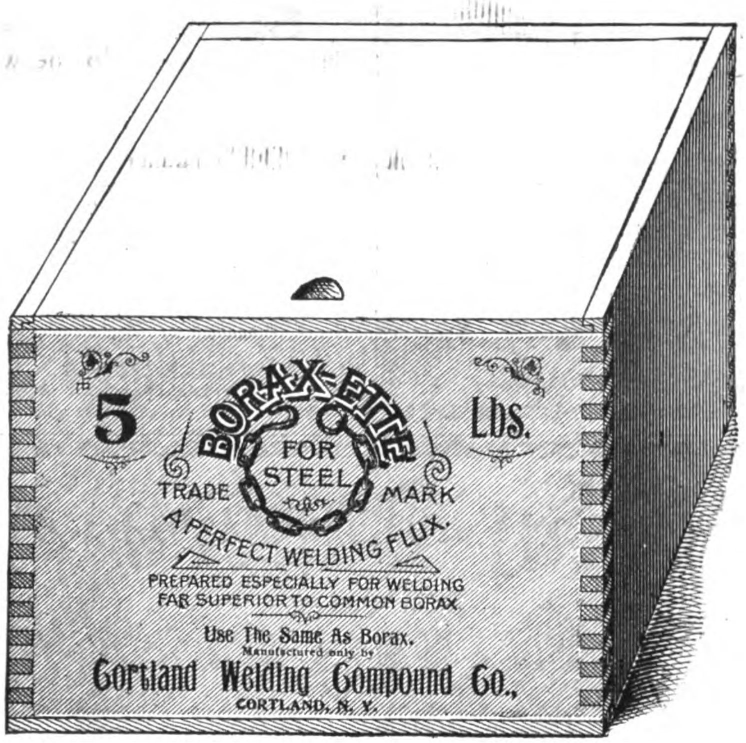

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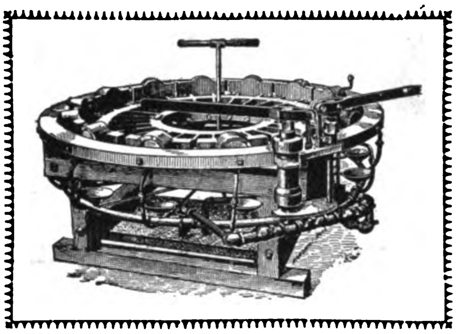

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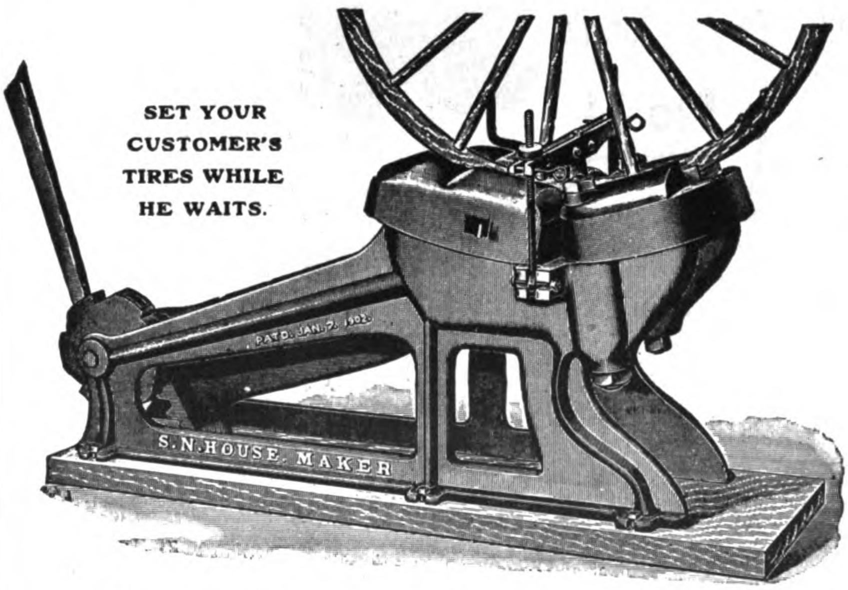

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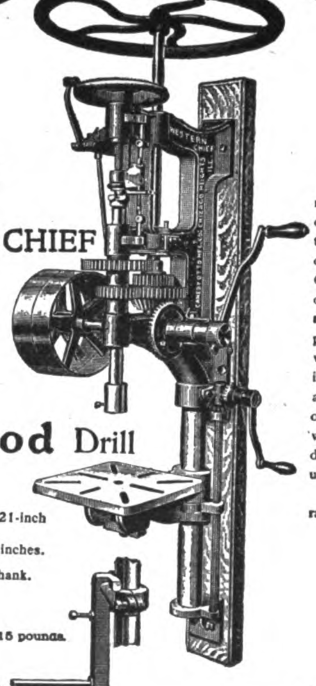

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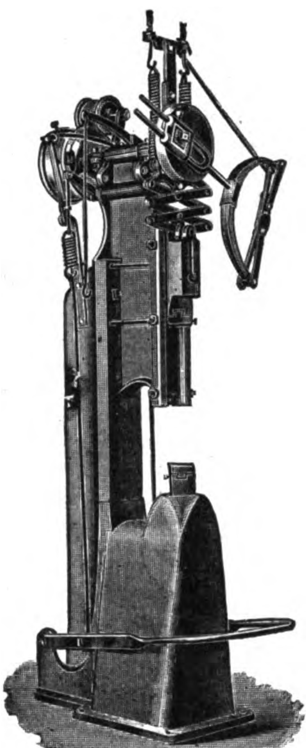

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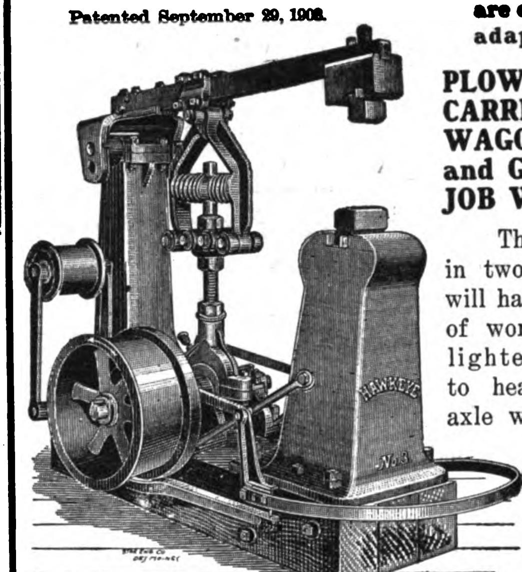

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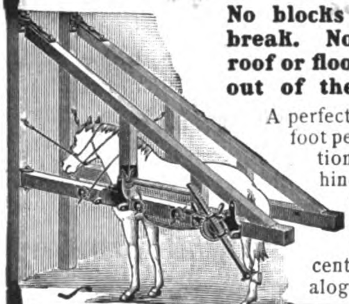

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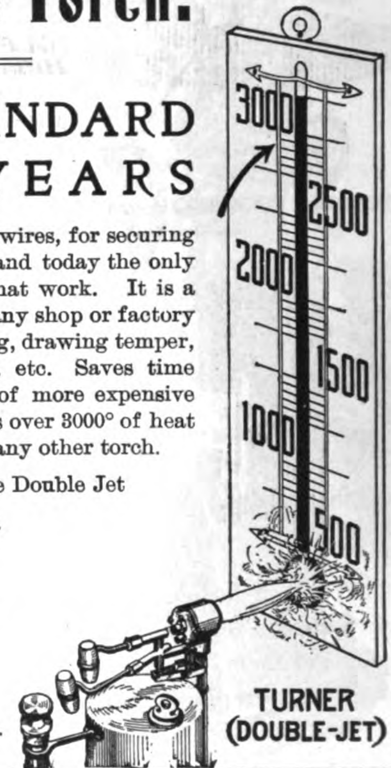

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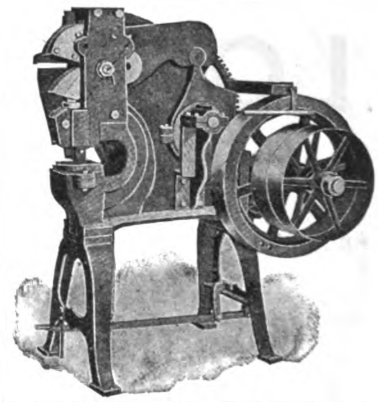

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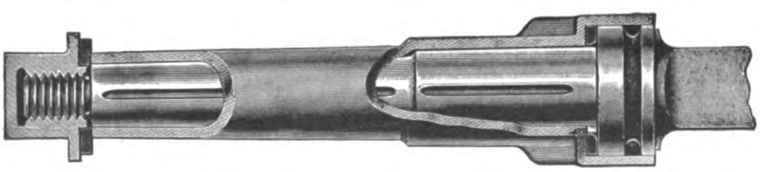

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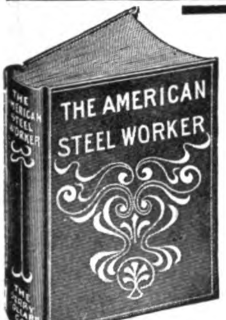


"BEST BOOK I EVER SAW"

Writes a blacksmith. Lots of others say so, too. Markham has been hardening steel for 27 years and studying it all the time. He tells in plain English just how to handle each case. Shows the best methods; but if you can't get them, it tells you how to do good work with what you have.

You can build a first class furnace if you want to from his plans and use any fuel you like.

Don't think you've got this information in other books—you haven't. It isn't there. Other books may read nicely and sound well, but none of the authors has had Markham's experience, and that's what counts.

343 pages, $2.50.

Money back if not satisfied, or sent on approval.

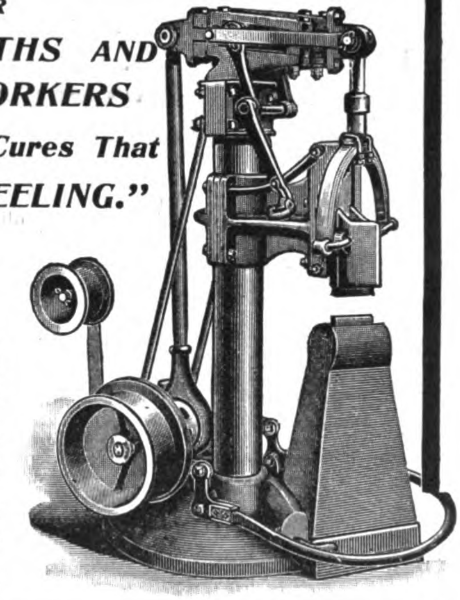
AMERICAN BLACKSMITH COMPANY,
P. O. Drawer 974. BUFFALO, N. Y.

MODERN POWER HAMMER

FOR

BLACKSMITHS AND IRON WORKERS

Used Daily Cures That "TIRED FEELING."



Height, 5 Feet.
Floor Space, 30x40 Inches.
Weight, 1200 Lbs.

Length of stroke changed instantly while running. The only hammer made that will strike a very light blow at full speed. All others slow down to get a light blow.

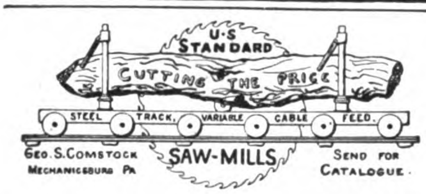
The "Modern" gives you any blow you want at any speed; hand lever controls the force of blow, foot treadle controls the speed.

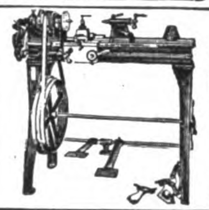
Long planed guides adjustable for wear. Cast steel hammer adjustable up and down to suit thickness of stock. Tool steel dies.

Greater range of work than any other hammer.

MANUFACTURED AND FULLY GUARANTEED.

GRINNELL MFG. CO.,
GRINNELL, IOWA.
SUCCESSORS TO THE KOCH MFG. CO.





LATHES

First-class Tools at reasonable prices. We build foot and power lathes from 9 in. to 15 in. Sensitive drills, emery grinders and wood lathes. Write for complete catalog. We guarantee to interest you.

THE CARROLL-JAMIESON MACHINE TOOL CO.
BATAVIA, OHIO - - U. S. A.

RUBBER TIRED TOP BUGGY. $27.50

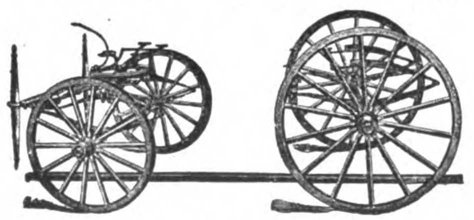
RUNABOUT, $35.00

BUGGY TOPS, $4.50

Write for 100-page Catalogue. It's free. Compare Our Prices.
BUOB & SCHEU, Estab. 1883 500-520 EAST COURT ST. CINCINNATI, OHIO.

GEARS IN THE WHITE

Catalogue A



1,000 Styles and Sizes

THE AKRON-SELLE CO., Akron, O.

EATON Letter Company

73 W. Eagle St., Buffalo, N. Y.

Ever Send Out circular letters to the TRADE? Our imitation typewritten letters absolutely cannot be distinguished from the real. They are the kind that get attention, that bring results. Send for free samples.

ONLY HIGH-GRADE WORK DONE.

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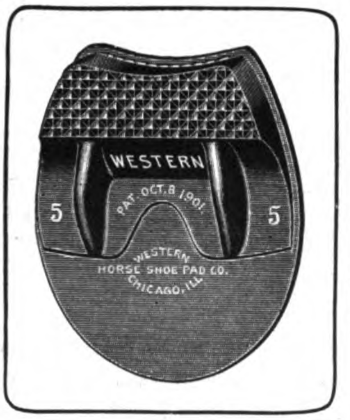


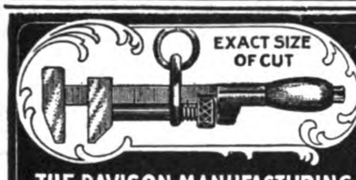
Do You Use Western Pads?

If Not, Why Not?

Did you ever stop to consider what the name "Western" means in connection with "Pads"? If you have not, we want to say right here, Mr. Horseshoer, that "Western" stands for "Quality, Design and Freedom from Freak Ideas."

Use Western Pads and be up to date

First Rubber Company
Sole Manufacturers
156-158 Lake Street *Chicago, U. S. A.*



A PERFECT WORKING MODEL IN MINIATURE OF THE LARGE WRENCH USED BY EVERY MECHANIC. EACH PART ACCURATELY PROPORTIONED AND MADE EXACTLY TO SCALE. HANDSOMELY NICKEL PLATED.
25¢
THE DAVISON MANUFACTURING CO. *112 FRONT ST. BROOKLYN, N.Y.*

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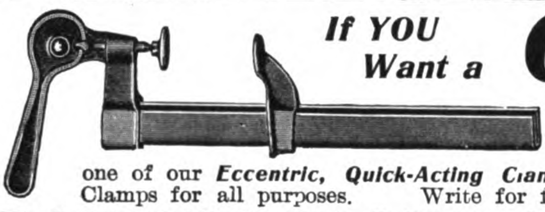
R. S. & A. B. LACEY, Patent Att'ys, Washington, D. C.
ESTABLISHED, 1869.



If YOU Want a **CLAMP**

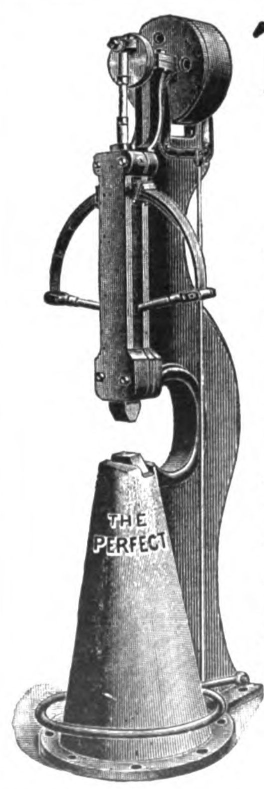
that is strong, a clamp that is instantly adjustable, a clamp that never lets go its grip, get one of our ***Eccentric, Quick-Acting Clamps.*** We have a large line of Clamps for all purposes. Write for free illustrated catalogue today.

BATAVIA CLAMP CO., ***Batavia, N. Y.***

Bolster Springs

ALSO WAGON SEAT, TRUCK AND PLATFORM SPRINGS

Sold by leading Jobbers, or write us
HARVEY SPRING CO.
RACINE JUNCTION, WIS.

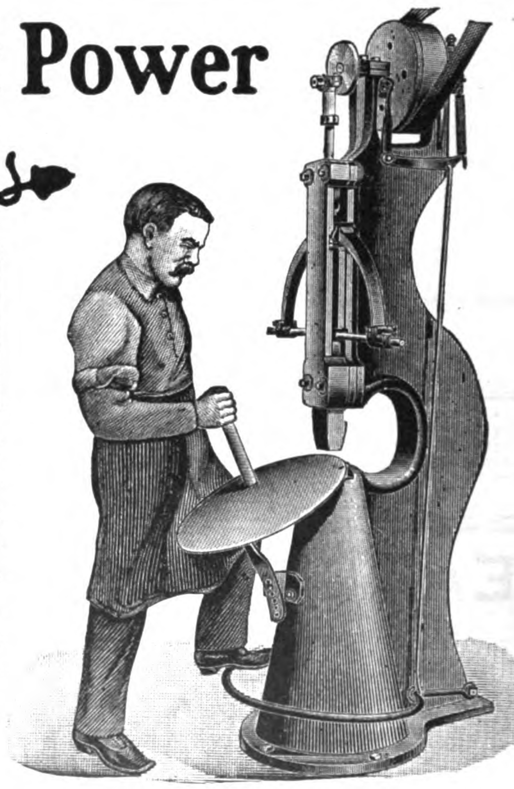


The Perfect Power Hammer

Simply Constructed
Easy to Operate from the Lightest Tap to the Heaviest Blow

Does a wide range of work. Sold under a guarantee. We have not only the most practical POWER HAMMER offered to the trade, but in addition, the most efficient method of SHARPENING HARROW and PLOW DISKS. Send for descriptive circular and price list.

On Exhibition, Palace of Machinery, World's Fair, St. Louis.



Macgowan & Finigan Foundry and Machine Co.

Saint Louis, Missouri

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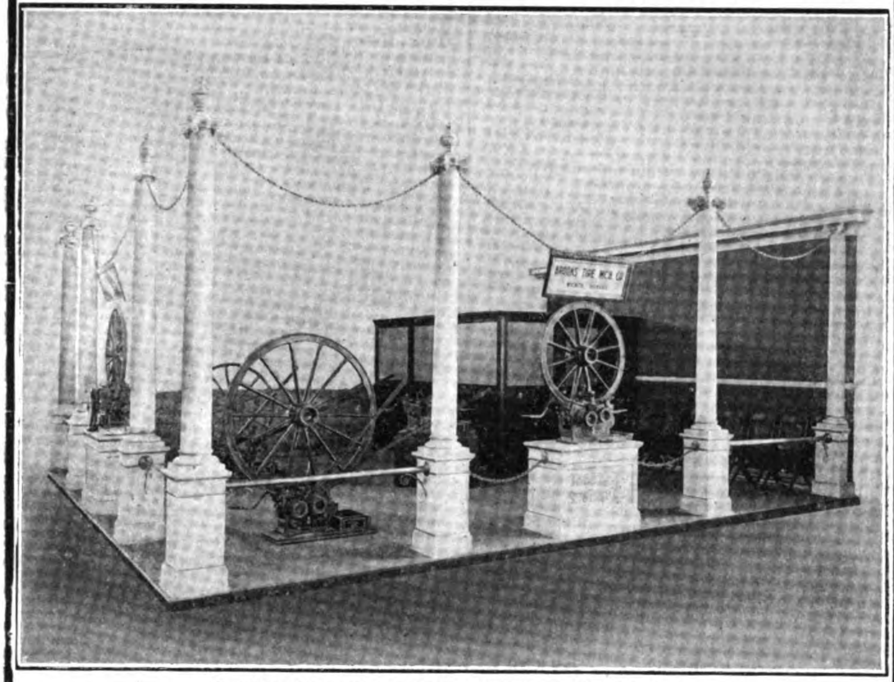


Exhibit of Brooks Cold Tire Setters at World's Fair.

A Practical Demonstration

of the superior construction and the advantages in operation of the . . . .

Brooks Cold Tire Setter

Is given every day at our World's Fair Exhibit, located in Transportation Building, just inside the south arch entrance at West end.

DON'T FAIL TO SEE IT!

It establishes our claims that it is The Best, The Quickest, The Most Practical and The Most Durable Cold Tire Setter made.

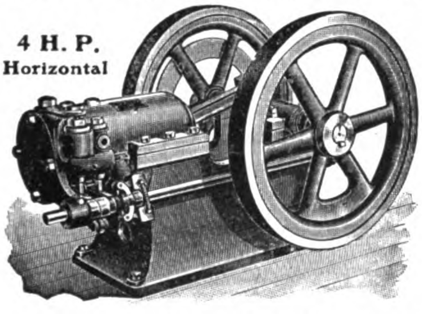
We ship them on trial. Send for circulars, prices and testimonial letters and get free a fine pocket Map of The World's Fair.

The Brooks Tire Machine Co.

121 North Water Street, WICHITA, KANSAS.

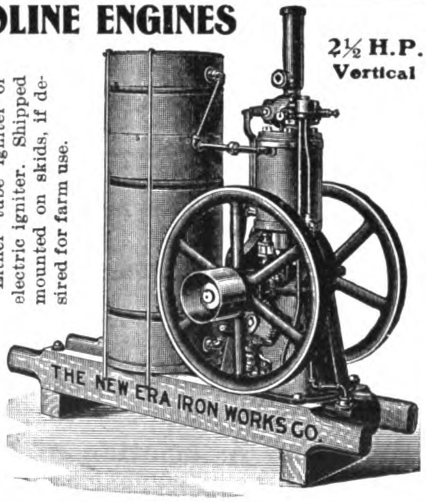
LITTLE GIANT GAS & GASOLINE ENGINES

4 H. P. Horizontal



Either tube igniter or electric igniter. Shipped mounted on skids, if desired for farm use.

2½ H.P. Vertical

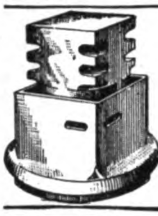


Also equipped with pumping attachments. Write for booklet describing full line New Era Gas Engines from 4 to 100 H. P. Special inducements to dealers as agents.

THE NEW ERA GAS ENGINE CO.

No. 63 Dale Ave., DAYTON, OHIO.

Newton's Heave, Cough, Distemper and Indigestion Cure. A veterinary specific for wind, throat and stomach troubles. Strong recommends. $1 per can. Dealers, mail or Ex.paid. Newton Horse Remedy Co. (3) Toledo, Ohio.



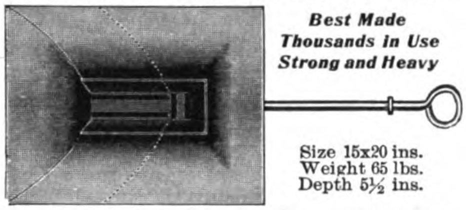
Extension Axle Nuts

Sure Cure for Wabbles and Rattles. Strongly endorsed by practical repairmen. Also Sand Boxes, Harness Menders, Hame Fasteners, Third Folding Buggy Seats, etc. Send for circulars. Agents Wanted.

County Rights on Easy Terms.

Hardware Specialty Co.
Box 10, Pontiac, Mich.

THOMPSON'S EXTENSION TUYERE IRON



Best Made
Thousands in Use
Strong and Heavy

Size 15x20 ins.
Weight 65 lbs.
Depth 5½ ins.

A BLACKSMITH'S DELIGHT

This Tuyere Iron and Fire Pot saves time, coal and money. It's no experiment. Can get a fire from 2 to 14 inches long. GUARANTEED; sent on receipt of price, $5.00. WHY NOT HAVE THE BEST? WILL PAY FOR ITSELF IN SHORT TIME.

THOMPSON TUYERE IRON CO.
2209 N. N. JERSEY ST., Indianapolis, Ind., U.S.A.

New Era Electric BLOWER

Direct connected, has been designed especially for the blacksmith, and it is his ever ready helper that works for less than five cents a day, and never tires. It places him on an equal footing with the largest steam shops and allows him to work at the anvil steadily while his work is being "electrically" heated.

Write for circular and particulars.

NEW ERA ELECTRIC CO. 942 W. Lake St., CHICAGO

LAY IN

a line of our primers, fillers, ruff stuffs, elastic and Japan colors, and our paint and varnish removers. They never fail to give perfect satisfaction. Once a user, always a user.

The Chas. A. P. Barrett Co.

Manufacturers of

Coach and Car Colors

Factory, - - Troy, Ohio
Office, 118 E. Third St., Dayton, Ohio

Write for our New Coach Color Book and Catalogue

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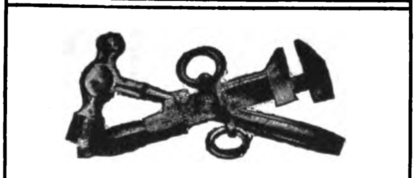
CONTENTS.

Index to Advertisers.

THEY ARE GOING FAST

Our neat little blacksmith's hammer watch charm has proved so popular that we have been obliged to order several additional lots, and these are going like hot cakes, too. It is a miniature hammer, 1¾ inches long, nicely made and neatly finished. Any blacksmith can have one sent him, prepaid, for 25 cents. Or you can get one FREE by sending us $1.00 and a new subscription to THE AMERICAN BLACKSMITH. Get your brother smith to take the paper, or order it yourself if not already a subscriber.



THEN ALSO we have a fine little monkey wrench, a perfect working model, 1⅝ inches long, and highly finished. In spite of its tiny size, the jaws work just like a big wrench. We send this prepaid, for 25 cents, or we will give it to you FREE with one new subscription.

Hammer and Wrench both for 40 cents, or two new subscriptions.

American Blacksmith Company,

BOX 974. BUFFALO, N. Y.

WILLIAMS, WHITE & CO.

MOLINE, ILLS., U. S. A.

This is no *CHEAP PRICED* hammer, nor cheap built hammer. This hammer is built for service, with all the adjustments and conveniences, of selected materials, high grade workmanship. Hard hitting, heavy, quick running. It will outlast your engine. Double faced frictions ground to a fit give perfect control of blow. Built with rubber cushioned levers instead of steel springs to order.

We also make Punch and Shearing Machines, Bulldozors, Benders, complete outfits for wagon and carriage smith shops. . . . .

A LITTLE PLUCK

and determination will enable blacksmiths to do wonders towards bettering their conditions and securing better pay for work. Have you ever thought that you should be earning more money, in view of increased living expenses and high prices for stock? Drop us a postal and our plan for enabling blacksmiths to co-operate and raise prices will come to you by return mail. It costs you nothing to get the plan. It may pave the way to better prices. NOW is the time.

American Association of Blacksmiths and Horseshoers

BOX 974, BUFFALO, N. Y.

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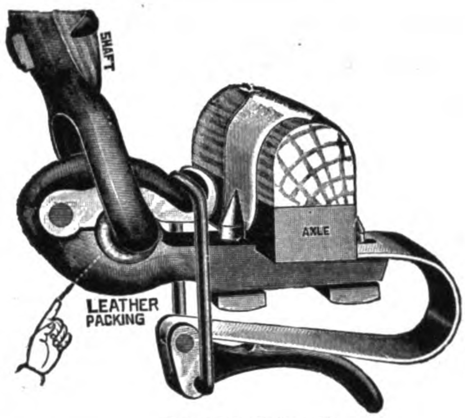


Coupling Closed

The Bradley Shaft Coupling

NEVER SQUEAKS or SIDE RATTLES

It cannot—for three reasons:

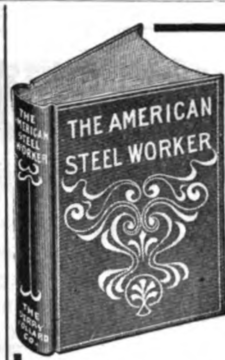
The leather packing is perfectly lubricated before it is put in the coupler.

The ball and socket construction holds equally secure in all directions.

The constant and uniform pressure of the spring automatically takes up the wear.

These features are the most important in a Shaft Coupling because of the object attained—ABSOLUTE NOISELESSNESS—not for A time, but for ALL time.

C. C. Bradley & Son
SYRACUSE, N. Y.



Isn't it . . . about time

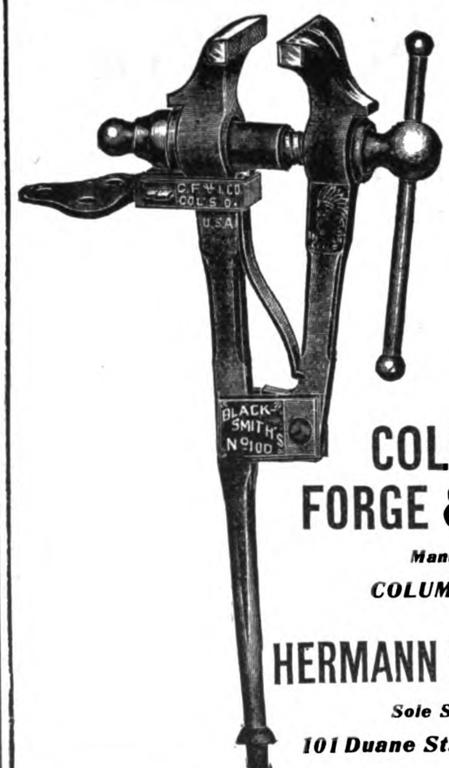
you took up the practical study of handling steel in Mr. Markham's course on Annealing, Hardening and Tempering? You've been putting it off, but its time to get busy NOW. We've arranged to give a copy of Mr. Markham's wonderful book

The American Steel Worker

with each scholarship, and the whole thing costs you only $10 cash, or four monthly payments of $3 each. It's the best investment you ever made.

THE EDUCATIONAL ASSOCIATION
256-257 Broadway, NEW YORK.

BLACKSMITH'S VISES



AND THE

ANVIL

THAT

"Rings Like a Bell"

COLUMBUS FORGE & IRON CO.
Manufacturers
COLUMBUS, OHIO

HERMANN BOKER & CO.
Sole Sales Agents
101 Duane St., NEW YORK CITY

ANVIL RINGERS, HAMMER SWINGERS and KNIGHTS of the FORGE

WHETHER you be a blacksmith, a horsesmith, a repairsmith or wagonsmith, we think you will be interested in the novel and unusual opportunity told of in this announcement, and the one on the opposite page. We are sure it will pay you to read every word on page XV carefully and keep this copy handy, for we may not have space to make this announcement again.

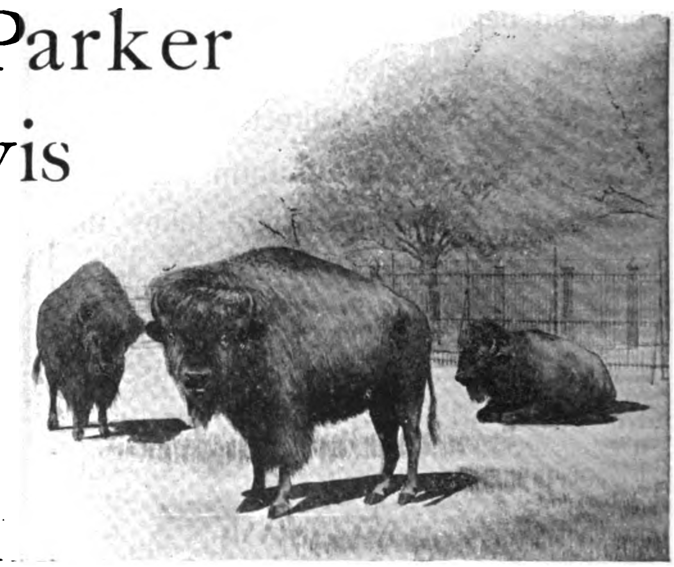
TO EXPLAIN, the American Blacksmith Company, in looking around for a News Year's souvenir for its subscribers, had an opportunity to secure a large lot of fine 1905 calendars at a very good figure. More than enough have been bought to present one free to each of our regular subscribers at New Year's, and it occurs to us that probably our subscribers could use a few themselves to advertise their own business, and we could give them the benefit of our bargain. Hence we shall sell the extra ones at cost in lots of 50 each. We have bought a good many thousand, but there will not be nearly enough to go round, so we have decided that ***these extra calendars will positively not be obtainable by any except our subscribers.*** Read about the calendars on the opposite page.

BE PROGRESSIVE. Advertise your shop. There is no better ad for the money than a good calendar with your name on it. We put your name on them free if you order fifty. The customer you give it to will hang it up, and every time he looks at it for a whole year it tells him where to get his work done. If you run a shop, doesn't this strike you as a good investment? Haven't you got fifty customers that are worth spending 4 cents on for a year's advertising?

SOMEONE WILL GET LEFT, because there is only a limited number. Better order now—it isn't one bit too early. Pay later if more convenient—any time before Dec. 1—but get your order in and have them reserved for you. Then at New Year's you can hand each of your fifty best customers one of these calendars with your name on it, and ask him to accept, not *a* calendar, but ***your*** calendar, with the season's compliments. Pretty good idea, isn't it?

500,000 Buffalo Blowers in use

"Teddy" or Parker Fairbanks or Davis



But crops are promising, and before spending your harvest money ask your dealer for prices on BUFFALO'S up-to-date line of Forges, Blowers, Drills, Steel Plate Punches and Shears, etc. Prices right, superior goods, guaranteed on every point. Money refunded if not entirely satisfied.

BUFFALO FORGE COMPANY, Buffalo, N. Y.

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The American Blacksmith

Special 1905 Calendar

Our 1905 souvenir calendar, selected after careful search, is 5½ by 10½ inches, on stiff cardboard, handsomely done in colors by the well-known lithographic engraving process. Ten different colors are used to give the desired soft appearance. The surface also has a special roughening, which adds wonderfully to its attractiveness. A dark green month pad is used, harmonizing splendidly with the picture. The black engraving on this page is only intended to show the shape and design. An assortment of four different figures (the one shown here and three others) gives a pleasing variety. Each figure is of an Indian, attractively posed, and all are fine calendar subjects.

Don't forget that this is a special calendar, designed and made for us only. It is entirely different from the large number of cheap stock calendars seen everywhere. Whoever sees it wants one; whoever gets one keeps it. One goes free, Jan. 1, 1905, to each regular reader. All whose subscriptions expire before that date should renew now, so as to be sure and get one. Here are the prices in lots of 50—See opposite page also.

(1) **50 calendars, your name on each, post paid . . $2.00**
(2) **50 calendars and one year's subscription $2.75**
(3) **50 calendars and four years' subscription . . . $4.00**

Buying in quantity we get a low figure and we offer them to readers at cost. You get the wholesale price on a retail order of fifty. You could not buy as good for $4.00 or $5.00. We are not figuring in any profit on them—the offer is simply an inducement for subscribers to renew their subscriptions promptly, NOW. While you are about it, why not pay for four years and save money? The paper itself is going to be made better each year. You save $2.00 on four years' subscription and you get 50 calendars to advertise your business, for about half what they are worth.

Whoever sees it wants one; whoever gets one keeps it.

This offer is good to all our readers whose subscription is paid to January, 1905. If yours expires before then, renew now so as to get in line for the calendar offer. Drop us a postal if you don't know how your subscription stands. We recommend that you get credit for four years—it's a special offer and will probably never be made again.

During September and October Only

We will give any reader six months' credit on his own subscription if he will send us one new yearly subscription, one year's credit for two new subscriptions. Get your brother craftsmen to take The American Blacksmith, and mention this special offer when you write us.

If you are not already a subscriber you can get in on this calendar offer, and save money too, by sending in your order for number (2) or (3) as above. Or send $3.00 even and get 50 calendars and the paper from October, 1904 to January, 1906. If you can't use 50 calendars in your business, $1.00 brings you the paper from October, 1904 to January, 1906, and one of our calendars free for your own home. We offer three extra months, October, November and December, FREE, as an inducement for you to subscribe NOW.

Remit by money order, express order or registered letter.

American Blacksmith Company

P. O. Box 974 — Buffalo, N. Y.

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Full information and price list on request.

Morgan & Wright Pads

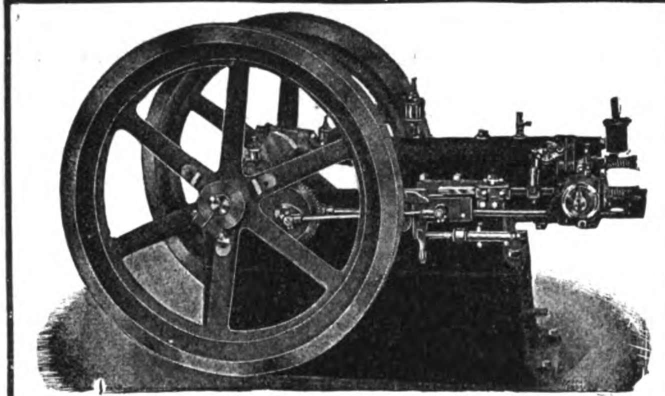
Are Good Pads

For the Horseshoer, the Horseowner and the Horse

Complete line, reasonable in price, strong, durable, easy to fit.

Morgan & Wright, Chicago


NEW YORK ST. LOUIS DAYTON SAN FRANCISCO



TO MAKE MONEY BUY A GEMMER

Man power is costly. It is poor economy to try to do work that you can make an engine do. The Gemmer Engine will more than pay for itself the first year it is in your shop. Our 2½ H. P. has been brought out especially to meet the requirements of the blacksmith and for similar work. It develops four actual H. P.

THE GEMMER COSTS LESS TO RUN

than any other engine made, using less than 1-12 of a gallon of gasoline per H. P. per hour. Its superior economy has been repeatedly demonstrated in competitive tests.

The UNUSUAL SIMPLICITY, HIGH-CLASS CONSTRUCTION AND LOW PRICES are other features that are making the Gemmer a popular machine wherever power is needed. Every engine sold makes us new friends.

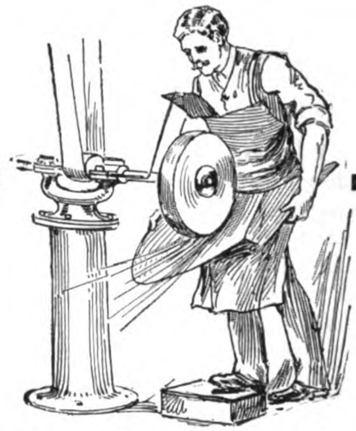
To prove the truth of our claims, we will ship any size engine and allow you

Free Trial at Your Own Work.

If not as represented and first-class in every respect it may be returned at our expense. WRITE FOR CATALOGUE.

GEMMER ENGINE CO.,

1730 Park Street, - - MARION, IND.



"CHICAGO" EMERY WHEELS CUT QUICK.

A wheel that will do the work in one-fourth to one-half less time is by far the cheapest in the long run. A wheel that will save only one hour per day during your busy season would pay for itself in full.

"CHICAGO" WHEELS save time.

They're made of stuff that cuts.

Emery Wheels.
Glue, Emery,
Polishing Wheels,
Grinding Machinery.

Made by Chicago Wheel & Mfg. Co.
42 W. RANDOLPH ST.
CHICAGO, U. S. A.

136 Page Catalogue for the Asking.

ALL BLACKSMITHS

will be interested to know that we are prepared to place in their hands at small cost a clean-cut, practical, up-to-date correspondence course of instruction in

HARDENING, TEMPERING AND ANNEALING STEEL

By MR. E. R. MARKHAM, a Steel Expert of 27 Years' Standing.

The course covers every phase of the treatment of steel in hardening, tempering and annealing; teaches the selection of steel, what and why certain steels should be used for certain purposes; heating for all purposes. Hardening baths, pack and case hardening. How to avoid troubles. Special instruction in the handling of high-speed steels is given.

Entire Course $10.00

"The surest road to advancement is increase of knowledge." Begin to advance NOW. Write for full particulars and easier terms TODAY.

AMERICAN BLACKSMITH COMPANY,

P. O. DRAWER 974. BUFFALO, NEW YORK.

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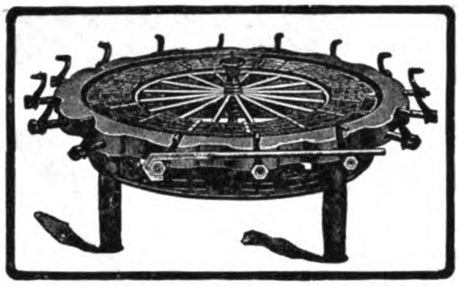
Henderson Cold Tire Setters



STANDARD TIRE SETTER CO., Keokuk, Iowa. LITTLE RIVER, Kans., June 13, 1904.

Gentlemen:—In August, the 7th day, 1901, we received one of your machines and have been operating it here in Little River ever since. Up to this time, we have set over 5000 tires of all description and we find it GOOD for not only setting tires, but it is worth more than the price of itself for pressing up old wheels on being cut down before the tire is put on after the rims have been fitted on, for putting everything to its place.

In short, we find it one of the best tools we have in our shop—a great trade drawing device and the BEST investment we have ever made in a piece of machinery.

Now this statement is absolutely unsolicited, but we simply do this to let our fellow mechanics know the FACTS and real merits and value of such a machine, for the Henderson Cold Tire Setter beats any and all other cold tire setters we have ever seen. We will stand ready to back what we have said herein, by our hundreds of costumers and the work we have done on this machine.

Wishing you the best of success in your enterprise, we are

Yours truly,
C. E. CASTEEL & SON.

When you buy a cold tire setter get one that sets the tire EVENLY ALL AROUND THE WHEEL. Get one that puts the entire wheel in the best possible condition. It's the HENDERSON. Write for full information.

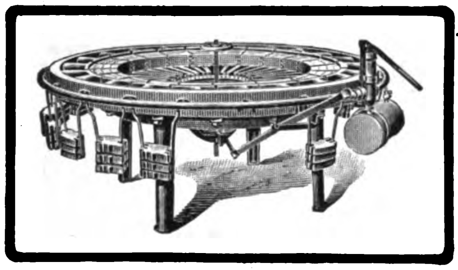
STANDARD TIRE SETTER COMPANY - - KEOKUK, IOWA

The Hercules Hydraulic Tire Setter

Hand or Power Machines

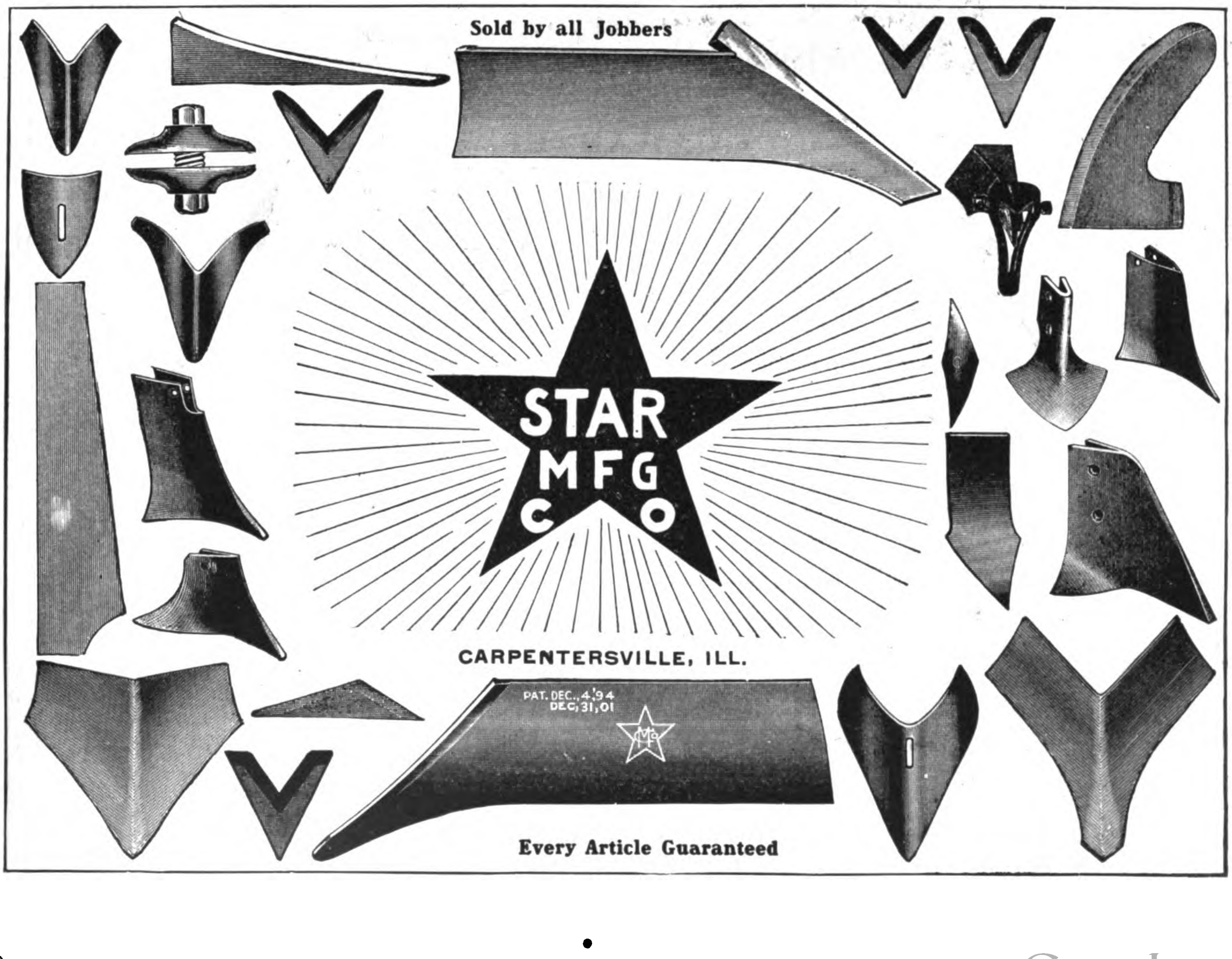
For Manufacturers or Repairers of Vehicles

Don't buy until you Investigate this Machine



Descriptive circulars, prices, terms, etc., on application

NATIONAL MACHINE CO. - - KEOKUK, IOWA



When you Buy, Buy the Best.
ALL SIGNS POINT to the

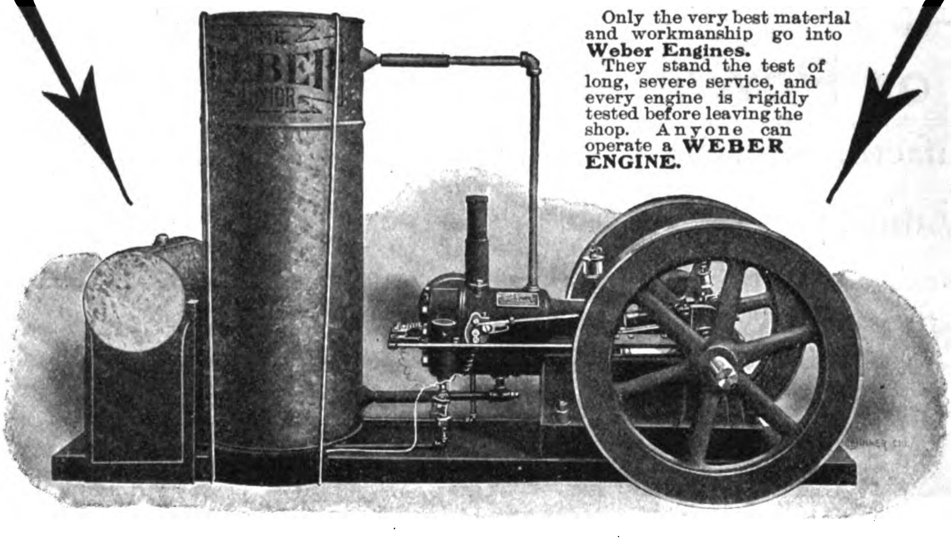
WEBER

as being the best engine built for Blacksmiths and Wagon Builders.

Over 8100 Weber Junior

2½ H. P. ENGINES

Now in use. Isn't this a remarkable proof of the superior qualities of our engines? Read our iron-clad guarantee, and the testimonials, two out of a thousand, all of them alike. We build engines from 2¼ up to 300 horse-power. If our Weber Junior isn't large enough, let us quote you on our 5 horse-power. More than 2,400 of these were put to work during 1903 making money for Blacksmiths and Carriage Builders.



Only the very best material and workmanship go into **Weber Engines.** They stand the test of long, severe service, and every engine is rigidly tested before leaving the shop. Anyone can operate a **WEBER ENGINE.**

Weber Gas and Gasoline Engines are Safe, Solid, Strong and Simple.

Weber Gas and Gasoline Engines are Durable, Compact, Complete and Economical.

GUARANTEE.

All Weber Engines are guaranteed to be of the very best material and the very best workmanship, and we hereby agree to replace any part found defective f. o. b. our works without cost for a period of two years.

We guarantee the consumption of fuel as noted below. We guarantee the speed to be steady and uniform. We guarantee that changes in temperature will not affect the engine's running We guarantee interchangeability of parts. We guarantee that the Weber can be operated without constant regulation of the trottle valve.

Weber Engines operate on one-tenth of one gallon of gasoline per horse-power per hour.

MURRAY, UTAH.

GENTLEMEN:—We have been using one of your Junior Engines about sixteen months, and in that time have given it a fair trial. We run a 16-inch blower, 30-inch band saw, 12-inch circular saw, drilling machine, turning lathe and emery grinder. We also have a pump connected with engine by cable at a distance of 280 feet from the engine and draw water for stock and culinary purposes.

We do general blacLsmithing, wagon and carriage work, wood turning, &c., and run four of our heaviest machines at once without any trouble and apparently mot a very heavy load for the engine. Our expense outside of gasoline and oil during the 16 months has not exceeded one dollar all told. We like the engine very much on account of its simplicity and ease of management.

Yours truly, A. M. PALMER & SONS.

SINKING SPRINGS, OHIO.

TO WHOM IT MAY CONCERN:—I bought a Weber Jr. gasoline engine some months ago, and it is the best value for the money I have ever obtained. I am running a band saw, machine drill, rip saw, wood lathe, iron lathe, emery stand, feed mill and corn sheller. It seems to me that this little engine must pull at least 5 H. P. I can show anyone how to operate it in two minutes. I can see that my business has increased 30 per cent since I put in power. I have seen several makes of engines, but none to compare with the Weber as an economical power. I hardly notice the cost and can afford to start up for a five cent job. I believe my engine will more than pay for itself for the first six months; all I regret is that I did not purchase an engine sooner. I would not try to run a shop again without power; and anyone buying a Weber will be pleased with it.

Very truly yours, J. S. OVERHULTZ.

Send Postal today for our Complete and Interesting Catalogue, Free.

Weber Gas and Gasoline Engine Co.

P. O. Box V 1114, Kansas City, Mo.

New York Offices, 115 Liberty St., N. Y. C.

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HAWKEYE WRENCH CO.
Marshalltown, Iowa.

DIES CLEAN THREADS SIZES SHOWN ON WRENCH.

PATENT NO. 720554

HAWKEYE (REGISTERED)

HAS MORE USES THAN ANY WRENCH MADE.

5 IN 1
NUT WRENCH, PIPE WRENCH, THREAD CUTTERS

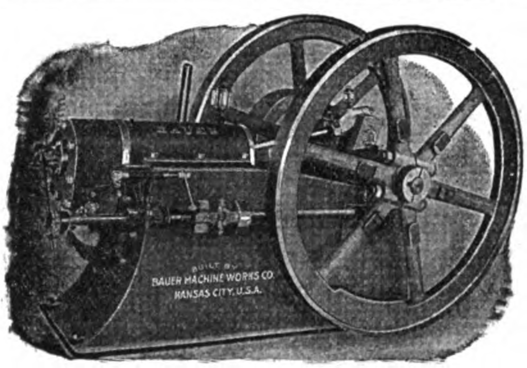
WRENCH 8 1-2 INCHES LONG.
SMALL JAW TAKES FROM 3-16 TO 3-4 INCH IRON.
LARGE JAW TAKES FROM 1-2 TO 1 1-8 INCH IRON.

MADE OF 50 POINT OPEN HEARTH DROP FORGED CARBON STEEL, SCIENTIFICALLY HARDENED.

PATENTED IN U. S., CANADA, AND FOREIGN COUNTRIES.

HONEST DEALINGS

Before an advertisement is accepted for this journal, careful inquiry is made concerning the standing of the house signing it. Our readers are our friends and their interests will be protected. As a constant example of our good faith in AMERICAN BLACKSMITH advertisers, we will make good to subscribers loss sustained from any who prove to be deliberate swindlers. We must be notified within a month of the transaction giving rise to complaint. This does not mean that we will concern ourselves with the settlement of petty misunderstandings between subscribers and advertisers, nor will we be responsible for losses of honorable bankrupts.



BAUER GASOLINE ENGINES..

The Acme of Simplicity and Perfection.

If you will examine and compare, piece by piece, you will say there is no other quite so good as the "Bauer." All sizes from 1¼ to 20 H.P. Write at once for free catalogue containing long list of letters from satisfied users. Our prices are also very interesting, considering quality.

THE FIRST BLACKSMITH in any town who buys of us gets the agency for his locality, a discount on his purchase, and a commission on his sales. A good engine sells readily. The Bauer is the best.

Write us Today.

Bauer Machine Works Co.
115-120 W. 18th St., KANSAS CITY, MO.

One Cent

is all it will cost you to send for our hanger, giving a table which will enable you to cut

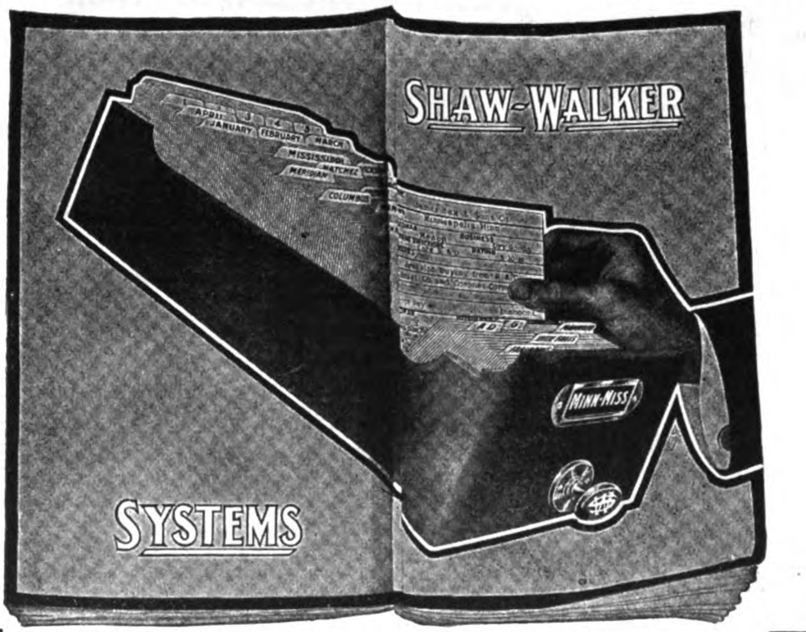
Horseshoe Bar Molds

without waste. We will also send you our new 1904 catalogue free

No. 23. Maud S Pincer

Champion Tool Co.
Meadville, Penna.

47 SYSTEMS
FOR BUSINESS MEN



THIS BOOK IS FREE

It illustrates 47 different kinds of business that are successfully conducted by the use of Shaw-Walker Card and filing systems. It tells you how to improve your office systems. How to save time, money and labor. How to increase the efficiency of your employees. How to decrease your pay roll. One hour invested in reading this catalogue will pay you large dividends during 1904. Send today for this valuable 58 page free catalogue.

THE SHAW-WALKER CO.

Branch at Chicago in the Marquette Building.

Muskegon, Michigan.

Blacksmiths Can Make Money

Bishopville, Ohio, Sept. 20, 1903.

DR. A. C. DANIELS,
Boston, Mass.

Dear Sir:—After I had been selling Dr. Daniels' Veterinary Medicines for about nine months I wrote you saying I was well pleased with my success. Since then my sales have almost doubled, and the goods returned have decreased, only $3.50 returned out of over $800; a little less than ½ of 1 per cent.

I think my agency is worth more to me than a fourth-class post office, and the best of it is the people do the talking for me now.

Thanking you for your favors in the past, I am,
Respectfully,
(Signed) E. N. HOON.

Send to

172 Milk Street,
Boston, Mass.

Dr. A. C. Daniels,

Largest Manufacturers of Veterinary Medicines in the World,

For full information.

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TWO GOOD WORKS ON HORSESHOEING

A TEXT BOOK ON HORSESHOEING, by A. Lungwitz. A complete treatise on anatomy, shoeing, bad feet, interfering, etc. Cloth bound, 168 pages, 141 illustrations - - - - - **$2.00**

MAGNER'S A B C GUIDE to sensible horseshoeing. Cloth bound, 130 pages, 400 illustrations - - - - - - - - - - - - - - - **$1.00**

Sent postpaid on receipt of price.

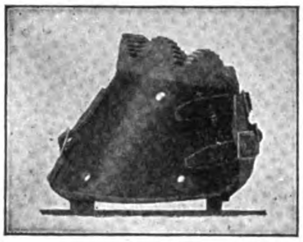
American Blacksmith Co.

Box 974——Buffalo, N. Y.

WANTED! Blacksmiths and Horseshoers

everywhere to sell the

EQUINE WATER-BOOT



the only ***Patented*** and ***Scientific*** device for applying nature's own remedy, water, to the foot of a horse.

By its use ***Hard, Dry, Brittle*** and ***Contracted*** feet are made soft and pliable like those of a horse in pasture. Pasture is brought to the horse instead of the horse to pasture. The ***soaking tub*** is a thing of the past.

For ***Diseased Feet*** the boot is ***Medicated*** and becomes a perfect ***Antiseptic*** and ***Disinfectant.***

The boot is ***Durable*** and ***Artistic*** and ***Sells at Sight.***

Made with or without frog. Prices range from $1.00 to $2.50 per pair. Sample pair mailed prepaid to any part of the U. S. or Canada on receipt of the retail price.

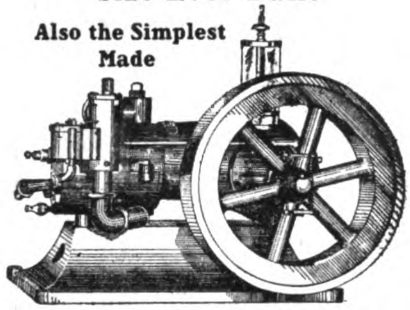
Liberal discounts and protection to agents and jobbers.

Send for circular and price list. Address,

THE EQUINE WATER-BOOT MFG. CO., *519 Hamilton St., ALLENTOWN, PA.*

Most Powerful Engine for its Size Ever Built

Also the Simplest Made



3 H.P. 21 INCHES LONG 150 POUNDS

There's value in our agency. One blacksmith sold three the first month.

Get Catalogue and Particulars
—Free on request.

Cushman Motor Co.

Lincoln, Nebr.

AN ATTRACTIVE OFFER

is here made to get you acquainted with our rapid selling specialties. Blacksmiths and wagon men all over the country are making nice profit by selling our goods with no trouble at all. Only a few specialties are shown here.

Our IXL Anti-Rattlers are easily put in and are guaranteed to stop rattle of pole or shaft.

Harsh's Dash Line Holder is a convenience every vehicle owner appreciates.

I·X·L

For 50 Cents, we will send you postpaid
1 pair IXL Anti Rattlers,
1 pair safety trace holders,
1 dash line holder.

For $1.25, we will send postpaid a dozen pair of single safety trace holders, or ***For $1.50,*** one dozen pair of double safety trace holders.

The Wabash Safety Trace Holder is a dandy. Safe, convenient. Can be worked in dark or with gloves.

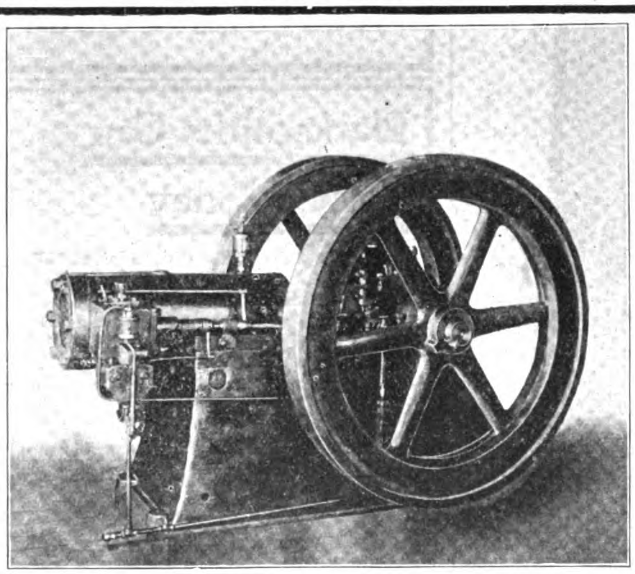
WRITE TODAY.

Write for our circulars and price list.

Launder, Harter & Harsh Mfg. Company

20-30 So. Miami Street, - - - Wabash, Indiana.

THE DICKINSON

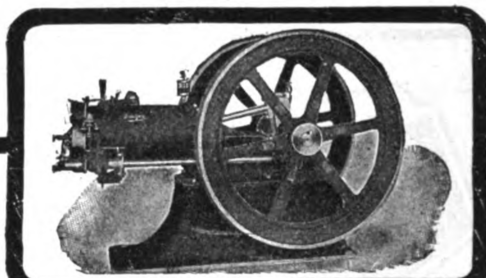


Starts Easily. Runs Quietly.

All bearings adjustable. Bronze boxes. Taper key adjustments. Warranted to please. Write for prices and terms.

Central Machine & Tool Co., Ltd.,

BATTLE CREEK, MICHIGAN.



The Top Notch of Satisfaction is Attained in our Line of

BADGER GAS AND GASOLINE ENGINES

STATIONARY—PORTABLE—TRACTION—MARINE

THEY ARE UNEXCELLED

For great power at low fuel consumption.
For quiet and smooth running qualities.
For general reliability and easy starting.
For regularity of speed and close regulation of power.

We do not make a cheap engine, but cater to that class of buyers who wish a first-class article, something that will not mean continual trouble and repairs. A cheap engine is a very expensive machine at any price.

We want blacksmiths everywhere to act as agents for this, the most complete, successful and best money-making line of gasoline engines on the market.

Every engine sold on trial, satisfaction guaranteed. Write at once for exclusive agency, prices and terms.

Handsome 48 page Catalog Free.

C. P. & J. LAUSON

Manufacturers

101 W. Water Street, - MILWAUKEE, WIS.

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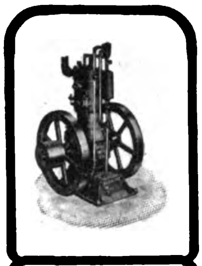
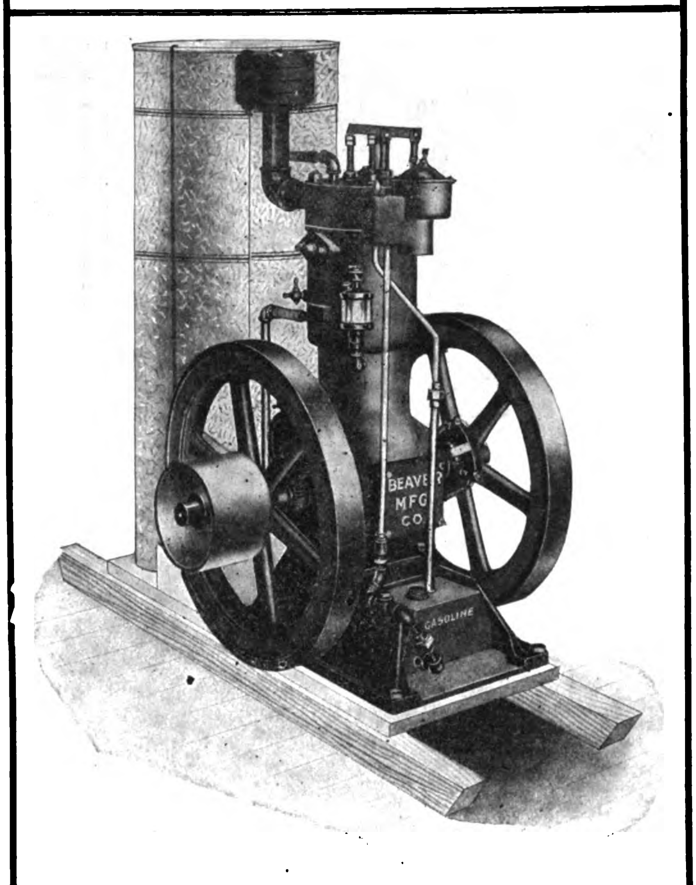
RELIANCE ENGINES



THE PERFECT POWER



"WHY"

THE BEST MATERIAL

ACCURATE CONSTRUCTION

UNEQUALED PERFORMANCE AND POSITIVE GUARANTEE

"WHY"

DEVELOP H. P. AS RATED

EASY TO START

USE LESS FUEL

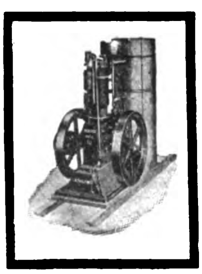
NOTHING TO ADJUST

ALWAYS READY

THE PRICE IS RIGHT

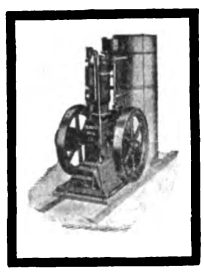
BUILT FOR BUSINESS ABSOLUTELY PERFECT

THE LATEST AND MOST IMPROVED ENGINE ON THE MARKET



GET OUR PRICES

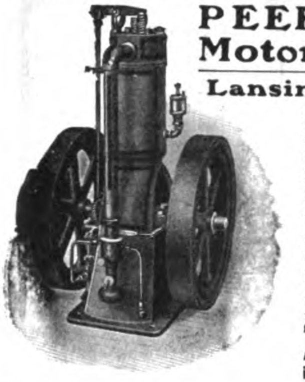
RESPONSIBLE AGENTS WANTED EVERYWHERE. CORRESPONDENCE INVITED.



Beaver Manufacturing Co.

Milwaukee, Wisconsin

DON'T BUY GASOLINE ENGINES until you have investigated "THE MASTER WORKMAN," a two-cylinder gasoline engine, superior to all one-cylinder engines. Cost less to buy and less to run. Quicker and easier started. Has a wider sphere of usefulness. Has little or no vibration. Can be placed anywhere without expense for foundation. Weighs less than one-half the weight of one-cylinder engines. Please give size of engine required. We make 2, 4, 6, 8, 10, 12 and 16 horse-power. Please mention this paper. Send for catalogue.
THE TEMPLE PUMP CO., Established 1853. Meagher and 15th Streets, CHICAGO.



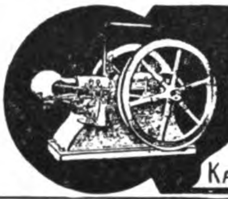
PEERLESS Motor Co.
Lansing, Mich.

For Simplicity of Construction, Durability and ease of Operation

The NOISELESS GAS and GASOLINE ENGINE has no equal.

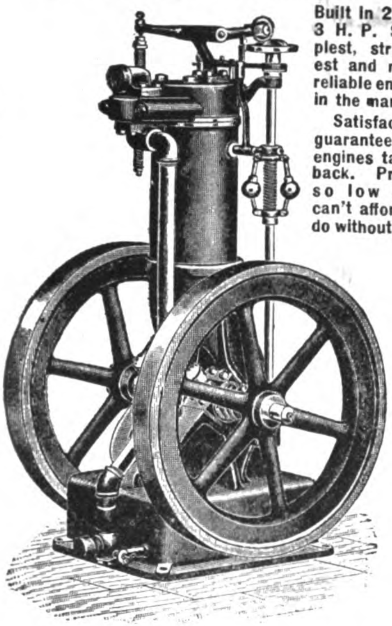
Made in 3, 6, 8 and 12 H. P. Write us for prices.

Agents Wanted in Every Town.



LIGHTNING GASOLINE ENGINE
NEW AND IMPROVED FEATURES SAVING EXPENSE
INCREASING POWER ALL SIZES WRITE FOR CATALOGUE
KANSAS CITY HAY PRESS CO. 482 MILL ST KANSAS CITY MO.

"WINNEBAGO CHIEF"
"CHEAPEST POWER ON EARTH."

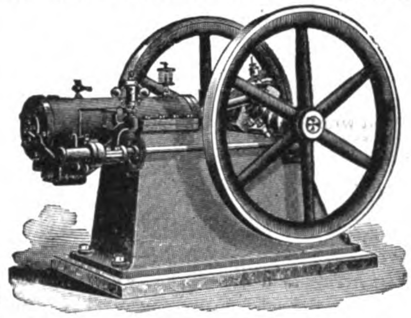


Built in 2 and 3 H. P. Simplest, strongest and most reliable engine in the market.
Satisfaction guaranteed or engines taken back. Prices so low you can't afford to do without.

Write for catalogue and prices.

National Engine Co., Rockford, Ill.

COLUMBUS GASOLINE ENGINES
ARE THE THINGS FOR BLACKSMITHS

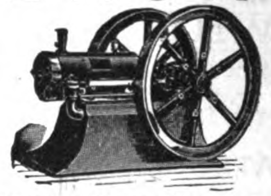


Send for Catalogue 33, Stating Horse Power You Need.

COLUMBUS MACHINE COMPANY,
Columbus, Ohio.

ECLIPSE
GAS AND GASOLINE ENGINES.
Vertical 2, 3, 4, 5, H. P.
Horizontal 5, 10, 12, 15, 20, 25, H. P.
Designed and Built for BUSINESS.
Catalogue on request. . . . . .
MYRICK MACHINE CO., Olean, N.Y.

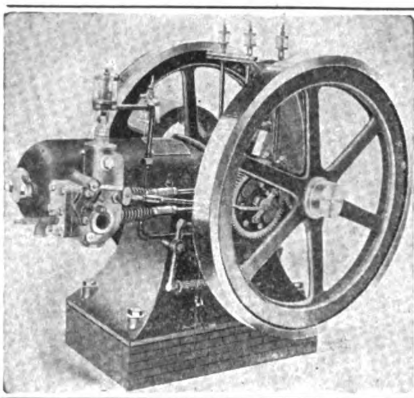
BACKUS



1 TO 100 H. P.

COMPACT AND RELIABLE.

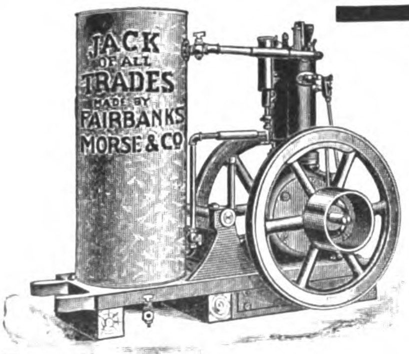
GAS AND GASOLENE ENGINES.
Simple, Economical, Durable You need one in your business. Write for circular and prices.
CHICAGO WATER MOTOR AND FAN CO.
22-24 S. Canal St., Chicago, Ill.



Model Gas and Gasoline Engines
Water or Oil Cooled

The most economical and simplest engine on the market. No cylinder head packing to blow out, and with our automatic sensitive governor, absolute regularity of speed. Stationary, Portable, Horizontal, Vertical Hoists, Pumping and Marine. Send for Catalogue No. 11.
We build the best launch engine of 3 and 6 H. P., with Reversible Bronze Propelier Wheel and Ideal Muffler.
If interested, send for circular.

CENTRAL CITY IRON WORKS
STEVENS POINT, WIS.



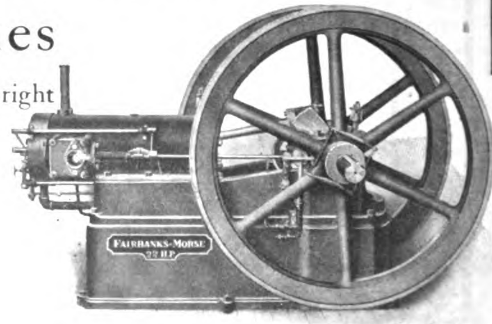
THE JACK OF ALL TRADES GASOLINE ENGINE
Develops over 2 H. P. It costs very little.
Send for Illustrated Booklet No. 80-F.

Fairbanks-Morse Gas or Gasoline Engines
Are best for the Blacksmith or Wheelwright

They develop more power for the money than any other. Get our catalogue and prices before purchasing elsewhere. Address nearest house.

Fairbanks, Morse & Company,

Chicago, St. Paul, Cleveland, Minneapolis, St. Louis, Omaha, Detroit, Denver, Louisville, San Francisco, Kansas City, Los Angeles, Indianapolis, Portland, Ore., New York, Cincinnati, Salt Lake City, London, Eng.



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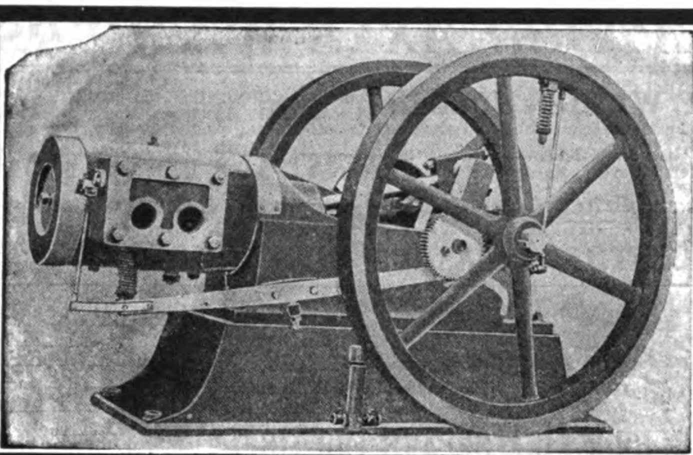
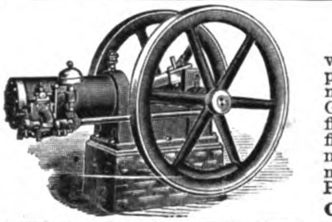


POWER IS WHAT YOU WANT

We Have It
in the
DAVIS GASOLINE ENGINES
Write for Catalogue and Prices

Waterloo Motor Works
Waterloo, Iowa



The Village Blacksmith's Dream.

Asleep on his cot he has a vision. The old dilapidated shop in which he has toiled for years has been transformed, and in its place he sees a new shop with modern equipment—Power Hammers, Drills, Blowers and whirling shafts driven by a "Capital" Gasoline Engine. Business increases and his coffers are overflowing with dollars. But alas, there is an awakening and he finds this all an empty dream. However, realizing the usefulness of power, he buys one of the Capital engines and thus makes his dream a reality. Kind friends, do thou likewise. Post Office address of builders.

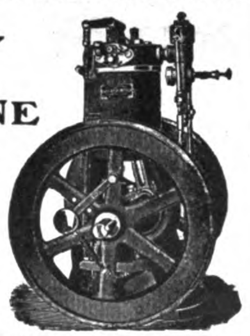
C. H. A. DISSINGER & BRO., - Wrightsville, Pa.

NO MORE TROUBLE about ignition in your engine if you get a ***Remy Magneto Igniter,*** suited for touch or jump spark ignition, with any gas or gasoline engine. They are absolutely reliable spark generators and the simplest ignition apparatus manufactured. Magneto Dynamos, Magneto Oscillators, Magneto Alternator Igniters, jump and touch spark coils, etc.

REMY ELECTRIC CO., ANDERSON, IND.

NO BLACKSMITH SHOP COMPLETE WITHOUT POWER.

No Power so
HANDY
as a Good
GASOLINE ENGINE.

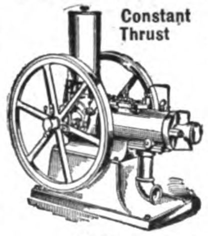


Let us send you our catalogue and quote prices. Our Specialty 1½, 2½ and 4 H-P. State your power needs. If you have a steam engine give full description

We sometimes make exchanges.

BATES & EDMONDS MOTOR CO., - Lansing, Mich.

The MIETZ & WEISS Oil and Gas Engines



Constant Thrust

STATIONARY and MARINE
1-60 H. P.

Adopted by the U. S. and Foreign Governments.
Most Economical and Safest Power known. Runs with common kerosene, distillate or fuel oils.
It will pay you to consult me before placing your order elsewhere. For Pumping, Electric Lighting, Charging Storage Batteries, and all other Power Purposes.
Highest award for Direct Coupled Engine and Dynamo, Paris Exposition, 1900.
Gold Medal, Pan-American Exposition, 1901.
Gold Medal, Charleston, S. C., Exposition, 1902.

A. MIETZ, 128-138 Mott St., New York
Send for Catalogue, Dep. 34.

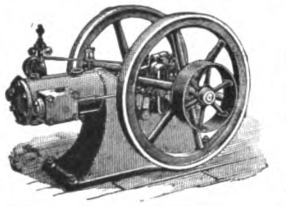
Have You an Engine?

If so, **The Practical Gas Engineer** will tell you how to get the best results from it. A plainly written book telling how to erect, operate and care for gas and gasoline engines. Cloth bound, 152 pages. Sent prepaid, for $1.00.

American Blacksmith Co.,
Box 974, BUFFALO, N. Y.

An Engine That You Can DEPEND UPON at all Times

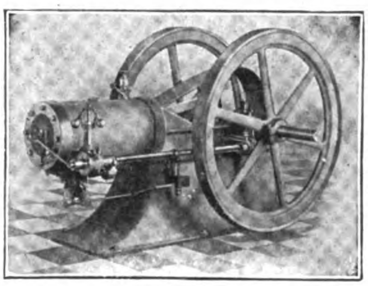
The WATKINS



is solid, substantial and well-made; has large, phosphor bronze bearings, forged steel crank and connecting rod, has everything that a **Good Gas or Gasoline Engine** ought to have. Our catalogue shows all sizes and describes them in detail. Shall we send you one?

The Frank M. Watkins Mfg. Co.,
537 Baymiller Street, Cincinnati, Ohio.

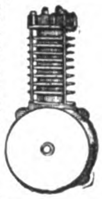
RELIABILITY AND ECONOMY
are combined in our engines.



Simple design, few parts, best material, good workmanship.

Milwaukee Machinery Co. 3015 Walnut St. MILWAUKEE, WIS.

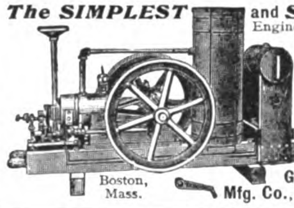
BUILD YOUR OWN GASOLENE MOTOR



We supply the castings, drawings and all accessories. A complete line of rough castings, also finished Motors for Bicycle, Automobile, Marine or Stationary. A 2-cent stamp gets our catalogue.

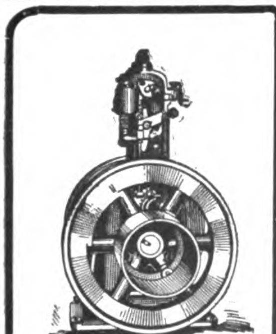
STEFFEY MFG. CO.
Pennock and Brown Sts., Philadelphia, Pa.

The SIMPLEST and STRONGEST



Engine made. Never gets out of order. Just think, about a cent an hour per horse power. Thousands in use. 1 1-2 to 40 h.p. Two years' guarantee. We also carry wood working machinery, shafting, hangers and pulleys.

Boston, Mass. Geo. G. McLaughlin Mfg. Co., 24 Washington St., N.



THE MARKED SUPERIORITY OF THE

"OTTO"

GAS AND GASOLINE ENGINES

in ease of starting and smoothness of running is readily apparent when compared side by side with the cheaper kind. While "comparisons are odious" they are sometimes helpful in arriving at the truth. See our exhibit at the World's Fair, Block 41, Machinery Hall, and draw your own conclusions.

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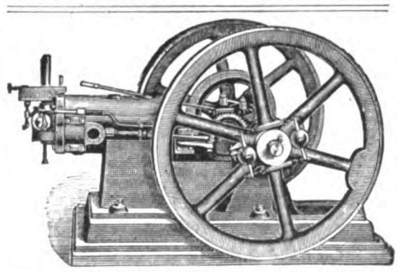

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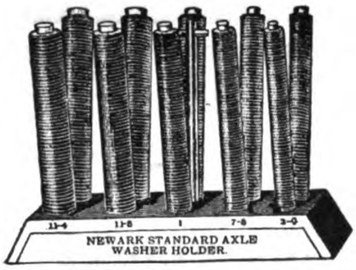

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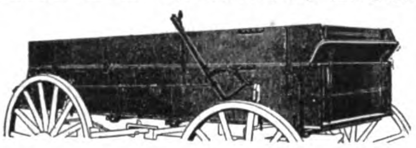

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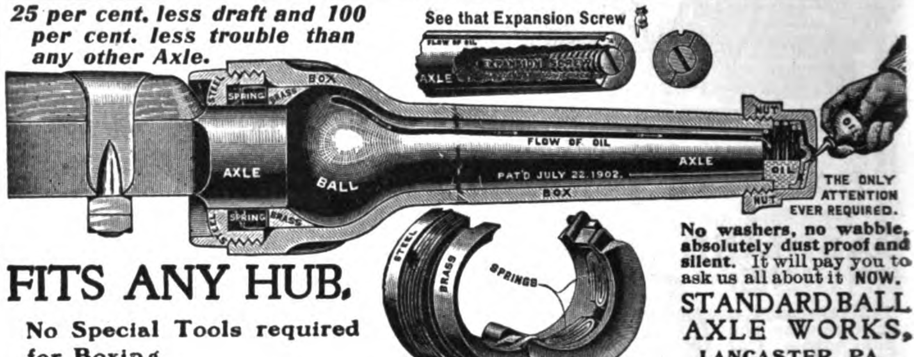

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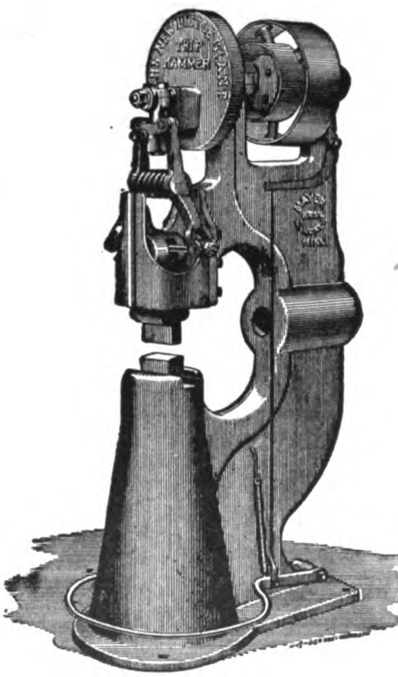

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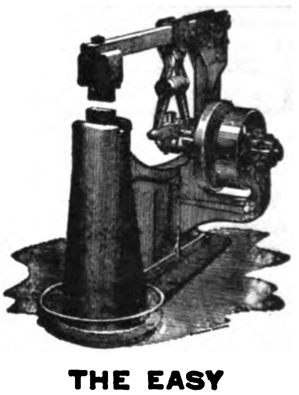

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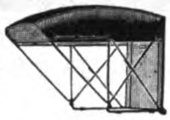

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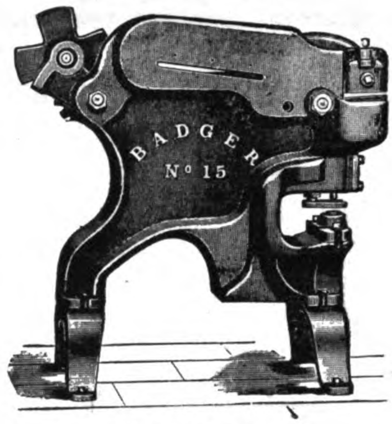

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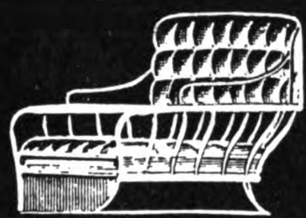

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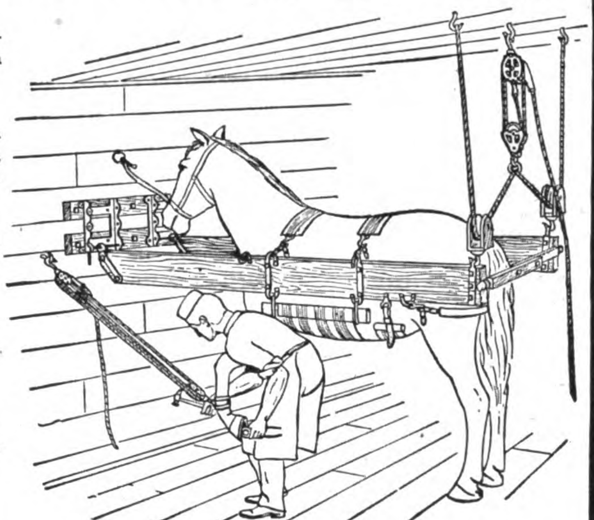

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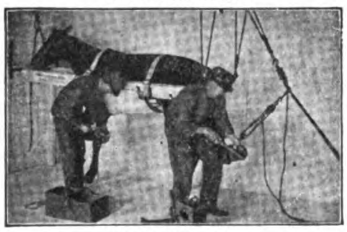

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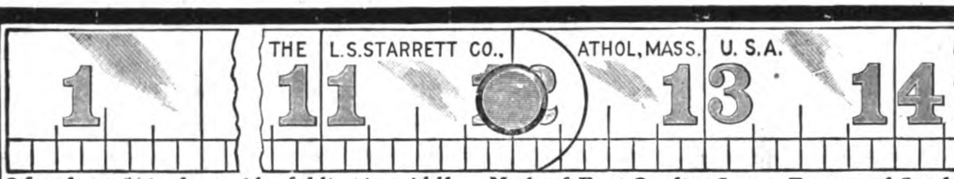

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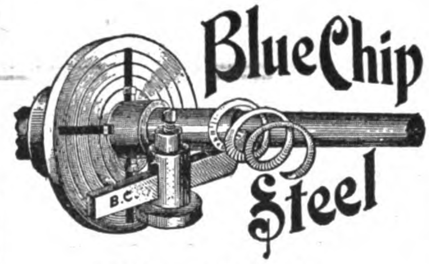

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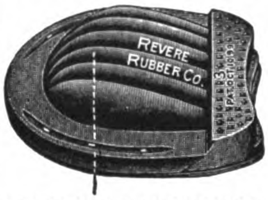

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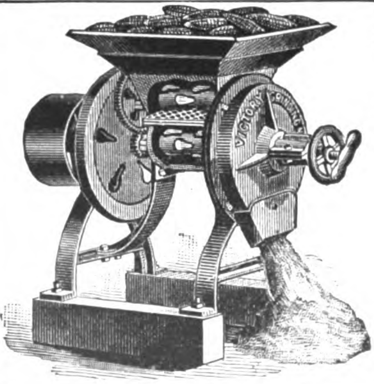

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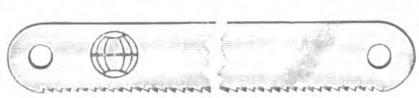

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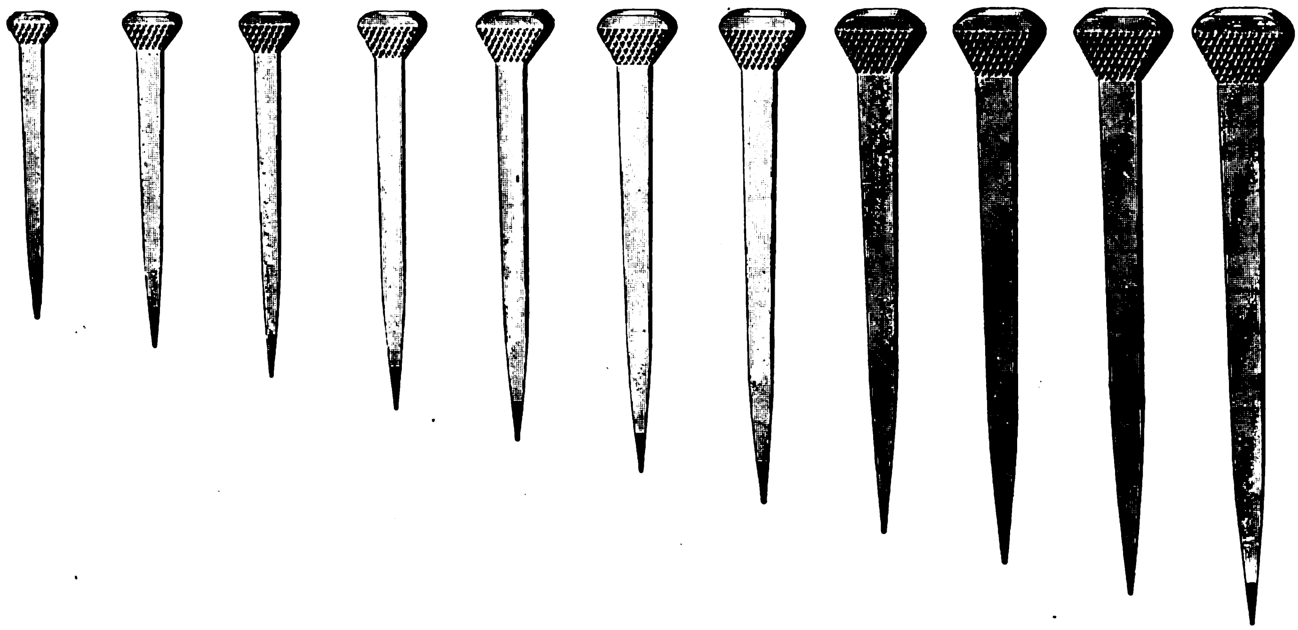

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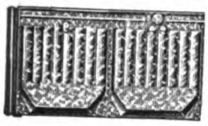

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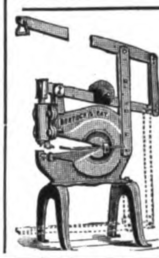

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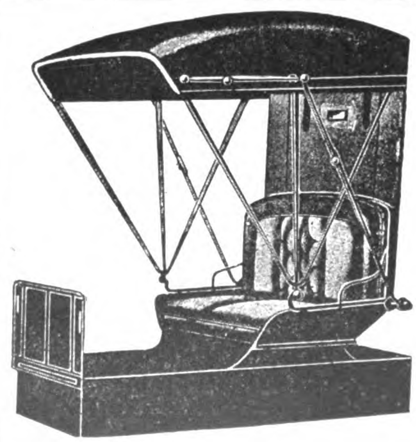

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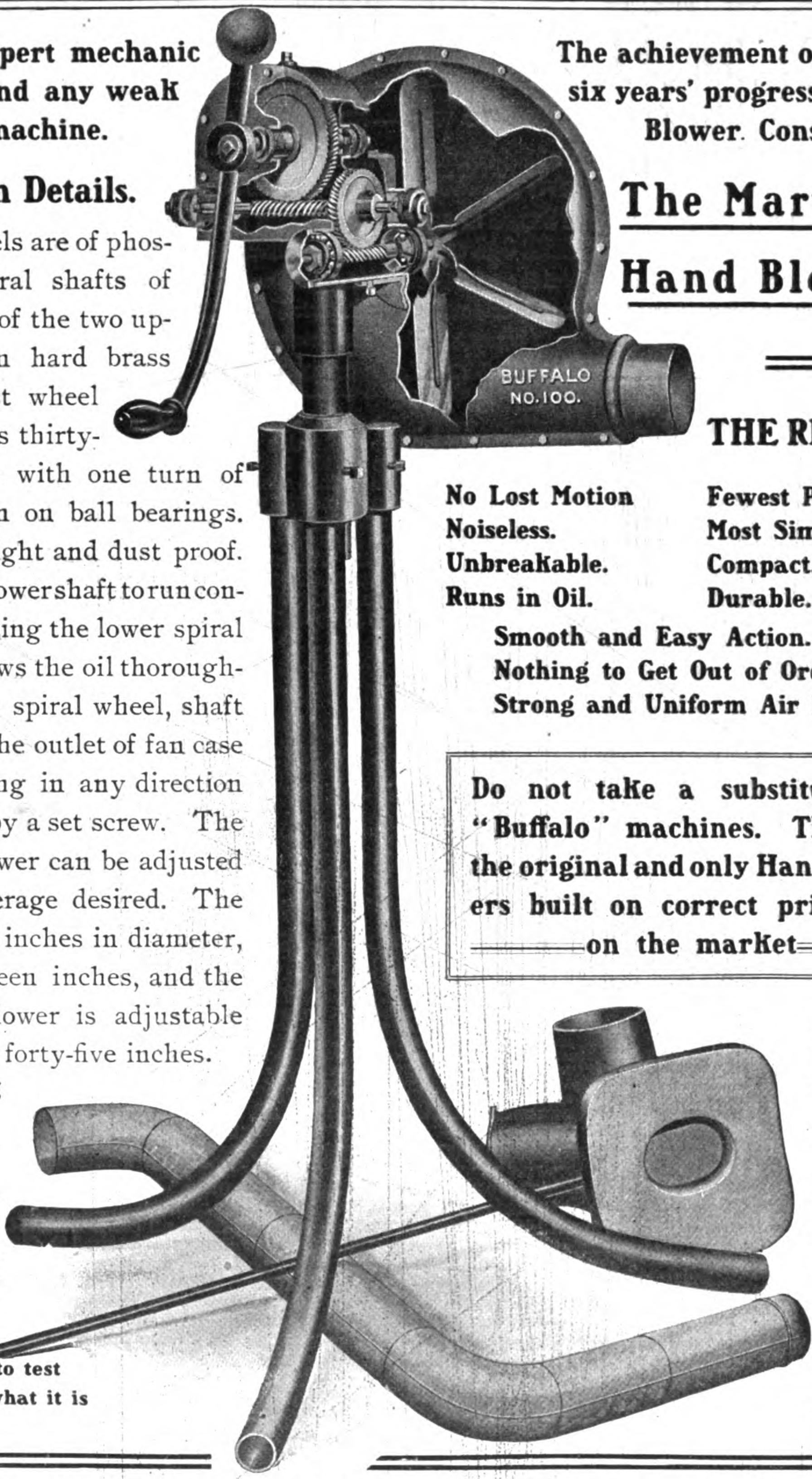
Ask the most expert mechanic you know to find any weak points in this machine.

The achievement of twenty-six years' progress in Hand Blower Construction.



Construction Details.

The spiral wheels are of phosphor bronze, spiral shafts of steel. The ends of the two upper shafts run in hard brass bushings. Blast wheel spiral shaft makes thirty-eight revolutions with one turn of crank, and is run on ball bearings. Gear case is air tight and dust proof. This permits the lower shaft to run constantly in oil, feeding the lower spiral wheel which throws the oil thoroughly over the upper spiral wheel, shaft and bearings. The outlet of fan case can be set pointing in any direction and is held firm by a set screw. The handle of the blower can be adjusted to allow any leverage desired. The blast wheel is ten inches in diameter, the fan case fourteen inches, and the height of the blower is adjustable from thirty-six to forty-five inches.

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Do not take a substitute for "Buffalo" machines. They are the original and only Hand Blowers built on correct principles on the market

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An Automobile, A Weber Gasoline Engine

and other prizes in cash given away

ABSOLUTELY FREE

YOU ARE BOUND TO WIN——NO POSSIBLE WAY TO LOSE.

To the Customer whose purchases total the greatest, in Dollars and Cents, from September 1st, 1904 to April 15th, 1905, we are going to give, ABSOLUTELY FREE, an AUTOMOBILE valued at $800.00.

To the Customer whose purchases are Second in amount during this period we shall give, ABSOLUTELY FREE, a 2½ h. p. WEBER GAS or GASOLINE ENGINE, valued at $125.00.

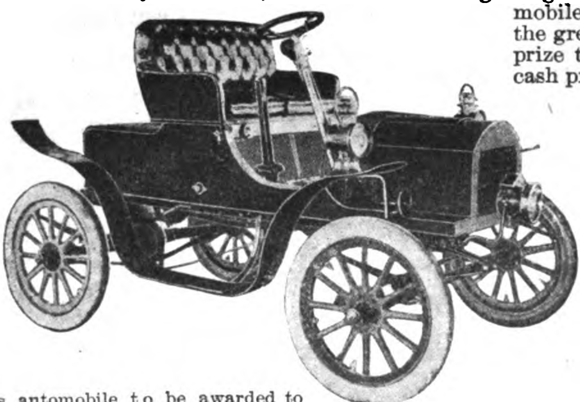
To the Customer whose purchases are Third in amount, during this period, we shall give, absolutely free, a CASH prize of $50.00.

To the Customer whose purchases are Fourth in amount, during this period, we shall give, absolutely free, a CASH prize of $25.00.

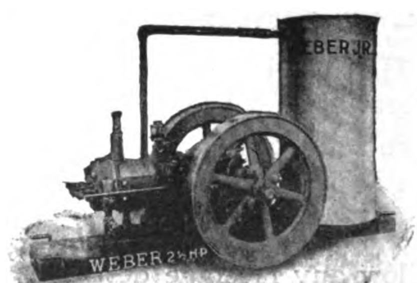
To the Customer whose purchases are Fifth in amount, during this period, we shall give, absolutely free, a CASH prize of $15.00.

A GRAND TOTAL OF $1,015.00 TO BE GIVEN AWAY

We appreciate the great volume of business with which we have been favored, and as an inducement for the continuance of this fine business, also for new business, we make this most extraordinary offer. No scheme or complicated conditions connected with this offer. Everyone in the trade is eligible and has an equal opportunity to compete for any one of these prizes. The reason for this is that while we control a large volume of business, it is comprised mostly of small orders. No person other than ourselves will know what another is purchasing, so everyone in the trade can compete on the same fair basis. There are no complicated conditions whatever. All you have to do is to send us your orders, a correct accounting being kept of each and every order. After April 15th the automobile will be awarded to the customer whose purchases total the greatest; the Weber engine goes to the second; a $50.00 cash prize to the third; a $25.00 cash prize to the fourth; a $15.00 cash prize to the fifth.



This automobile to be awarded to the customer whose purchases total the greatest amount from September 1, 1904, to April 15, 1905. The list price and the price at which it has sold is $800.00. It cost us, at wholesale exactly, $640.00. It is on exhibition at our store and is open for inspection to any one who may desire to see it. It has the latest French style body, four full elliptic springs, long wheel base, 3-in. Diamond tires, adjustable wheel post, 7 h. p. engine, a sliding gear transmission, something no other runabout can boast of; artillery style of wheels, gasoline capacity for 125 miles, water capacity for 500 miles, the cost of running one quarter of a cent a mile. This machine is manufactured by members of the Association of Licensed Automobile Manufacturers, and has been exhibited and is represented in the leading cities in this country. When you think that your chance of winning this is equal to anyone, doesn't this appeal to you as a fine offer? We want you to take advantage of it and get in line at the very start. We have circulars complete in their description of this machine, and shall be glad to mail them to anyone upon request.



This 2½ h. p. Weber engine to be awarded to the man whose purchases are second greatest in amount from September 1st, 1904, to April 15th, 1905. This engine is well and favorably known and represents without question the best gas or gasolene engine on the market to-day. The space here is to limited too give an extended discription, but descriptive circulars will be cheerfully sent to any address upon request. If you don't win the automoble, there is a very good chance for you to win this engine. No one knows what your purchases amount to, you don't know what the other man is buying, so send on your orders and don't forget to secure the advantage of an early start.

OUR GOODS ARE THE BEST AND PRICES THE LOWEST.

The quality of the goods and our prices are not to be affected by this offer. We make this offer merely to advertise and stimulate business and you can ill afford to pass it by. Remember that a correct accounting of your purchases will be kept from September 1st to April 15th. Any and everyone who sends in an order within that time will compete for these prizes. Even though your order may appear small to you, don't fail to send it, for, as we have explained before, while we control a great volume of business, the orders are small and yours will no doubt prove large and a great factor in the winning of one of these prizes. Although you have the same chance as anyone else, even though you don't win a prize, YOU ARE BOUND TO GAIN for we give you better value for less money than you can obtain elsewhere. **We have just issued a new revised sheet, reducing considerably our Spring catalogue prices** on both axles and springs. **You will be surprised** at the low prices we offer and we want you to **write for this sheet, also our Spring 1904 catalogue,** if you fail to have it, so that you will be in line early for the greatest offer that was ever presented to you.

Don't Forget That There is Nothing to Lose. But Everything to Gain.

Further particulars, if desired, cheerfully sent at your request.

CRAY BROTHERS, Cleveland, O.

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