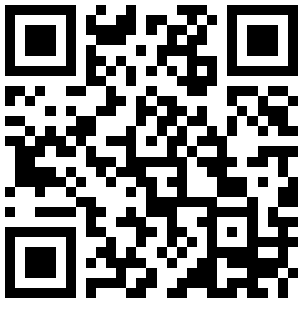

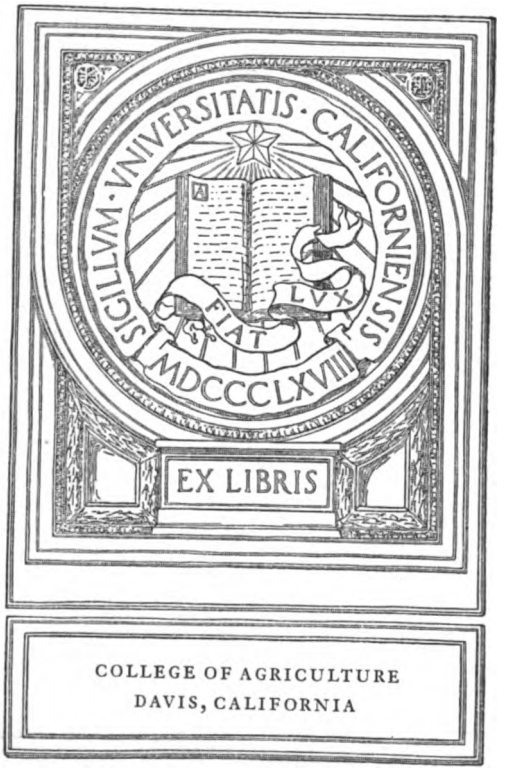

AMERICAN BLACKSMITH AUTO & TRACTOR SHOP

VOLUME 19
NUMBER 1

BUFFALO, N. Y., OCTOBER, 1919

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Oshkosh, Wisconsin

AMERICAN BLACKSMITH AUTO & TRACTOR SHOP

VOLUME 19 | OCTOBER, 1919 | NUMBER 1

BUFFALO, N. Y., U. S. A

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BUFFALO N. Y

Cable Address: "Blacksmith, Buffalo"

What Are You Making of Yourself?

Editorial from The Arnold Print.

OVER yonder young Black is leaning against a telephone pole in front of a barber shop. If you passed that way last night you would have seen him, and you would have seen him the night before, too, and the night before that. 'Most every evening Black wastes a couple of hours just leaning against that pole.

Over here in the room above the drug store young Smith is studying. Every evening he aims to keep at his books at least a half hour. Some nights he's pretty tired, and it's a mighty hard job to rivet his attention to his studies, but somehow he manages to stick to it.

Black and Smith used to loaf around a good deal together until Smith got a "hunch" that he wasn't making anything out of himself—that he wasn't buildng anything for the future. But somehow he couldn't make his pal see it that way. So the latter just idles away his time.

As you read this it is safe to say that you would bank on Smith as the man who eventually will come out ahead. But have you ever stopped to apply this case to yourself? Just what are you doing with your leisure time and just what are you doing for the future?

FROM THE CHIN UP

From the chin down you are worth about $1.50 per day.

From the chin up you are worth anything. There's no limit.

You have a mistaken idea. You think you are paid for your work says a great railroad man. You are not. You are paid for what you think while you work. It's the kind of brain that directs your hands that gives you your rating. And what causes you the most concern: the contents of your school or the mass below the collar-bone? Are your thoughts flabby, uncontrolled, wayward and useless, though you are expert in tennis and golf? Is your thinker as keen, alert, accurate and dependable as your hands? What interests you most, books or beer? What pains you most, stomach-ache or a lie? Where do you get your pleasures? From the chin down. And is all your fun in the cellar? Don't you ever have any fun in the attic? Suppose it were possible to live after the head had been severed from the body, which part would you rather have, the head part or the meat part?

What are you anyhow, an animal pestered with a mind, or a soul imprisoned in a body? Do you know that the gist of culture consists of transferring one's habitual amusements from below to above the nose?

THE MODERN FARMER

A modern farmer is Jim Smith
As are most farmers now.
He does not wear out horses with
Long sessions at the plow.

Jim has a tractor, which can draw
Gang-plows and heavy drags;
And has not such a hungry maw
As have hard-working nags.

He has the latest implements,
A useful auto-truck,
And dollars where he once had cents;—
'Tis not all due to luck.

The modern farmer knows his game
And plays in winning way;
When on a check he writes his name,
Most any bank will pay!

—Charles Horace Meiers.

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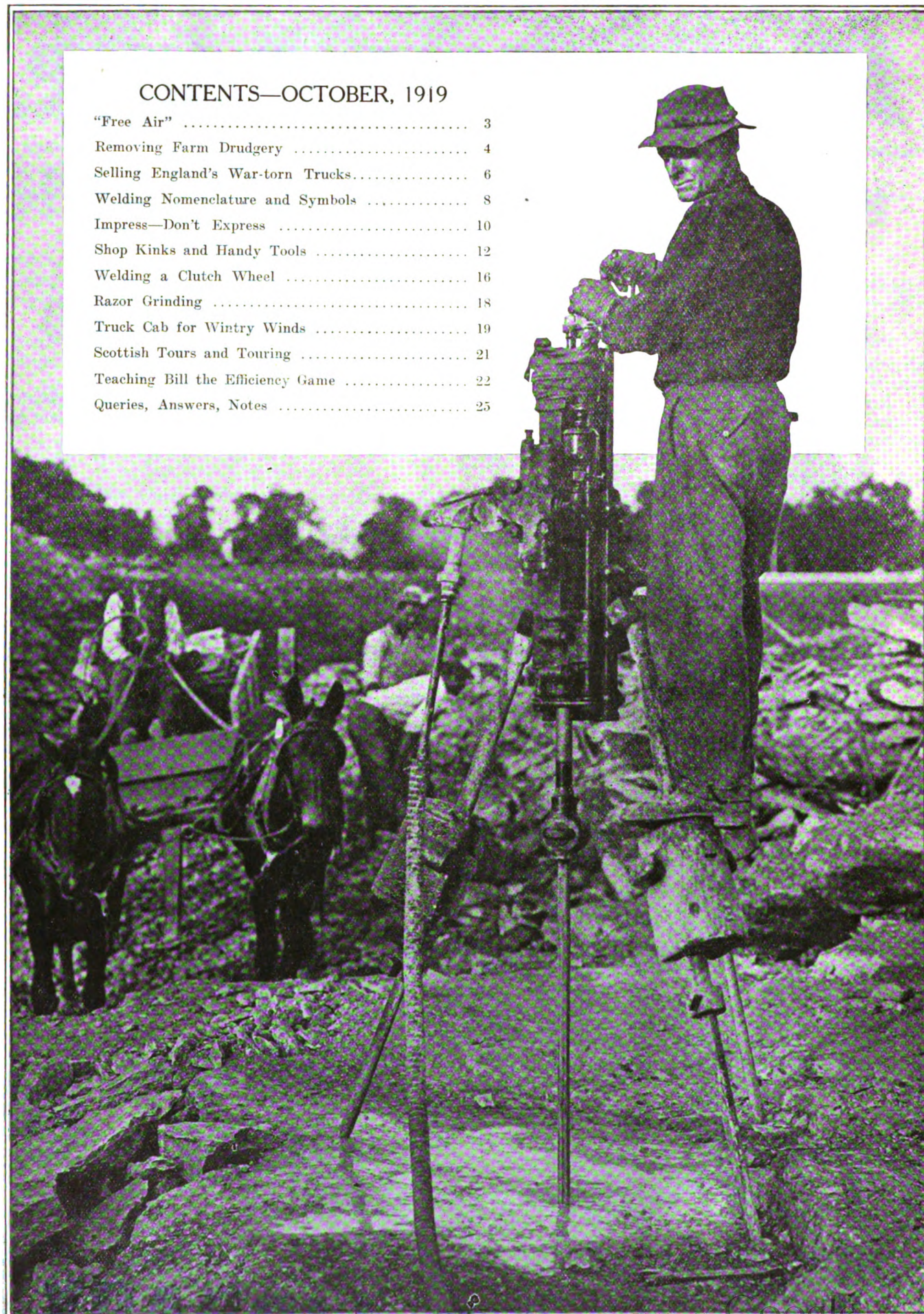


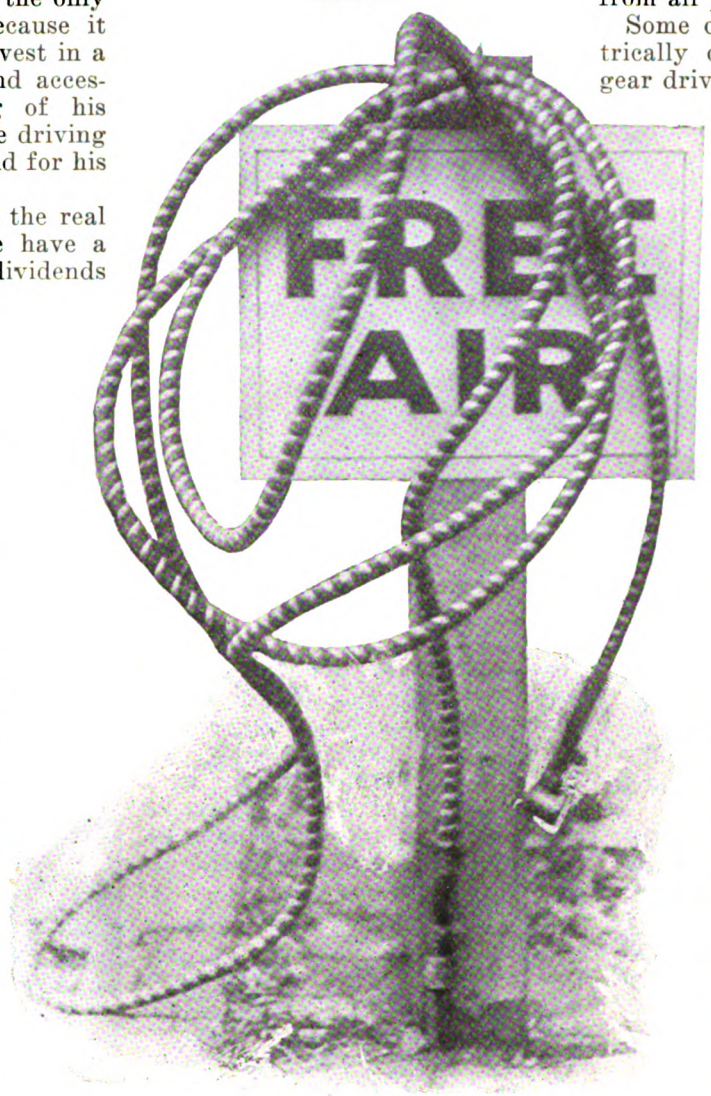
ABOUT the only thing unaffected—as yet—by the high prices of the profiteers, price manipulation of jobbers and wholesalers and on which the "present high costs of labor and materials" has absolutely no affect, is the air we breathe and the same we pump into our automobile tires.

"Free Air" is the sign that one reads or should read, in front of practically every garage and repair shop in the land and the only reason it is "free" is because it pays the shop owner to invest in a suitable air compressor and accessories for the supplying of his patrons and the automobile driving public in general, with wind for his tires.

Before getting along to the real subject of this article we have a word to say about the dividends paid by such an investment, which, aside from being a mere convenience to regular patrons is a source of profit which can be directly traced to this form of accommodation. As an example: a driver discovers he has a soft tire and to avoid rim cuts he stops at the first available place to bring the pressure up to normal and while he is doing it, in about eight out of ten cases, he is "tanking up" with gasoline. This is only a sample and affects the sale of gasoline alone and the writer knows of at least one instance in which a garage owner who had installed an air compressor at a cost of something like $100 has almost doubled his sale of gasoline, not to mention such accessories as spark plugs, tubes, tires, patches, etc.

If you are considering the installation of such equipment, and it is worth considering if you are not, the type of apparatus most suitable to meet your requirements will probably be the first thing you will want to know about and the next will be "how much will such an arrangement cost me?" The first question can be answered by stating that you can find a size and type of air compressor to suit the most modest requirements and operated by either engine or electric power that you already have available or driven by its own electric motor. Regarding the cost of compressors, you can get them for as low as $35 and as much beyond that as you care to go, and if you have an old internal combustion engine around the shop you can make a fairly competent air compressor yourself for practically nothing by reducing the amount of compression space in the cylinder

PART 1



JOS. M. ZAEPFEL

and using a check valve to prevent the air from coming back into the compressor. The compression space of the cylinder can be reduced by bolting one or two thicknesses of boiler iron to the top of the piston. A tank, safety valve, pressure gauge and proper piping will of course, be necessary.

As already stated the simplest form of compressor is one driven by a belt from the shop line shaft, the operation of the compressor being controlled by tight and loose pulleys. The air from such a compressor can be stored in a tank or pumped directly into the tires. The next form to consider is the electrically operated portable or stationary equipment. Where a highly efficient and convenient installation is desired and where the size of the shop makes the first cost of approximately $200 possible such an equipment is the most desirable from all points of view.

Some of the self contained electrically operated compressors are gear driven and while there are all kinds of individual tastes and requirements on the subject it is suggested that the belt or chain driven types be selected in preference to the stiff, inflexible and somewhat noisy gear drive.

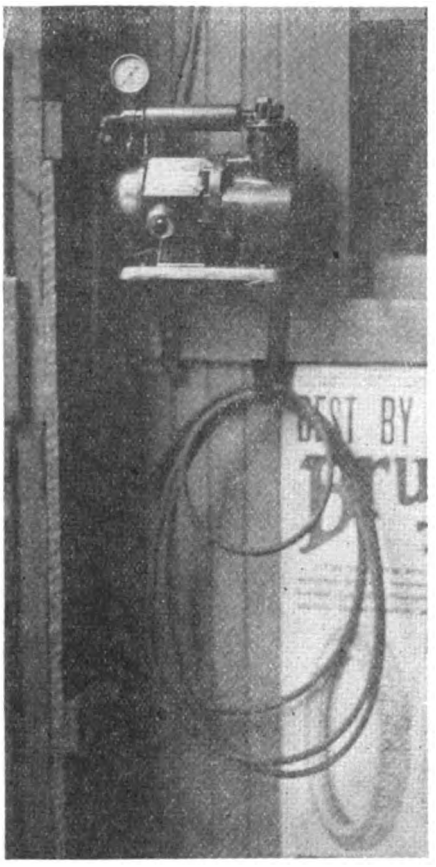
Where it is not desired to run air lines throughout the shop as would be necessary with a station ary compressor the portable outfit, complete with tank gives the advantage of air in storage in addition to portability and can be wheeled readily to otherwise inaccessible places.

There is more or less moisture formed through condensation of the air in the piping and storage tanks of every air system and provision should be made for daining this water off at intervals by providing suitable drain cocks at the lowest point of the tank and pipe system and it might be even more desirable to have the air pipes arranged to drain into a trap, which is merely a short length of pipe connected with the air line by a T, closed at the end and fitted with a drain cock.

A safety valve must be provided in all cases where storage tanks are used and these are generally set to "blow" at 150 pounds pressure. Storage tanks designed for compressed air use should be tested to stand at least 300 pounds pressure for a working pressure of 150 pounds. An air pressure gauge of some sort must also be used with all air compressors.

Where electricity is used to drive the compressor it may be found desirable to use an automatic pressure

controller. This is a device which automatically maintains the air tank pressures between any predetermined point. Usually thes controllers are set to start the compressor in motion automatically when the tank pressure becomes reduced to 115 pounds and to stop when the pressure comes up to 140 pounds. This device can also be set for pressure within other limits when desired. (To be continued)



A COMPACT ELECTRICALLY OPERATED COMPRESSOR THAT IS READILY PORTABLE AND CAN BE PLUGGED IN ON ANY LIGHT SOCKET

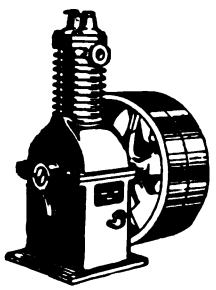
THE TRACTOR THAT DOES THE FARM DRUDGERY

There are thousands of farmers who could use motor trucks to good advantage for the hauling which usually consumes a large part of their time, but in many instances these time-saving features of the motor truck have not been brought to their attention, or they do not feel that they have use for a motor truck. One farmer recently complained to his neighbor, a truck owner, that he had so much hauling to do that it was impossible for him to get it done. His neighbor said, "I'll come over in the morning and help you." In the morning he appeared with his motor truck and asked what he should do.

"Well," was the reply, "I have a load of manure to haul from town, that I'm in a hurry for, so I guess we'll go after that first."

They went to town, a distance of seven miles, loaded the manure on the truck and returned. Within two hours from the time they started the work was done. The speed with which this work was accomplished surprised the farmer. He had not realized his need of a truck until he had it demonstrated in the most practical manner.

"What did that contraption cost?" he asked his neighbor, and many other questions. The result of this lesson was that a week later this farmer owned a similar truck and was no longer complaining of his inability to do the necessary hauling on his farm.



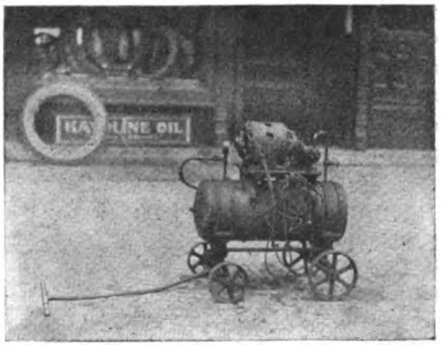
THIS COMPRESSOR MAY BE DRIVEN BY THE SAME ENGINE THAT FURNISHES OTHER POWER FOR THE SHOP

"That motor truck takes the last drudgery out of farm work." Those were the exact words of a power farmer not long ago. This man was past middle age, has used mechanical power in farming operations since boyhood; the 300-acre farm which he now owns was originally cut-over wood land, more than half of which he has reclaimed with mechanical power. Moreover, he is a highly successful power farmer, and for that reason his statement with respect to the motor truck carries all the more weight because he knows what he is talking about.

Just think what it means to have the last drudgery taken out of farm work! Some farmers may look upon this as an extreme statement; they may take the stand that there will be plenty of drudgery left even after the purchase of a motor truck. Of course, there are exceptions in almost every case, and, as the saying goes, the exceptions only prove the rule. But if we make a careful analysis, it will be found that the farmer isn't so far wrong.

In the past few years a great advancement has been made in the development of mechanical power and labor-saving equipment, and its application to farming operations. With the full use of modern farm implements and machines, in fact, all farm-operating equipment, along with mechanical power, the muscular labor of both man and beast is reduced to such a degree that the heavy work we call drudgery, is practically eliminated. This is true at least to such an extent that what heavy, laborious work does remain ceases, in a sense, to be drudgery because there is so little of it left, as compared to the days when all farm work was largely drudgery.

But getting back to where the motor truck comes in, there is no denying the fact that the marketing of farm crops with teams is for the most part just plain drudgery; hauling heavy loads on the average country roads is hard work for both men and teams, a job which every farmer is always glad to see finished. But the motor truck takes this drudgery out of farming because it relieves the teams and in so doing relieves the men who have to drive them. The motor truck, because of the speed at which it operates, makes the trip to and from market in much shorter time than teams and, consequently, the time of marketing a crop is greatly reduced. As a result, the farmer does not ordinarily have to put in such long hours when there is a rush to get a crop to market.



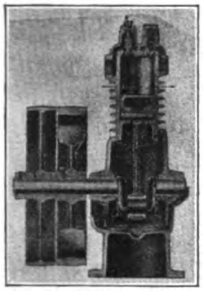
MOUNTED ON IT'S OWN TANK AND ELECTRICALLY OPERATED THIS OUTFIT CAN BE TAKEN ANYWHERE

A farmer who has found the truck indispensable in doing his work of hauling milk to a condensery, says: "I couldn't begin to do the work with two teams, even though I took all day to do it. All during summer, in my off hours, I have found time to haul all the ice

used in my town. I am having a stock rack made for this truck, and will haul stock to my city market, forty miles away. It will take only seven hours to go and return. I spend very little for repairs because I take care of the truck myself."

Another declares: "Nobody could induce me to go back to horses. During eighteen months I have run my truck more than 17,000 miles, and my repair bills have been $41. Twenty-five miles is the limit of a day's work for a team, and they can not even do that every day. With my truck I can double that mileage in half a day."

Most of the tractors now on the market are thoroughly reliable. The engines are highly developed, due to years of experience in manufacture. The tractor has passed the experimental stage. The big question of the farmer is to decide the size and character of the tractor that will be most profitable on his farm.



INTERIOR OF TYPICAL AIR COMPRESSOR (CURTIS)

The average size farm will not justify both horses and tractor. It may be said the tractor will not prove profitable unless at least seventy-five per cent. of the horses can be eliminated. Therefore a tractor to be really profitable on an average size farm must do at least seventy-five per cent. of the work that horses do—and the nearer it comes to doing all farm work without horses the more profitable it will be. The ideal on on a small farm is a light, moderate priced tractor which you can start on the first furrow in the spring and keep working all the season—plowing, harrowing, drilling, cultivating, mowing, harvesting, etc., doing all your farm work until the silo is filled.

Some tractors are good for all round work, some for special tasks; some for one kind of ground, some for another. The purchaser should inform himself as to what is best for his conditions. Some small tractors pull two bottoms, some many more. One big fellow draws eighteen plows. In a test, a light machine plowed 1.9 acres in an hour and thirty minutes.

The tractor works in hot or cold weather, by night or day. It makes possible a great saving of man power. Formerly it was supposed that only a regular mechanic could manage the intractable tractor. But now a greatly improved and simplified machine is made, and at one meeting many women were demonstrating the ease with which they could be handled. One young woman who had never driven a tractor before, volunteered to drive one of the improved makes. Within ten minutes she was executing fancy steps with it, so simple was the matter of guiding.

The great advantage of the caterpillar type lies in the fact that it lays its own track, and thus its power to travel over ground impassable for other types.

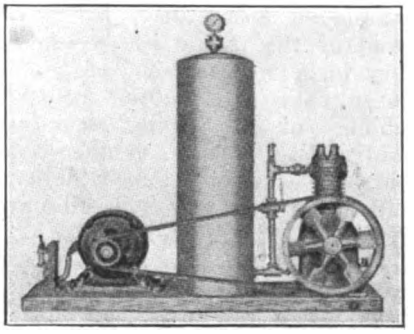
There is the four-wheeled type. Two wheels balance and guide the machine, and two more large, heavy wheels furnish the pull and traction. Sometimes the two steering wheels are combined in one, leaving a three-wheeled tractor, and again there is but one drive or traction wheel.

There is the two-wheel, in which the two drive wheels also steer the machine, and lastly, though it may not be technically admitted in this category, there is the converted automobile.

In the tractor of today we find many of the causes of their improvements. Better materials are being used. Steel has replaced castings, and the finely adjusted machinery developed for the automobile has found its use on the tractor. Hence we find standard bearings that make for smoother running and longer wear. We find in the tractor of today a lubrication system as perfect and modern as that in the automobile. Ignition systems, so admirably attuned to the touring car, also serve the tractor, and modern radiation keeps the tractor cool even at its hardest work on the hottest days. Carburetion for the handling of various kinds of fuel is no longer an experiment, and the tractor purchaser may with reasonable assurance look for a minimum of trouble with clutch, transmission, valves, piston, rings, fuel supply, differentials, ect.

With a truck, a trailer saves power and is often a great money-saver on the farm. The manager of a dairy farm, with a trucking side line, found this to be the case. It went a long way toward solving their marketing problem. They had found the dairy farm could obtain higher prices for produce by reaching market with fresh stock. Therefore, a trailer, with a five-ton capacity, is used behind a truck having a four-ton capacity. This trailer is equipped with a special body to match the body of the truck, and is used for hauling practically all kinds of material and merchandise on the farm.

High-grade motor trucks are built with ample power to take



MOTOR DRIVEN STATIONARY COMPRESSOR SET

them over the worst roads and the steepest grades ordinarily encountered. For instance, the motor of a truck must exert ten times the force to move it over a sandy road that it does over paved roads. Therefore, when used over ordinary hard-surfaced roads and moderate grades it is using only a part of its power.

Roughly speaking, the average motor truck, when loaded develops a draw-bar pull in pounds of one-half of its rated capacity. For example, a three-ton truck will develop 3,000 pounds draw-bar pull. The draw-bar pull required to haul a ton of material varies from fifty pounds on a brick street to 150 pounds on a hard, country road. An average of 250 pounds draw-bar pull will haul an extra ton on a trailer. A three-ton truck, therefore, will carry its three-ton load and still have sufficient reserve power to haul from twelve to fifteen tons behind it.

Under ordinary road conditions, the average truck has plenty of reserve power to handle a trailer of equal carrying capacity. The load is doubled, at the least, with a comparatively slight addition to the operating expense. This additional expense will run from ten to twenty per cent. To illustrate the profit in

truck-trailer operation, as compared with truck alone, suppose that a truck is earning $24 a day, with an operating expense of $14 a day, thus making a profit of $10. For about $2 a day additional to cover trailer operating expense the truck would, with trailer attached, carry double the load, and the profit would be $18 instead of $10, an increase of eighty per cent, in efficiency.

The use of trailers is also practical in connection with autos. Many auto owners make their own trailers of an old buggy axle and wheels, while a great many prefer to buy a trailer.

Selling England's War-Torn Trucks and Cars

John Y. Dunlop

Enormous prices paid for cars of questionable age and condition. The element of comedy and reckless plunging present all the elements of a three ring circus.

NOW that the British government has been able to get a great amount of its serviceable and unused war stocks and materials home again, the powers that be in charge of such matters are placing at the disposal of the public a very large number of motor cars and motor transport vehicles of all kinds, sizes and conditions. These vehicles are sold at weekly auctions which are held at various points in all parts of the United Kingdom.

The machines are grouped into two classes, those which are in first class operating order and those that are sold as they stand on view, no warranty being given or implied in the catalogue and a considerable amount of criticism has arisen regarding the repair of the motor vehicles placed in the second, "unwarranted" category and strong views have been expressed as to the liklihood of cars of repute falling into the hands of unscrupulous parties and being botched up to the disadvantage of the subsequent purchaser which would quite naturally be inimical to the interests of the manufacturer and purchaser.

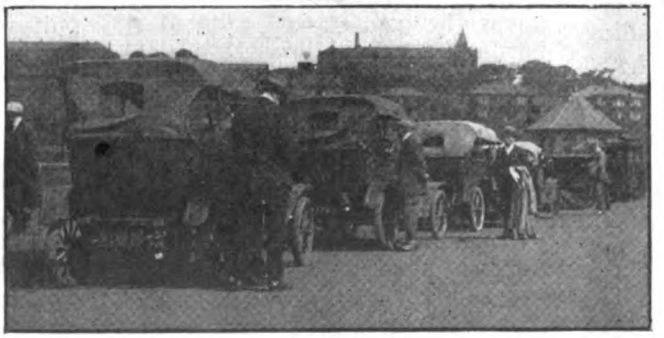
Such criticism would not be forthcoming and such fears wouuld not be engendered if all used and damaged government vehicles came into the hands of responsible parties having the proper facilities for overhauling and repairing.

The series of sales that have been held at Olympia, London, are for the best class of cars and those in running order and stress is laid on this point very often by the auctioneer and among others that were sold were five Rolls-Royce cars and a six cylinder Daimler. These six cars, the auctioneer announced, would be driven before the assemblage of prospective buyers when they were reached on the list to be sold and although they brought higher prices than other cars a great amount of amusement was caused through the bidding. The Daimler took a long time to appera and apparently had some difficulty in starting, but when it did come it sold for 1,025 guineas. The next was a fairly old Rolls-Royce equipped with a three-quarter landaulet body. This, the auctioneer announced, was a 40-50 horsepower car. The bidding opened at 1,000 pounds and was sold for 2,100 pounds or approximately $10,500 which is even something better than the cost of the highest priced car sold in the United States for the highest of high class cars. The next was a Sunbeam car of more recent model and this one sold for 3,250 guineas.

The noise after this one had been cold advertised that "running order" might mean anything and when the chassis appeared there were several bids of 100 pounds and then while the auctioneer was holding a

A FEW OF THE MANY HOLLEY TRUCKS THAT ARE PUT UP FOR SALE

ONE OF THE ALBION TRUCKS FOR WHICH THERE IS A GREAT DEMAND



THESE TWO FORDS BROUGHT 68 POUNDS EACH ABOVE—CARS LIKE THIS BROUGHT BIDS FOR MORE THAN THEY COST WHEN NEW

conversation with some friends, the bid raised itself to 250 pounds and stopped simultaneously with the chassis which, with much backfiring, came to a stop halfway to the auctioneer's rostrum. After another start the car managed to get up to the auctioneer and all further efforts to start it again were in vain. However, at the end and after much chaffing the ultimate buyer got his "bargain" for 1,325 pounds, the antiquated Rolls was then pushed out of the way to the cheers of the crowds.

There were many more of these similarly spirited bouts of bidding by those who seemed to treat the spending of a few thousand pounds as something of a joke and after seeing some of their purchases, the writer has often wondered who the joke was on.

A few weeks ago a sale similar to the one described, was held at Scotstown, Glasgow, where the standard of the machines was much below that of the London sale. There they were and you simply bought them as they stood. Many of the cars were "dismantled" and very much dismantled at that. The prices were much lower but even the old junk piles that looked as though they might have been automobiles once were disposed of and in some cases at very good prices. Similar sales are to be held each week until the whole of the government's supply of motor vehicles has been disposed of.

WE SHOULD WORRY

A large British engineering company has announced its entry into the field of motor car production with a model which is openly regarded as an attempt to meet American competition by adopting American methods of mass production. The company hopes to put 20,000 cars on the market in the first year. This car, says the American Chamber of Commerce in London, is the 16 to 20 horse power, five passenger cubitt which is to sell at £298 (approximately $1,490).

There is no guarantee that the makers of this car will be successful in putting it on the market in the quantity necessary to make the estimated price possible, nor that it will prove satisfactory in service when it is produced. Although the makers are an old established engineering concern of wide experience, the car is still largely a paper car. Only one has actually been built and this for testing purposes. It has been run almost 30,000 miles and is reported to have given a thoroughly satisfactory performance, but no others have yet been made.

If the car can be put on the market satisfactorily there should be a bright future for it at the price. The issue of stock which the company floated for this purpose was quickly oversubscribed and the British public is eagerly awaiting the appearance of the first models which will meet the competition of the low-priced American cars. The American Chamber of Commerce points out in this connection that all American car builders have to add a 33 1/3 per cent import tariff duty c. i. f. to their selling price in Great Britain.

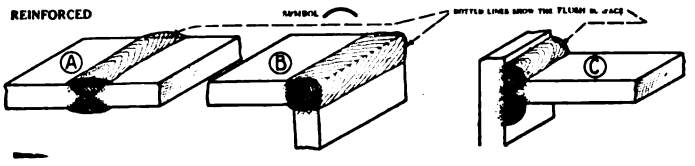
As an aid to locating the cause of unusual noises in gas engines, some experts recommend throttling down the motor and determining the frequency of the noise. Generally speaking, the common engine noises occur at either camshaft or crankshaft speed. By noting when the knock occurs with reference to the rotation of one or the other of these shafts, it may be more easily classified. In every case main bearings produce knocks at crankshaft speed, as do also crankpin and wristpin defects. Knocks at camshaft speed, which is half that of the crankshaft, are usually due to a loose bearing or to end play in the shaft. If an attempt is made to classify these sounds before proceeding further in the diagnosis, much time and effort can often be saved.

Benjamin Franklin said: "Remember that time is money. He that can earn ten shillings a day by his labor, and sits idle one-half that day, though he spends but sixpence during his idleness, he has really spent or thrown away five shillings besides." Make your time and money work. Buy W. S. S.

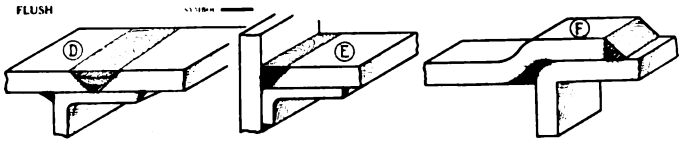
CONVERSION TABLE
MILLIMETER EQUIVALENTS OF FRACTIONAL INCHES
1/64 INCH TO 8-63/64 INCHES

		1in.	2 in.	3 in.	4 in.	5 in.	6 in.	7 in.	8 in.
		25.3995	50.7990	76.1986	101.598	126.998	152.397	177.797	203.196
1-64	0.3968	26.7964	51.1959	76.5954	101.995	127.394	152.794	178.193	203.593
1-32	0.7937	26.1932	51.5928	76.9923	102.391	127.791	153.109	178.590	203.990
3-64	1.1906	26.5901	51.9896	77.3892	102.788	128.188	153.588	178.987	204.386
1-16	1.5874	26.9874	52.3865	77.7860	103.185	128.585	153.984	179.384	204.783
5-64	1.9843	27.3838	52.7834	78.1829	103.582	128.982	154.381	179.781	205.180
3-32	2.3812	27.7807	53.1802	78.5798	103.979	129.578	154.778	180.177	205.577
7-64	2.7780	28.1776	53.5771	78.9766	104.376	129.775	155.175	180.574	205.974
1-8	3.1749	28.5744	53.9740	79.3735	104.773	130.172	155.572	180.971	206.370
9-64	3.5718	28.9713	54.3708	79.7704	105.169	130.569	155.969	181.368	206.768
5-32	3.9686	29.3682	54.7677	80.1672	105.566	130.966	156.365	181.765	207.164
11-64	4.3655	29.7650	55.1646	80.5641	105.963	131.363	156.762	182.162	207.561
3-16	4.7624	30.1619	55.5614	80.9610	106.360	131.760	157.159	182.559	207.958
13-64	5.1592	30.5588	55.9583	81.3579	106.757	132.156	157.556	182.956	208.355
7-32	5.5561	30.9556	56.3552	81.7547	107.154	132.553	157.953	183.352	208.752
15-64	5.9530	31.3525	56.7520	82.1516	107.551	132.950	158.350	183.749	209.149
1 4	6.3498	31.7494	57.1489	82.5485	107.948	133.347	158.747	184.146	209.546
17-64	6.7467	32.1462	57.5458	82.9453	108.344	133.744	159.143	184.543	209.943
9-32	7.1436	32.5431	57.9426	83.3422	108.741	134.141	159.540	184.940	210.339
19-64	7.5404	32.9400	58.3395	83.7391	109.138	134.538	159.937	185.337	210.736
5-16	7.9373	33.3368	58.7364	84.1359	109.535	134.935	160.334	185.734	211.133
21-64	8.3342	33.7337	59.1333	84.5328	109.932	135.331	160.731	186.131	211.530
11-32	8.7310	34.1306	59.5301	84.9297	110.329	135.728	161.128	186.527	211.927
23-64	9.1279	34.5274	59.9270	85.3265	110.726	136.125	161.525	186.924	212.324
3-8	9.5248	34.9243	60.3239	85.7234	111.122	136.522	161.922	187.321	212.721
25-64	9.9216	35.3212	60.7207	86.1203	111.529	136.919	162.318	187.718	213.118
13-32	10.3185	35.7180	61.1176	86.5171	111.916	137.316	162.715	188.115	213.514
27-64	10.7154	36.1149	61.5145	86.9140	112.313	137.713	163.112	188.512	213.911
7-16	11.1122	36.5118	61.9113	87.3109	112.710	138.109	163.509	188.909	214.308
29-64	11.5091	36.9087	62.3087	87.7077	113.107	138.506	163.906	189.305	214.705
15-32	11.9060	37.3055	62.7051	88.1046	113.504	138.903	164.303	189.702	215.102
31-64	12.3029	37.7024	63.1019	88.5015	113.901	139.300	164.700	190.099	215.499
1-2	12.6997	38.0993	63.4988	88.8983	114.297	139.697	165.097	190.496	215.896
33-64	13.0966	38.4951	63.8957	89.2952	114.694	140.094	165.493	190.893	216.292
17-32	13.4934	38.8930	64.2925	89.6921	115.091	140.491	165.890	191.290	216.689
35-64	13.8903	39.2899	64.6894	90.0989	115.489	140.888	166.287	191.687	217.086
9-16	14.2872	39.6867	65.0863	90.4858	115.885	141.284	166.684	192.084	217.483
37-64	14.6841	40.0836	65.4831	90.8827	116.282	141.681	167.081	192.480	217.880
19-32	15.0809	40.4805	65.8800	91.2795	116.679	142.078	167.478	192.877	218.277
39-64	15.4778	40.8773	66.2769	91.6764	117.075	142.475	167.875	193.274	218.674
5-8	15.8747	41.2742	66.6737	92.0733	117.472	142.872	168.271	193.671	219.071
41-64	16.2715	41.6711	67.0706	92.4701	117.869	143.269	168.668	194.068	219.467
21-32	16.6684	42.0679	67.4675	92.8670	118.266	143.666	169.065	194.465	219.864
43-64	17.0653	42.4648	67.8643	93.2639	118.663	144.063	169.462	194.862	220.261
11-16	17.4621	42.8617	68.2612	93.6608	119.060	144.459	169.859	195.258	220.658
45-64	17.8590	43.2585	68.6581	94.0576	119.457	144.856	170.256	195.655	221.055
23-32	18.2559	43.6554	69.0549	94.4545	119.854	145.253	170.653	196.052	221.452
47-64	18.6527	44.0523	69.4518	94.8513	120.250	145.650	171.050	196.449	221.849
3-4	19.0496	44.4491	69.8487	95.2482	120.647	146.047	171.446	196.846	222.245
49-64	19.4465	44.8460	70.2455	95.6451	121.044	146.444	171.843	197.243	222.642
25-32	19.8433	45.2429	70.6424	96.0419	121.441	146.841	172.240	197.640	223.039
51-64	20.2402	45.6397	71.0393	96.4398	121.838	147.237	172.637	198.037	223.436
13-16	20.6371	46.0366	71.4366	96.8357	122.235	147.634	173.034	198.433	233.883
53-64	21.0339	46.4335	71.8330	97.2326	122.632	148.031	173.431	198.830	224.230
27-32	21.4308	46.8303	72.2299	97.6294	123.029	148.428	173.828	199.227	224.627
55-64	21.8277	47.2272	72.6267	98.0263	123.425	148.825	174.224	199.625	225.024
7-8	22.2245	47.6241	73.0236	98.4232	123.822	149.222	174.621	200.021	225.420
57-64	22.6214	48.0209	73.4205	98.8200	124.219	149.619	175.018	200.418	225.817
29-32	23.0183	48.4178	73.8173	99.2169	124.616	150.016	175.415	200.815	226.214
59-64	23.4151	48-8147	74.2142	99.6137	125.013	150.412	175.812	201.211	226.611
15-16	23.8120	49.2116	74.6111	100.011	125.410	150.809	176.209	201.608	227.008
61.64	24.2089	49.6084	75.0080	100.408	125.807	151.206	176.606	202.005	227.495
31-32	24.6057	50.0053	75.4048	100.804	126.203	151.603	177.003	202.402	227.802
63-64	25.0026	50.4021	75.8017	101.201	126.600	152.000	177.399	202.799	228.198

Welding Nomenclature and Symbols



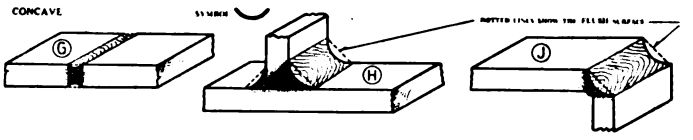
Reinforced—is a term applied to a weld when the top layer of the welding material is built up above the plane of the surrounding material as at "A" above, or when used for a corner as in "C". The top of the final layer should project above a plane of 45 degrees to the adjoining material. This 45 degree line is shown "dotted" in "C". This type is chiefly used in a "strength" or "composite" kind of weld for the purpose of obtaining the maximum strength efficiency, and should be specified by the designer together with a minumum number of layers of welding material.



Concave is a term applied to a weld when the top layer finishes below the plane of the surrounding material as at "G" above, or beneath a plane of 45 degrees at an angular connection as at "H" and "J" above.

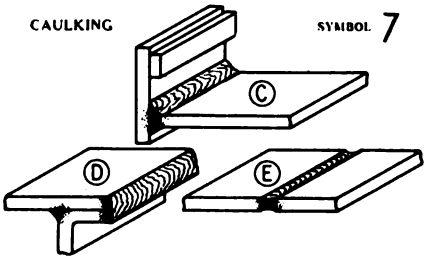
To be used as a weld of no further importance than filling in a seam or opening, or for strictly caulking purposes, when it will be found that a minimum amount of welding material will suffice to sustain a specified pound square inch pressure without leakage. In this "type of weld" it will not be necessary for the designer to specify the number of layers of material owning to the lack of structural importance.

Flush is a term applied to a weld when the top layer is finished perfectly flat or on the same plane as on the adjoining material as shown in "D" and "E" above or at an angle of 45 degrees when used to conect two surfaces at an angle to each other as at "F". This type of weld is to be used where a maximum tensile strength is not all important and must be specified by the designer, together with a minimum number of layers of welding material.



A **Tack** weld is applying the welding in small sections to hold two edges together, and should always be specified by giving the **space** from center to center to weld and the **length** of the weld itself. No particular "design of weld" is necessary of consideration.

A **Tack** is also used for temporarily holding material in place that is to be solidly welded, until the proper alinement and position is obtained, and in this case neither the **length, space or design of weld** are to be, specified.



A **Caulking** weld is one in which the density of the crystalline metal, used to close up the seam or opening, is such that no possible leakage is visable under a water, oil or air pressure of 25 lbs. per square inch. The ultimate strength of a caulking weld is not of material importance—neither is the "design of weld" of this kind necessary of consideration.

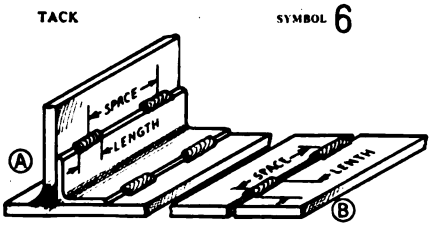
A Strength weld is one in which the sectional area of the welding material must be so considered that its tensile strength and elongation per square inch must equal at least 80 per cent of the ultimate strength per square inch of the surrounding material. (To be determined and specified by the designer). The welding material can be applied in any number of layers beyond a minimum specified by the designer.

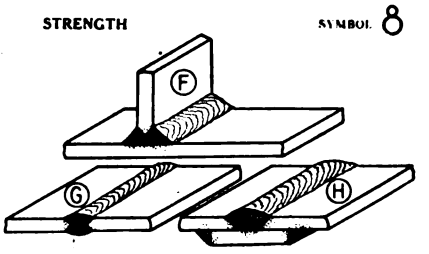
The density of the crystalline metals is **not** of vital importance. In this form of weld, the "design of weld" must be specified by the designer and followed by the operator.

A Composite weld is one in which both the strength and density are of the most vital importance. The **strength** must be at least as specified for a "strength weld," and the density must meet the requirements of a "caulking weld" both as above defined. The minimum number of layers of welding material must always be specified by the designer, but the welder must be in a position to know if this number must be increased according to the welder's working conditions.

Double Bevel is a term applied to the edge finish of two adjoining plates, when the adjoining edges of both plates are beveled from **one** side only to an angle, the degrees of which are left to the designer. To be used where maximum strength is required, and where electrode can be applied from **one** side of the work only.

Single Bevel is a term applied to the edge finish of a plate, when this edge is beveled from **one** side only to an angle, the degrees of which are left to the designer. To be used for "strength" welding, when the electrode can be applied from **one**

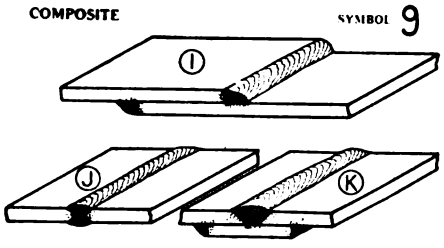




side of the plate only, or where it is impossible to finish the adjoining surface.

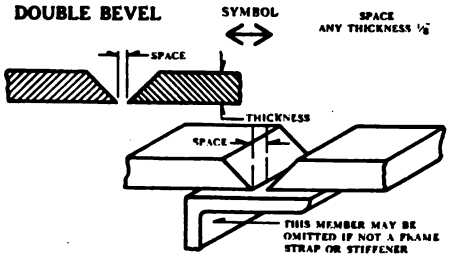
FACTS ABOUT DRILLS

An ordinary twist drill has three cutting edges, the circumference, between the flutes, known as the land of the drill, being obtained by grinding off the cutting edge back of the flute. The cutting edge is backed off to the back of the flute,

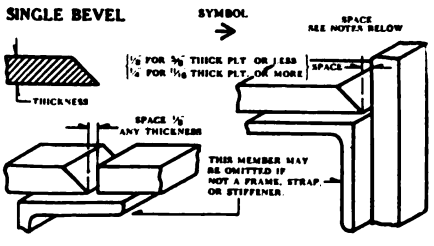


and the drill has its diameter only at two points.

The object of grinding the drill in this fashion is to prevent it seizing from heat or dragging against the walls of the hole and cause it to require an unnecessary amount of energy to turn it. In case the



"land" of a drill is worn off and the drill be perfect in every other particular, it will be found practically worthless for drilling any depth. Most twist drills have two flutes only. However, three and even more have been made, but owing to the more delicate, com-



plicated operation in grinding its advantages are counterbalanced to such an extent that it is not considered practical. Therefore the keenness and durability of the cutting edge of a drill are governed by the amount of clearance given by the grinding of the cutting edge to correspond to the twist of the flute.

The angle of the front face of a twist drill varies at every point in the entire diameter of the drill being governed by the spirality of the groove or flute. The sooner we acquaint ourselves with these peculiarities found in standard drills the sooner we will get better results with less efforts.

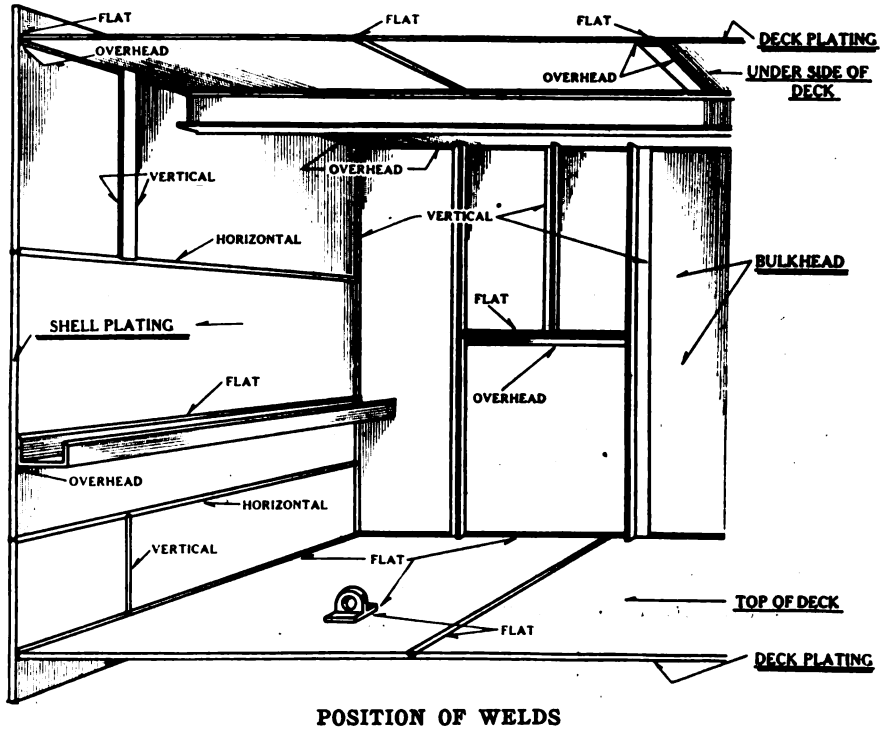
A drill ground exactly true will wear until the flutes are ground entirely away and cut clean, straight holes. On the other hand, if one of the cutting edges is a trifle longer than the other the drill will cut a hole larger than the drill and the result is the drill will be dulled very rapidly on the side doing the cutting. If the hole drilled is of any depth, it will be smaller the deeper it is drilled, leaving it an irregular taper with rough walls.

Then, again, we may take a drill ground accurate and increase the feed without, however, increasing the speed accordingly, and get results much resembling the drill ground out of true. If we take a drill with one cutting edge ground longer than the other and the two cutting edges at entirely different angles to the angle of the axis of the drill, we will drill a hole with crooked rough walls, varying in size from top to bottom.

Paint and leather substitutes are the great factor in keping a buggy in good condition and looking bright and neat. Paint will greatly lengthen the life of any vehicle, and the wagon repair man can be depended upon to get the right kind of goods.

For the wheels and body he should use a special carriage varnish. For the top he should use a top renewer designed for that particular purpose. If the top is worn out, some good leather substitute, which is sold by the yard by stores handling dry goods also by auto, and carriage top makers, will be found a very satisfactory material for a new one. It is best to have en experienced top maker make the new top. If the top is kept dressed with the top renewer, it is likely to last as long as the body and wheels. The same is true of the seat and back upholstery. A seat dressing will help greatly to prevent or retard the deterioration of the upholstery.

The best way to remove a wire-edge on a wood chisel is to draw the tool edge lengthwise across the corner of the hardest bit of wood that can be procured. Repeated two or three times, this usually discourages the wire edge, and then a slight further grinding will bring the tool up to good cutting edge after being whetted or set on an oilstone of course. See that the face of the stone is flat.



POSITION OF WELDS

Impress—Don't Express

Look at Your Business from the Customer's Viewpoint

J. L. HAKY

A year or so ago a man in New York was quite sure he had discovered why so many people write poor business letters. He turned it over in his mind and talked it over with several business men of his acquaintance, and every way he looked at it, it seemed to be sound. It was so simple he couldn't believe he had discovered a new principle of business letters. But so well did the idea take that a large correspondence school has grown up around it and business men the country over are learning the new principal of letter writing.

Here is the whole idea boiled down in one sentence: "Impress—don't express." When you write a letter, don't write as it occurs to your mind, but look at it entirely as it is going to appear to the man who gets it.

A Sweeping Principle

This apparently simple idea is one which every business man can put to work in his store, or shop, or office. It is an idea which is already used, unconsciously for the most part, in all kinds of enterprises. It is at the basis of every pleasing place you walk into.

It is particularly necessary that you look at your place of business through the eyes of the people who come in, for your own eyes soon get to the point where they actually do not see it.

Why does the man begin his letter with "In reply to yours of the 29th instant, beg to state," or some other threadbare and insane expression? Because his mind has has traveled over that part of his letters so many times that it takes no notice of it. Why does the appearance of some stores and offices oppress you so when you enter them? Because the proprietor has seen it so long in that condition that his eyes no longer function.

Some Rather Horrible Examples

A publisher in a large city went bankrupt not very long ago, as publishers often do. When the receiver, a young man, came into the office, he was fairly prostrated by what he saw. Immediately in the foreground were two roll-top desks piled and littered over with old papers and magazines. That was the first thing that greeted the eyes of anyone entering the establishment. Next came a few dilapidated offices filled with ragged old furniture and overflowing with printed rubbish. Back in the far end of the place, almost hidden from view, was a number of girls—stenographers, typists, addressers, and the like.

The first thing the receiver did, being a man of good business parts, was to take one of the prettiest and most intelligent girls and put her at the door to meet callers, find out what they wanted, and carry in their cards. The rest of the time she did her regular work. Then the receiver carted away the roll-top desks and the rest of the debris, cleared away that part of the offices nearest the entrance, and moved up all the rest of the girls and their work.

Now when a man enters those offices he is confronted by a charming girl, and the next thing he sees is a lot of attractive dresses and coiffures, and finally he passes on to the offices in which the dust cloth, the paper baler and some varnish have worked a transformation. No wonder business men who come to these offices want to come back, and no wonder business is picking up and for the first time in years paying a profit. The establishment no longer **ex**presses the slothful mental habits of a lot of decrepit old men, but it **im**presses the caller with color, beauty, courtesy and order.

He Can Let His Medicine Case Alone

A doctor who had reached middle age and saved a modest sum of money decided to invest it in a drug store, where he could live the well-regulated life of a business man and never again hear the telephone ring just after he had taken a hot bath and climbed into bed. He leased the corner store in the apartment house in which he lived on an attractive boulevard, and put in a supply of drugs, cigars, toilet articles, and the rest of the regulation drug store equipment. By the time he got his fixtures and stock paid for he hadn't much left, but he stood back and waited for customers to come in and bring him his living.

Although the corner was not one the United Cigar Stores Company would have selected for a store, there were plenty of people who passed, especially in the morning and evening, to have given him a comfortable business. But for some reason they didn't come in. Soon the ex-doctor's bank savings were going to pay light and rent, and failure stood ahead.

But the lease was signed for a year, so he picked up a young man, little better than a boy, who lived in the same building, put him in the store, packed up his medicine case, and started making calls again. His idea was to rebuild his practice and to close out the drug store as soon as he could find a buyer or as soon as his lease expired.

The boy had some candy store and some cigar store experience, but he knew nothing of drugs, and not being a registered pharmacist, had to let that part of the store go entirely. He went to work on the two windows—the store fortunately was on the corner—and he never let the trims stay in long enough for the passers-by to get used to them. He hauled out all the candy there was in the place and arranged it attractively on top of the counter and in the windows, and put up a cigar and cigarette display that had pulling value. He picked out two of the best five and ten-cent brands of cigars, featured them in the window, and develop that display into the backbone of a neighborhood box trade which soon paid a profit. He let the public know that he sold brick and bulk ice cream—

in short, he built up a brisk trade in the quick turn-over stuff, most of which showed a profit. So well did the boy develop that side of the business that the doctor is now back in the store taking care of his drugs, amounting now to practically a side line to the store's regular business. The windows and afterward the counters of the store were made to catch passing eyes favorably. The boy worked through through other people's eyes to save the store.

Two Stores—Two Methods

A grocery store on a busy street, for some unknown reason, was never crowded with customers. It was less than a block from two other grocery stores, one of them a large one, both of which were, during the busy times of the day, overflowing with trade. For some unknown reason—unknown until the arranging of a store becomes more of a science—customers in paying numbers never came into this store, and it wasn't because the clerks were not polite or courteous. A grocery store travels on a narrow enough margin at best, and this one soon died for want of customers.

Today that same place is occupied by a fruit and vegetable store in which, during a great part of the day, it is hard to find comfortable shopping room. In the middle of the store and along each of the walls rise up great counters covered with the most appetizing looking vegetables and fruits, all marked with price cards. The windows themselves are a revelation of color and appetite-provoking displays of melons, pears, etc., etc., The store is an attractive place as seen through the eyes of those who pass, with the result that it is doing a flourishing business where another store practically in the same line of business failed.

Price marking alone has done a great deal to stimulate the business of many stores, simply because it is looking at the stock of goods from the customers' standpoint. The clerks all know the prices of the various articles for sale, and it is not for them or for the proprietor that price tags stick up in all directions. The man who first put prices on all his merchandise so everybody could see them immediately, must have done so after walking into the store some morning, looking at it through his customers' eyes.

Big Stores or Little

The big stores of the biggest cities have almost without exception grown to their present size from small beginnings. Through years and years of patient, steady development along the lines of sound business administration, many of them have grown to unbelievable proportions.

Enter one of the big successful stores and look it over from the standpoint of impression. The effects they produce merely by their appearance will be a thing of no small wonder if you take the trouble to analyze what you see. The windows, counters, walls, decorations—everything gives you a feeling of beauty, artistic conception and mighty fitness. There is a most cunning design and the most artistic elaboration behind the effects of pleasure and desire which the modern big store produces upon you.

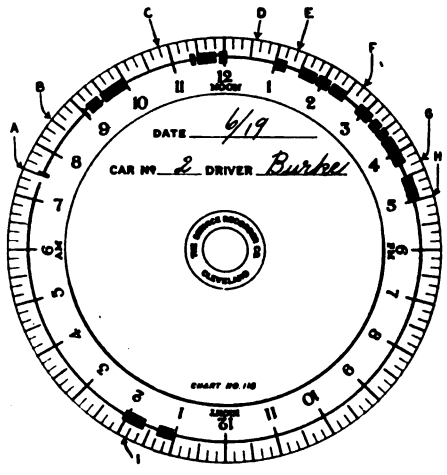
The big stores of the smaller towns and cities cannot match the gigantic expenditures of the large metropolitan establishments, but they can apply the selfsame principle to their own places in proportion. In every town there are stores, small and large, which do more than their share of business. It is because of the quality of merchandise they handle, because of the fairness and courtesy of the proprietors and clerks—and it is also because of the way the stores **by their appearance**, affect the people who pass them and who come in.

Every time you pass or enter your own store or shop or office, borrow your customer's or your clients' eyes for a minute and give the place a searching once over. You will see many things that you will want to change immediately, and you will begin right away adding creative touches of arrangement and decoration which will be touches of destiny upon the future of your business.

BOMB-PROOF ALIBIS NEEDED NOW

An Ohio genius has put on the market a truck recorder that shows up "on paper" every detail of the truck's operation during the day and hence it is easy to ascertain whether the truck is doing "an honest day's work for an honest day's pay".

As pictured above, the heavy marks show when the truck was in motion and the light line when the truck was standing idle, and is explained as follows: A—truck started at 7:30; B—hour and 25 minutes to load; C—hour and 20 minutes at freight depot; D—lunch hour; E—fifteen minutes (loading); F—held up 20 minutes (drawbridge); G—stopped 15 minutes somewhere on return trip that must be explained; H—put up at garage at 5; I—truck taken out during night. Needless to say the installation of such recorders on trucks will show where the time is being lost.



HOW PISTONS ARE SOMETIMES SCORED

At this time of year much damage is done to automobile engines, and other engines as well, due to pistons seizing the cylinder, states the agricultural engineering department at the Nebraska University farm.

This causes the cylinder walls to be scored, and in many cases they are practically ruined. The reason for this is that in cold weather cylinders and water jackets warm slowly, while pistons and rings get hot and expand with the first few explosions. Therefore, if the engine is allowed to run at a high rate of speed before the whole engine is warmed up, damage is apt to occur, especially with comparatively new cases which have pistons fitted very tightly.

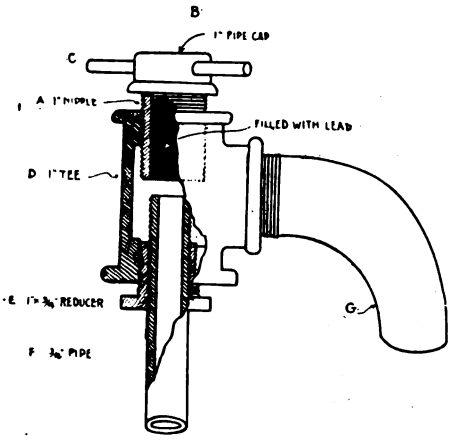
This condition is aggravated because oil does not run freely. There is nothing to be gained by allowing the engine to race, while there is considerable to lose. There is no harm in allowing it to run idle at a fair rate of speed until it is warmed. In fact, this may be advisable.

Merit the respect of your employes. Treat them fairly and justly, but beware of placing yourself in their power—or in the power of anyone else for that matter—by entrusting them with too many business secrets.

VALVE FROM OLD PIPE FITTINGS

The dealer or scrap metal dealer pretty near always has a supply of old pipe and fittings that he will sell readily for a fraction of a cent a pound more than he purchased them for, and when one can obtain nearly perfect fittings in such a a way, it is possible to improvise many needed things from them.

The sketch explains how a low

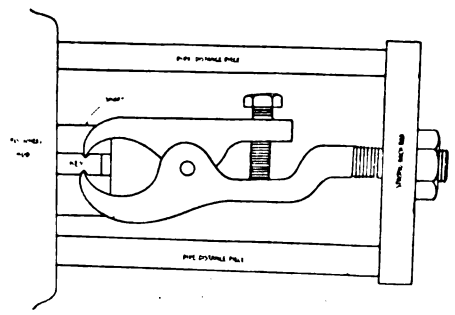


pressure faucet was easily made for an oil storage tank from such fittings.

A 1 inch pipe nipple capped on one end with the pipe cap B and fitted with a small piece of round rod C is filled inside with lead. This is screwed into a 1 inch pipe Tee D. The other end of the Tee is fitted with a 1x¾ inch reducer bushing and into the bushing a piece of ¾ inch pipe F is screwed, the end being first square and true and to a conical shape. This piece of pipe should screw pretty well in so that the lead filled one-inch nipple can be screwed down onto it thus making the valve seat. A piece of 1 inch pipe bent as shown at G is screwed in for a spout.

EFFICIENT KEY PULLER

This tool was designed by a shop mechanic for pulling keys that



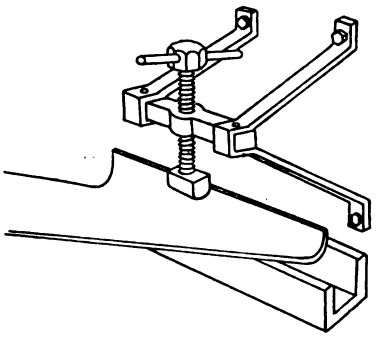
have no heads. It is of simple construction and could be made by a handy mechanic from the drawing herewith.

Two V slots or notches are cut in the sides of the key with a chisel to enable the jaws of the tool to grip the key. Suitable distance pieces and a strong back are used as a frame work.

Those who have a use for such a tool can adapt the idea to their work and make the tool of such a size as will best suit their needs.

BENDING RIG

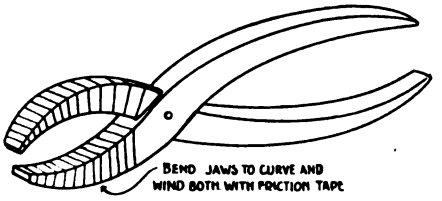
Now and then there comes to all shops a flanging or plate bending job and it is well to have some means other than a sledge and fuller for the work. A simple idea for a bending rig is shown in the sketch. It is a home-made affair to



be seen in frequent use in a small smith shop of Concord, N. H. The strong back is made from a section of a discarded wagon axle. A large size standard bolt was used for a bending screw and a section of channel bar used under the screw for flanging light plate.

GREASE CUP PLIERS

Having a pair of long jawed straight pliers that had seen their day of usefulness as nipping pliers, I conceived the idea of turning them into insulated pliers for grip



ping my polished oil cups when turning them in or out. The sketch shows the scheme. The jaws were heated and then bent to generous curves, and then they were wrapped well with best quality friction tape. I have found these pliers very handy for gripping polished work about the auto.

TWO HANDY KINKS

These two kinks are worthy of space even though simple for they have proven of value to the writer and they are passed on with the

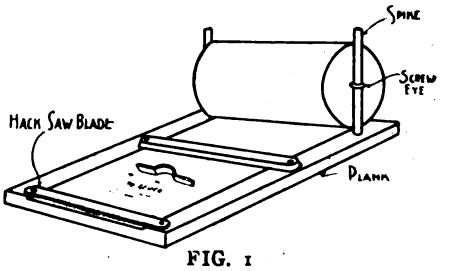


FIG. 1

thought that they will be of the same value to others.

Fig. 1 illustrates a very handy scratch pad made from a roll of narrow width white wrapping paper such as used in drug stores for wrappngi medicine packages or even heavy toilet paper. The roll of paper is mounted on a wooden core into the ends of which are screwed two eye screws. The base consists of a soft wood board. The paper roll is held on it by two headless spikes and the sheet of paper is guided on the board by a strip of wood at A and a hack saw blade at B. The teeth of the blade make an effectual perforator to aid in easy tearing off of the used paper.

Fig. 2 pictures a very necessary instrument around any shop. It is dubbed with the name "Eye Doctor" and consists of a small loop of

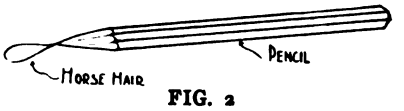


FIG. 2

human or horse hair glued into the pointed end of an ordinary pencil. The pencil is split open lengthwise and the lead removed.

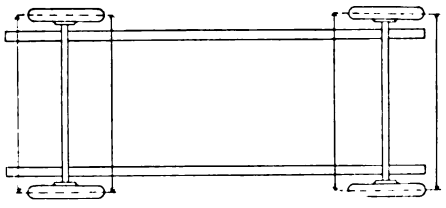
The groove is filled with glue and the loop of hair put in the end, then the pencil is clamped together again.

The flexibility of the hair makes it ideal for work on the tender human eye for removing foreign particles and by inserting the loop under the eye lid and then releasing the lid and pulling the loop out, it generally gets the speck that is there.

Many stores are putting into practice the self-serve idea, either for a department or a single counter. Of course, help is eliminated and the novelty of the idea appeals to many, especially if they are saving by this means.

CHECKING WHEEL ALIGNMENT

Misalignment of either front or rear wheels of a motor car means unnecessary tire wear and strains on the running gear, particularly in the steering mechanism if it is the front wheels which are out of line. Car owners can easily check up this alignment. To make sure



that front wheels have the proper amount of gather, simply stretch a string between the center points at the front of the tires. There should be ¼ inch more space at the rear than at the front. When the rear wheels are measured in this way the distance between the tire centers should be the same on the forward side as at the rear.

To test the alignment of front and rear wheels a string extended from front to rear in a straight line should come in contact at the front and rear of each tire on that side, the steering gear being turned until this is the case. Then the string should be carried to the other side of the car, where the process is repeated. If a distance of more than ¼ inch is found to exist betwen the side of the tire and the string, the wheel is out of alignment, and the greater this distance the greater the wear on the tread. When such variation is discovered the wheels should be adjusted immediately.
F. H. Sweet.

STRAIGHTENING BENT FRAME MEMBER

F. H. Sweet

One of the most common repairs to a frame is straightening a spring horn or dumb iron in event of a collision. A very simple and effective method of performing this work is shown in diagram, providing that the frame is bent forward of the radiator support and that the shock has not cracked or materially injured the metal. If the frame side is cracked it will be well to straighten it to its original form, and then fill in the cracks with new steel by the oxy-acetylene process or a reinforcing plate inside the frame side channel. If the frame is merely bent, straightening to its original form will be all that is necessary to effect a perfect repair. The radiator should be removed, as well as the front axle and springs. The front of the machine is supported by blocking under the frame members or by any suitable stand. The body should be raised from the chassis about four inches at the front end, so that a loop of chain can be passed around the frame member to act as an anchorage for a piece of joist used in straightening the side side members. A piece of sheet steel is placed under the frame and supported by the box, the top of which has been covered with about 2 inches of sand. A rough furnace may be constructed of firebrick and the frame covered with charcoal, a slab of firebrick serving to keep the heat confined to the bent portion of the frame. A large gasoline blow torch is employed in connecting with the burning charcoal, and sufficient heat is applied to bring the frame side to a cherry or dull red heat for several inches each on side of the bend.

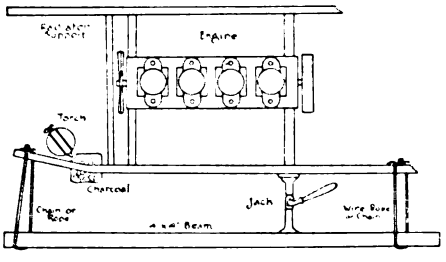
The torch is set aside, and while one man carefully manipulates the jack, which is best placed against a piece of board resting on the frame member at a point where the engine support is bolted, or where a cross brace is riveted, an assistant facilitates the work by hammering and contouring the heated section to bring it back into shape. A blacksmith's "flatter" should be interposed between hammer and frame in order not to dent the frame side, as might be done if the hammer blows were directed against the heated member. The straightening can be done only while the frame member is hot enough to show color, and as soon as the redness is lost the torch must be applied again to heat the bent section before any further work is done. A block of wood may be interposed between the frame channel so that the chain or bar loop at either end of the beam does not crush in the metal where pressure is applied. The sketch shows the manner of doing the work and the use of the tools to effect a very satisfactory restoration.

ENGLISH FARMERS OBJECT TO SHOEING PRICES

The members of the Cheshire (England) Branch of the Farmers' Union are so firmly convinced that the horseshoers in that country are charging too much that they have sent an ultimatum to the Lancashire and Cheshire District of the National Master Farriers' Association stating, "that if the price of shoeing is not considerably reduced the Executive Committee will proceed to establish shoeing forges throughout the county for the use of its members."

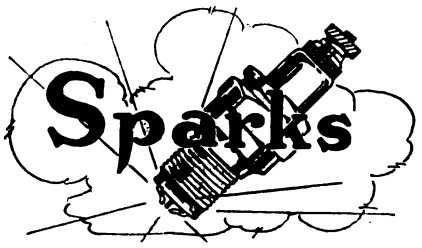
In contending that the prices charged are eminently justifiable the Registered Shoeing Smiths make the following statement:

"Material is rising in price and likely to do so still more; wages will in all probability increase—they should if they don't; men are still underpaid as everyone acquainted with the trade agree; working hours are to be reduced to 47 shortly, which also will add to the cost of production in the forge. How can any man reasonably expect a farrier to reduce his charges whilst his expenses are increasing?



These farmers want in many cases advice or an opinion on a sprain, sidebone, ringbone, even on an old crock with laminitis, and have the audacity to want this advice and shoeing at their own prices."

The following "hint" may be of service to some driver of an automobile with gravity feed tank located under front seat when he unexpectedly finds his gasoline so low that it will not flow to the carburetor when going up a steep hill and the road so narrow that he can not do the usual "stunt" of turning the car around and backing up the hill. The writer has found himself in this predicament and invariably finds that by setting a jack on the rear axle housing and the other end against the frame or car body it is very easy to raise the rear end of the body 6 or 8 in. so that the gasoline will again flow to the carburetor and no further difficulty will be experienced in going up the hill. The jack can then be removed when level ground has been reached.



Most self-made men forget to make themselves agreeable.

When a man leaves town for a while he expects people will miss him a good deal. But they don't.

Once in a while a stenographer adds a knowledge of spelling to her knowledge of shorthand and the keyboard.

You may not believe it. But excitement gets monotonous quicker than anything else.

One reason why a man has no chance with a woman in an argument is because a woman can't get indignant without getting hysterical.

No married man should brag about his self-control. He lost control of himself the day he got married.

The trouble about letting a girl go to an out-of-town school is that it is so hard for her friends to get acquainted with her when she gets back home.

Never direct a man to a place where there is good fishing. He will advertise you as a liar for the rest of his life.

The minority is always in the right when you happen to be in the minority.

Why is it a man isn't ashamed to do a lot of things that he would be ashamed to be caught doing?

It doesn't help a married man to have a way of his own. The betting is that he has a wife who outweighs him.

At 16 she knows that a prince is going to come along and carry her away to a palace. But at 26 she hopes that the man who marries her will rent a house that has at least six rooms in it.

A married man's idea of extravagance is hiring a taxi when you are going anywhere with your own wife.

A girl is never so selfish that she wants a whole hammock to herself.

The reason why a woman never gets mad at her husband is because she is never so happy as when he is giving her money to spend.

Gall is great stuff. We know some tobacco cadgers who get mad and make you apologize because you haven't sense enough to carry their favorite brand when they bum a chew from you.

You can't always judge a man by his clothes. But you can usually judge by the clothes his wife is wearing.

Another thing we would like to know is this: If a man puts a new floor in his establishment, does he charge the improvement to overhead expenses?

A watched pot never boils over.

The Three Tallest Fish Stories

Don Marquis, in the Evening Sun, New York

Noah an' Jonah an' Cap'n John Smith,
Mariners, travelers, magazines of myth,
Settin' up in Heaven, chewin' and a-chawin',
Eatin' their terbaccy, talkin, and a-jawin';
Settin' by a crick, spittin' in the worter,
Talkin' tall an' tactless, as saints hadn't orter,
Lollin' in the shade, baitin' hooks and anglin',
Occasionally friendly, occasionally wranglin'.

Noah took his halo from his old bald head
An' swatted of a hoppergrass an' knocked it dead,
An' he baited of his hook, an' he spoke an' said:
"When I was the Skipper of the tight leetle Ark
I useter fish for porpus, uster fish fer shark,
Often I have ketched in a single hour on Monday
Sharks enough to feed the fambly till Sunday—
To feed all the sarpints, the tigers an' donkeys,
To feed all the zebras, the insects an' monkeys,
To feed all the varmints, bears an' gorillars,
To feed all the camels, cats an' armadillers,
To give all the pelicans stews for their gizzards,
To feed all the owls, an' catamounts an' lizards,
To feed all the humans, their babies an' their nusses,
To feed all the houn' dawgs an' hippopotamusses,
To feed all the oxes, feed all the asses,
To feed all the bison and leetle hoppergrasses—
Always I ketched, in half an hour on Monday
All that the fambly could gormandize till Sunday!"

Jonah took his harp, to strum and to string her,
An' Cap'n John Smith teched his nose with his finger.
Cap'n John Smith, he hemmed some an' hawed some.
An' he bit off a chaw, an' he chewed some and chawed some:—
"When I was to China, when I was to Guinea,
When I was to Java, an' also in Verginney,
I teached all the natives how to be ambitious,
I learned 'em my trick of ketchin' devilfishes.
I've fitten tigers, I've fitten bears,
I have fitten sarpints an' wolves in their lairs,
I have fit with wild men an' hippopotamusses,
But the perilousest varmints is the bloody octopusses!
I'd rub my forehead with phosphorescent light
An' plunge into the ocean an' seek 'em out at night!
I ketched 'em in grottoes, I ketched 'em in caves,
I used fer to strangle 'em underneath the waves!
When they seen the bright light blazin' on my forehead
They used fer to rush at me, screamin' something horrid!
Tentacles wavin', teeth white an' gnashin',
Hollerin' an' bellerin', wallerin' an' splashin'!
I uster grab 'em, as they rushed from their grots,
Ketch all their legs an' tie 'em into knots!"
Noah looked at Jonah, an' said not a word,
But if winks made noises, a wink had been heard.
Jonah took the hook from a mudcat's middle
An' strummed on the strings of his hallalujah fiddle;
Jonah give his whiskers a backhand wipe
An' cut some plug terbaccer an' crammed it in his pipe!

(Noah an' Jonah an' Cap'n John Smith,
Fishermen an' travellers, narreratin' myth,
Settin' up in Heaven all eternity,
Fishin' in the shade, contented as could be!
Spittin' their terbaccer in the little shaded creek,
Stoppin' of their yarns fer ter hear the ripples speak!
I hope for Heaven, when I think of this—
You folks bound hellward, a lot of fun you'll miss!)

Jonah, he decapitates that mudcat's head,
An' gets his pipe ter drawin'; an' this is what he said:
"Excuse me ef your stories don't excite me much!
Excuse me ef I seldom agitate fer such!
You think ye fishermen! You think yer none!
I won't even tell yer half o' what I done
You has careers dangerous an' checkered!
All as I will say is: Go and read my record?
You think yer fishermen! You think yer great!
All I asks is this: Has one of ye been bait?
Cap'n Noah, Cap'n John, I heerd when ye hollered;
What I asks is this: Has one of ye been swallered?
It's mighty purty fishin' with little rods an' reels.
It's mighty easy fishin' with little rods an' creels.
It's mighty pleasant ketchin mudcats fer yer dinners,
But this here is my challenge for saints an' fer sinners,
Which one of ye has vyaged in a varmint's inners?
When I seen a big fish, tough as Methooslum,
I used for to dive into his oozly-goozlum!
When I seen the strong fish, wallopin' like a lummicks,
I useter foller 'em dive into their stummicks!
I could v'yage an' steer 'em, I could understand 'em,
I useter navigate 'em, I useter land 'em!
Don't you pester me with any more narration!
Go git famous! Git a reputation!"

Cap'n John he grinned, his hat brim beneath,
Clicked his tongue of silver on his golden teeth;
Noah an' Jonah an' Cap'n John Smith,
Strummin' golden harps, narreratin' myth!
Settin' by the shallows forever an' forever,
Swappin' yarns an' fishin' in a little river!

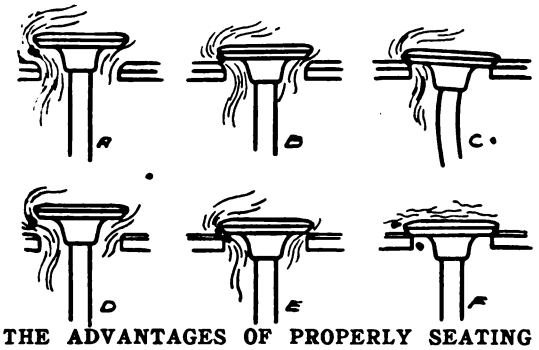
UNASSEMBLED VERSE

Last night
As I sat
On the porch
Smoking the pipe
That killed our canary,
And
Ruminating upon
The general order of things,
While the flivvers
Cavorted
Melodiously by,
There flashed,
Within the periphery
Of my consciousness,
A thought,
A most inventive thought—
It thrilled me!
Suppose we produce them
(Meaning 4'ds)
By incubator methods,
Taking a nut,
A valve, and a section
Of radiator
And
Associating
Them together
In a warm enclosed place;
Alternately
Spraying with gasoline
And black varnish
Until presto!
There leaps forth
A new car.
I hope
That Mr. 4D
Will see this
Because
It might save him
Lots of money
And,
Incidentally,
Grant a boon
To the burdened
Proletari—
Art.

D. S. O.

VALVE GRINDING HINTS

The ideal valve seat is a very fine edge as it is more easily ground and will last longer. By referring to the illustration the action of a the valve on a piece of carbon which might locate on the seat can be seen. The first three pictures, A, B, and C show what occurs on a wide seat—a bent or warped valve. Drawings D, E, and F show the effect of a similar piece of carbon that would lodge in a narrow seat. A wide seat holds the carbon which will speedily burn out the valve while a narrow seat will have a tendency to cut the carbon and has a tendency to keep the seats clean.



THE ADVANTAGES OF PROPERLY SEATING VALVES IS HERE SHOWN

On some old motors the valve push rods become worn in the center, due to the continual tapping against the valve stem. If the motor were timed by the gap alone it might be considerably out of time as the feelers would bridge the actual point of contact on the push rod as shown in the illustration. All valves on a worn motor should therefore be timed by piston travel. One may tell if the push rods are worn by removing the valve springs and feeling the tops of the push rods. New rods are straight across the face while the worn rods have a depression in the center of the face.

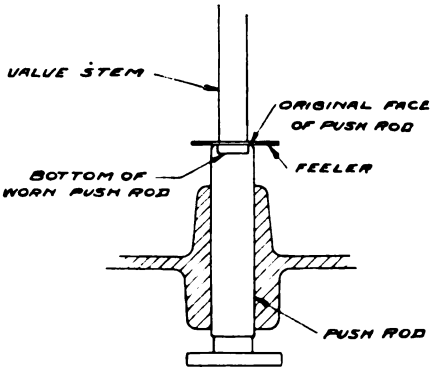
HICKORY IN THE UNITED STATES

The hickory timber of the United States is rapidly reaching practical exhaustion. The States of Arkansas, Kentucky, Tennessee and Mississippi furnish probably 85 per cent. of the supply. Those who have knowledge of the supply in these States know full well that it can be but a few years when this will be depleted. There is no other timber that will take its place nearly so well, but of course other timber must be used wherever possible.

The reserves of hickory timber are now located back from the railroads and rivers. which calls or added labor and expense to secure it. Year by year the haul gets longer and longer, and thus is added a progressive expense as time goes on.

It is quite evident to manufacturers that year by year the grade of hickory timber becomes lower and lower. This is because the owner of the timber will not permit cutters to go into the woods and select the best, as was common practice in the years past. For this reason in many wood goods lines there is necessarily a lower run of grades, and in this connection the manufacturer and wholesaler are helpless; they must carry what stock they can get.

Competition is strong for hickory in all shapes. This is not by any means limited to manufacturers of parts, but includes the vehicle industry, which is the largest using hickory; also numerous other manufacturers of lesser importance. The foreign demand for hickory logs and lumber will now be back,



WHY A "FEELER" DOES NOT ALWAYS SHOW PROPER CLEARANCE BETWEEN PUSH ROD AND VALVE STEM

which, with the depleted stocks, will make a tremendous factor in sustaining and likely increasing the price.

While the domestic demand is slackening in the United States, the foreign trade is increasing rapidly. In every foreign market there is an immense demand for hickory, which will get stronger as more shipping becomes available.

Don't loan tools. You only have to waste time toting them back to the shop.

Benton's Recipes

Acid-Proof Cements.—An excellent recipe for an acid-proof cement contains the following ingredients:

Crude, finely cut rubber..... ..... 1 part by weight
Linseed oil, boiled ....4 parts by weight
Fire-clay .....6 parts by weight

Another equally satisfactory mixture requires the following materials:

Rosin .....1 part by weight
Sulphur .....1 part by weight
Fire-clay .....2 parts by weight

The following mixture will resist all acid vapors (even nitric acid):

Litharge .....80 lbs.
Red lead ..... 8 lbs.
Flock asbestos .....10 lbs.

These substances should be fed into a mixer, a little at a time, with 6 quarts of boiled linseed oil.

A good cement for dilute hydrochloric acid is the following:

White China clay.....1 part by volume
Fine white sand, or powdered quartz and sand .....2 parts by volume

Mix the ingredients thoroughly, working them up with just enough silicate of soda, diluted with an equal volume of water, to make a paste. If a little fine casein is added to the silicate of soda, the mixture will be smoother.

To Drill Hard Steel—To drill hardened steel make an old-fashioned flat drill and temper as hard as it will stand. Use camphor and turpentine in place of oil. I have drilled steel in this manner which I could not drill in any other way.

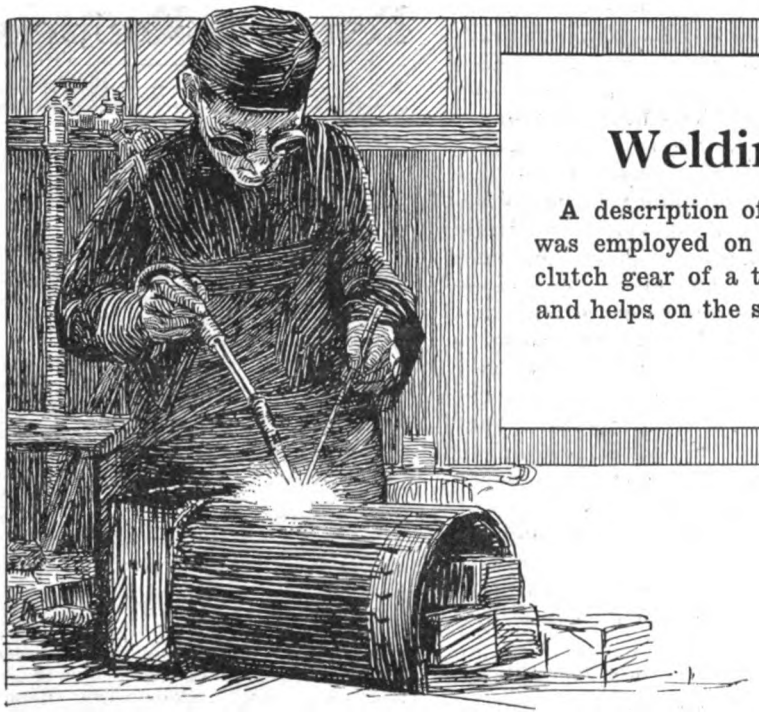
Bronzing Fluid for Steel—To obtain a light bronzing fluid use nitric acid, 6 parts; nitric ether, 5 parts; alcohol, 5 parts; muriate of iron, 5 parts. Mix thoroughly and then add 10 parts sulphate of copper dissolved in 50 parts of water.

To Clean Rusted Steel—to Preserve Steel from Rust—Rusted steel can be cleaned by brushing with a paste compound of ½ ounce of cyanide of potassium, ½ ounce castile soap, 1 ounce whiting, and water sufficient to form a paste. The steel should be washed with a solution of ½ ounce cyanide potassium in 2 ounces water.

Crack Filler for Cast Iron—This is composed of Japan dryer 2½ ounces, finely ground dr ywhite lead 1½ ounces. These are carefully mixed and then added to a quart of finished Japan, when enough rotten stone is added to make a thick paste.

Painting Concrete—Treat the surface with a solution of zinc sulphate and water, equal parts by weight. The liquid may be applied with an ordinary bristle brush after the concrete is dry. This should be allowed to dry from two to four days when the paint can be applied in the ordinary way.

Welding Steel and Iron—An English reader says to take 50 parts of clean iron filings, 5 parts sal-ammoniac, 3 parts borax and 2 parts balsam of copaiba and mix thoroughly. Now heat the steel to a red heat, knock off all scale and apply the compound. The iron in the meantime, is heated to a white heat and the pieces are welded in the ordinary manner.



Welding a Clutch Wheel

A description of the oxyacetylene welding process as it was employed on a cast iron wheel used for shifting the clutch gear of a traction engine. Including general hints and helps on the subject of welding.

—David Baxter.

THE casting illustrated in the pictures accompanying this discussion offers quite a problem to the oxyacetylene welder, although it looks simple enough at first glance. The problem is not so much one of keeping the wheel from cracking during or after the welding as it is to keep it from distorting. Of course the proper expansion and contraction must be attended in order to produce a wheel in perfect alignment. Also there is some danger of the wheel cracking, either in the weld or near it. This too, is a matter governing the heat reactions. In other words the amount and direction of the expansion should be estimated and regulated, or guided, if the welder is proficient in the art. Heat must be applied in such a way as to cause the casting to expand in a certain direction in order that the contraction from it will act in harmony with the contraction of the weld as it cools. For instance, suppose a part of a casting, say a space one by four inches is heated to the near melting stage, while the balance of the job remains nearly cold. Then suppose the heated spot is allowed to cool. When it starts to cool contraction sets in and quite naturally pulls the section that has been heated away from the colder parts. The obvious remedy for this is to heat enough of the casting so it will expand and contract with the weld; the heated spot corresponds to the weld. Or to put it differently; so there will be no abrupt limit to the expansion and contraction of the weld. These reactions increase or diminish gradually the farther we get from the melted zone, according as whether the casting is heating or cooling.

By way of illustrating the meaning further, without using exact figures, let us suppose the melted part to be 100, and that the heat decreases 5 degrees with every inch away from the melted zone. We will say that this is a gradual reduction to nothing at the normal part of the casting. Now, since cast iron expands when heating and contracts upon cooling we see that the expansion is the greatest at 100 and that it gradually diminishes the farther we get from the heat at the melting zone. This decrease is steady, no sudden strains or great variations close together. We see from this that if a large area is heated around the weld it will have less tendency to crack when the contraction sets in. Because, all things being equal, the contraction will follow the cooling gradually.

I have given the foregoing abstract of the characteristics of the phenomena with the hope that the reader may be led to understand why certain things were done in the welding process as it was used on the casting illustrated. Space forbids an exhaustive discussion of the subject of expansion and contraction in the many different phases either in scientific words or non-technical; there are so many little things that cause the characteristics to vary in any metal that it would take a volume to cover them all. Therefore, the best thing to do, perhaps, is to take the different jobs that have been successfully welded and discuss them one at a time.

I have selected for this month's article the casting shown in Fig. 1. Which is a clutch wheel of an engine. This job can be welded under two systems, and probably with equal success by an expert torch operator. But as we must consider the abilities of the novice we will discuss but one; the simplest way of regulating the expansion and contraction to keep the wheel round and to prevent it from cracking. This is the method wherein the whole casting is heated; it requires less thought and care than the other method known as the localizing method, although it may be the slower. If the whole job is heated it follows that it will all expand, also all contract. These reactions will balance if the heat has been evenly, or correctly distributed, provided of course, that some part of the cooling is not influenced by outside forces.

In the localizing process only parts of the job are heated; the intention being to cause expansion to act in such a way that it will be balanced by the flame of the welding torch. Or to put it differently, the expansion of the weld will follow the preheated part outward. And in turn the contraction of the heated part will follow the weld contraction inward. This latter system requires considerable knowledge and practice. But, while it requires much thought it is easily mastered by experience. It is probably the cheapest, quickest, way to do a job, but the inexperienced welder will do well to employ the all-over heating process unless

he can afford to experiment.

The job herein illustrated was satisfactorily repaired under the "all-over" system. Which I will endeavor to explain in detail. Perhaps the best way to do this will be to describe every phase of the work as it was done in this particular shop, leaving each welder to make such changes as the arrangement and condition of his shop demands.

First, the clutch wheel was broken in three spokes as indicated by the white marks on two of them and the riveted patch on the other one. The riveted patch was the result of an attempt to repair the wheel without welding, and probably was the cause of the other breaks since these occurred afterwards. Notice the location of the cracks close to the hollow hub. Also note that the wheel has considerable rigging attached: pinion, clutch, shoes, etc.

The metal of the fractures was one inch thick by three long. The material of which it was made was soft large grain gray cast iron.

In proceeding to weld this wheel the first thing was to strip all of the rigging off; the pinion, shoes, and shifting gear was removed. Then the near vicinity of each fracture was cleaned of all grease and dirt, exposing the bare bright metal. Next the fractures were grooved with a chisel and hammer. This chamfering was all done on one side of the crack, an unusual thing for this class of work. But essential on this particular job because there was danger of breaking out a spoke or a section of the rim if the chipping were done on both sides of the crack. The metal was chiseled out on the side next the hub, sloping back an inch or more from the crack at the top; or on the flat side of the wheel. This groove extended to the full thickness of the metal when finished. The riveted patch was removed after preparing the other two grooves. Then a similar groove was cut in this spoke too.

After these preparations were made the casting was arranged for preheating as is indicated in Fig. 2. The wheel was placed with the hub resting on the dirt floor of the shop. Fire bricks were placed at intervals around beneath the rim, both to balance the wheel and to prevent it from sagging when heated. These bricks were wedged up until the weight of the wheel barely rested upon them; the weight was not taken off of the hub because this would result in the very effect it was desired to avoid. The heavy hub would tend to make the wheel sag in the center.

The wheel was then enclosed in a loosely walled circle of fire brick and covered with strips of corrugated sheet iron. This furnished a cheap but efficient device in which the casting was heated all over previous to welding. It served to confine and conserve the heat, thus tending to quicken the work and to prevent cold air from reaching the casting, which might result in a cracked weld. The wall also helped to protect the torch operator from the heat

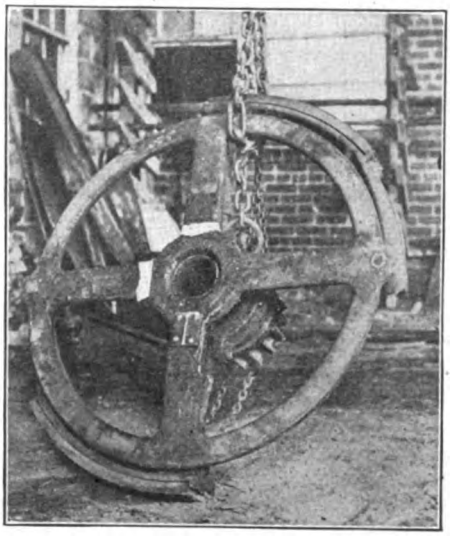


FIG. 1—THE CLUTCH WHEEL AS IT CAME TO THE SHOP, SHOWING THE LOCATION OF THE BREAKS AND GEAR THAT WAS REMOVED BEFORE WELDING

of the preheating fire. And it provided a working space around the job entirely free from litter.

The preheating was done with two air pressure oil burners inserted through the wall as shown in Fig 3. The flame of these burners was directed so as to heat the rim and spokes as well as the hub, more on the side including the three cracked spokes. These spokes and the rim were heated more than the hub. The effect being to cause this section of the rim to expand enough to open the cracks or to spread the grooves about a thirty second of an inch. The hub was heated only fairly hot; just enough that it would contract a little when cooling.

The burners were lighted and allowed to burn until the rim was red hot before applying the welding flame. When this stage of the preheating was reached the sheet iron was drawn back just enough to expose one of the grooves. A half and half number seven flame was brought in contact with this groove near one end of it. At the same time a quarter inch soft cast iron filler rod was put in contact with the flame and heating groove. The bottom of the groove was then melted together its full length across the spoke, using the filler rod to knit the metal and flick out the bits of slag. The rod was also utilized for applying the flux powder. The application of the flux powder was accomplished by dipping the melting end of the filler in a pot of it, carrying it quickly to the weld. Meanwhile the flame was swinging in short arcs sidewise across the groove. This motion was maintained throughout the welding of all spokes.

After melting together the entire bottom of the groove the weld was worked back along the groove to the starting point, adding a layer of new metal to the first melt. Care was taken to see that the sides as well as the bottom were in a fluid state before adding new metal. The filler rod was always in touch with the weld except when applying flux powder. This in effect furnished a tiny stream of new metal continually flowing into the weld. Most of the time a twisting motion was given to the filler rod.

When the first layer reached the starting point the weld was doubled back across it in another layer. This layer was thoroughly melted and mixed with the first. In this manner the groove was filled to the top; a layer at a time with a well rounded surplus on top of the last one.

The ends of the groove were then given a neat appearance by re-melting the rough metal and blowing it downward. The filler was utilized to scrape down any stubborn portions. In this process the flame was pointed straight down across the end of the groove very close to it. Some sort of finish such as this is neeeded on welds located on the sides of spokes where it is difficult to grind them.

When the first spoke was complete it was covered with the sheet iron to re-heat whilst another one was attacked. This was one located opposite the first, leaving a spoke between them to be welded last. The welding was achieved in the same way as the first spoke. By melting the bottom of the groove together first, then welding layer upon layer until the groove was filled and rounded over. The ends of this weld were smoothed in the same way too. Then the weld was covered and the last spoke at-

tacked. Meanwhile a close watch was kept over the preheating to see that none of it was lost. The third weld was made exactly like the first. The work on all three being done as rapidly as possible to prevent the heat being conducted to the hub as it was desired to keep this at the one stage of expansion; say about a third expanded. Then there would be small danger of it contracting and drawing away from the weld.

When the last weld was complete the brick wall was pulled down and the wheel quickly turned over flat upon the floor. Quantities of scrap asbestos paper were shoveled onto the rim and spokes as soon as the wheel had been turned entirely, covering it so no heat could escape. The whole proceeding was handled as rapidly as possible in order to allow the operator to weld rapidly the under sides of the spokes before contraction set in. Not much welding was needed here, however. Just the filling of a few hollow spots and the melting down to the level of the projections. The rough spots were wiped off with an old flat file. Only the smallest space was uncovered while so doing; just a little of the asbestos scrap was removed. This was immediately replaced as soon as the weld was finished. The spokes were taken in the order of their first welding. In this order the coldest ones could be brought back to heat while the others were still hot enough. Each weld was covered immediately after welding.

The position of the wheel on the dirt floor prevented it from warping although care was taken to see that the heavy hub was certain not to be suspended. After completing the last weld the whole thing was buried deep in scrap asbestos and permitted to remain so an hour or more. When it would no longer fry a drop of water near the hub the casting was

Very little machining was needed since the casting had been "hot finished" during the welding. This hot finishing was accomplished by a deft manipulation of the welding flame; the pressure was used much as one would use a water hose to clean a floor or walk. The high spot and slaggy portions of each weld were washed to the edges with the pressure of the flame. Here they were scraped off with a miniature hoe made of a piece of iron rod flattened at one end.

This cindery deposit, which is a mixture of flux and slag, when properly scraped away leaves the bare metal much smoother than when the job is cleaned cold. The flame must be kept playing around over the portion being scraped.

When the clutch wheel was pronounced satisfactory, the pinion, shoes, shifter, etc., were attached again in their proper places. It might be well to state the reasons for removing this rigging in the first place. The primary reason perhaps was to prevent any chance of damage. Then it made the job bunglesome to handle in the preheater. Also it would have wasted lots of heat, tending to hold back the welding. And it is possible it might have interfered with the governing of expansion and contraction.

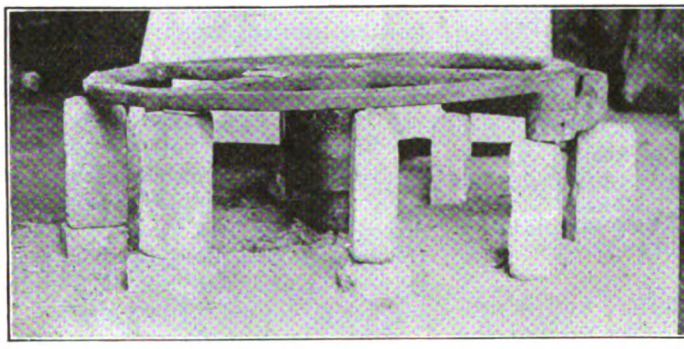


FIG. 2—METHOD OF SUPPORTING THE CASTING AND RELIEVING STRAIN ON THE HUB

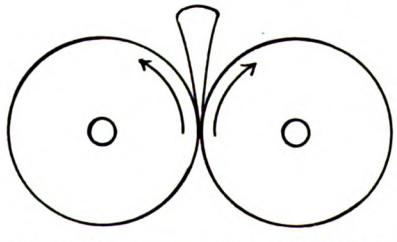
FIG. 3—THE CONSTRUCTION OF THE PREHEATING FURNACE

MORE ON RAZOR GRINDING

E. M. Peterson

The first thing after the blade has been forged, hardened and tempered is to rough grind, that is to grind the blade down to closely the approximate shape and appearance it is to bear when finished and this is done on an ordinary emery wheel, care being taken not to get the blade heated any more than is absolutely necessary in the operation.

Following the rough grinding operation, the concaving or so called hollow grinding is in order. The hollow grinding or concaving machine is an easily constructed bit of machinery that can be easily constructed and consists of two grinding wheels mounted together and running in opposite directions as shown by the arrows in the illustration. The hollow grinding operation is a "wet grind" and streams of water should flow on both sides of the blade to prevent heating. A light weight is usually placed on the top of the blade to keep it dragging on the wheels and the cross feed can easily be manipulated by hand although on machines that are specially built for the purpose an automatic feed is used in order that one man can attend to two or more machines.

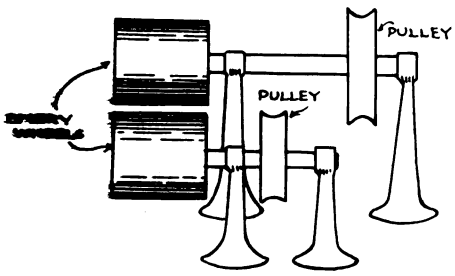


BLADE IN PLACE FOR CONCAVING. THE ARROWS INDICATE THE DIRECTION OF ROTATION OF THE GRINDING WHEELS

The emery wheels commonly used range in size from 1½ inches in diameter and 1¼ inches thick to 2 inches in diameter by 1½ inches thick. The speed of these wheels should be very high and hardly less than 8,000 r. p. m. or even faster with small wheels.

As shown by the illustration a hollow grinding or concaving machine is very simple in construction

and merely requires suitable supports and pulleys for the grinding wheels. Separate belts may be used. As most of the machines used in the manufacture of razors are placed on benches it is both convenient and advisable to have the belts come from underneath the bench in order that plenty of room



SIMPLY CONSTRUCTED MACHINE FOR CONCAVE GRINDING

will be permitted the operator without the interference that would naturally arise from the use of overhead belts.

After the blade has been hollow ground it goes to the buffer for rough polishing and the polishing operations will be described in the next article.

In the alteration of existing premises, or the construction of new premises to take care of automobile repair or garage business, the blacksmith has several features to consider.

A building that would be entirely suitable for storing cars could not always be used successfully as a workshop. The average blacksmith shop is not well enough lighted to be used for motor car repairing without changes in building construction. Old time smith shops are seldom properly heated or ventilated. Another thing that condemns the average wooden structure as used for carriage or wagon shops, livery stables, etc., is that these are very inflammable, which is a big disadvantage even if the proper lighting facilities and heating systems are installed in them.

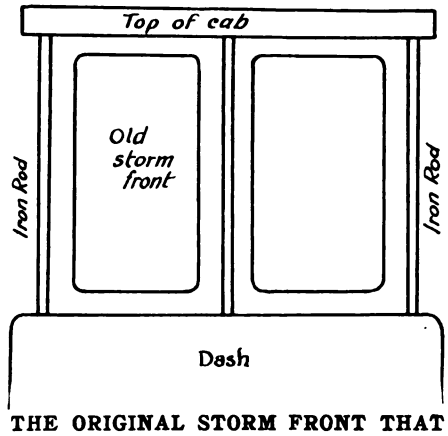
In considering the requirements of the building utilized for motor car repair work, the most essential is that the building be absolutely fire-proof, which means that only such material as steel, brick, stone or concrete be used with a minimum of wood.

Truck Cab for Wintry Winds

M. H. GEORGE

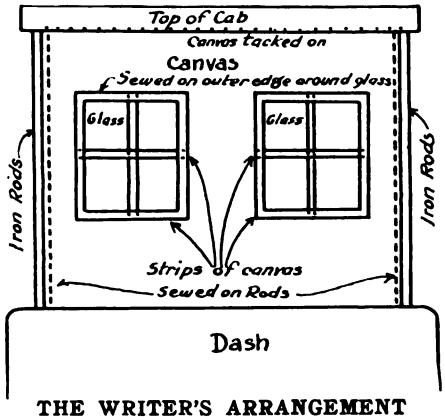
I think that the man or men who designed the cabs on most trucks had a grudge against the human race. These cabs are all right for a hot summer day but if a man has to ride in one when the thermometer is down to freezing or lower one of these cabs then it is to sit on top of a mountain on a cake of ice with a north wind blowing sixty miles an hour. If the manufacturer of trucks had to ride in them when it was cold I am sure that the cabs would be different ly designed. I have had occasion to drive a well known make of two ton truck this winter and it is all right if it is not too cold but if there is a north wind blowing and you have to face it, it is very uncomfortable.

This truck came from the factory equiped with a storm front made of top material with two large sheets of celluloid sewed in. The back of the cab was fitted with a curtain of the same material with three small sheets of celluloid. Each of the side curtains had two small sheets of celluloid. This celluloid is all right to see through when it is new and it keeps the wind out too, but after it is used awhile it turns dark and



THE ORIGINAL STORM FRONT THAT CAME WITH THE TRUCK

discolors then it soon breaks and is worthless. This was the case with the celluloid on this truck and as it had to be driven in all kinds of weather I decided to see what I could do to improve it. I am not going to give any measurements as the same measurements would not apply to different makes of cars. To begin with, I got a piece of canvas long enough to go in place of the storm front. The upper edge was tacked to the edge of the cab and the lower edge was tacked to the upper edge of the dash. In case of a metal covered dash and cab one could use wood or metal strips and fasten them in place with screws. This would be better in any case as the tacks will jar out in a short time. I made no provi-

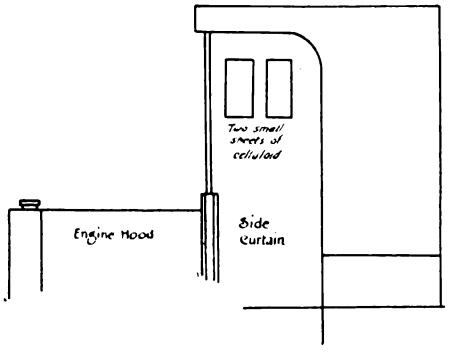


THE WRITER'S ARRANGEMENT

sions for rolling up either the front or the back curtains as when it comes warm weather they will be taken off and placed where the glass will not get broken. The sides of this canvas was pulled around the two rods that support the roof of the cab and sewed through and through with a large needle and twine string. The stitches should not be too long and they need not be as fine as the ones that you take when patching the seat of your Sunday pants. Now comes the hard part. It might be better for one to not sew this front in placec until he has done what I am going to describe now.

A hole should be cut in this canvas directly in front of the driver's seat and also one in front of the other seat. I will give the dimensions of these holes and if they do not suit your particular needs they can be changed. I found that twelve by fourteen inches was about right. The long measurement (14 in.) should be up and down. Now get two panes of window glass sixteen by eighteen inches. Double strength glass is better then the common kind. Now you have two pieces of glass and two holes that are two inches smaller each way then your glass. The-

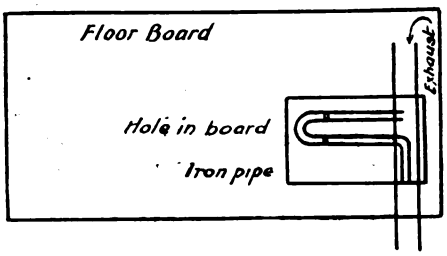
idea is to fasten this glass into those holes and this is the way I did it. Take some strips of canvas the same as the front, two inches wide and sew around the hole on the outside edge. This will make what would be called a groove in wood, the glass will have to be put in before it is all sewed around. Now if you can get a piece of tape about an inch wide or perhaps an inch and a half, it would be better than canvas. This should be sewed across the glass one strip up and down and one across the glass, also one on each side of the glass. This should be tight as it will have a good deal to do with holding the glass in place. If this is not quite clear I think that the illustration wil perhaps help more than the description. In the back curtain that came with the truck there were three sheets of celluloid but there is no need of but one light of glass. Have this glass eight by ten inches and that will give you a window six by eight to see through. This will want to be in the middle of the curtain and it will need the cross pieces of tape sewed on just the same as on the large ones in



SIDE VIEW

front. The side curtains should have just one pane of glass in each one about the same size as the one in the back curtain. The front edge of the side curtains should be sewed on to the canvas, but the top and the back edge can be fastened to the sides of the cab with the fasteners that come on the truck. This will allow them to be unfastened and hitched over across the front, when they are not needed and they will not interfere with seeing what is in front of the truck. A good deal of cold came up under the lower edge of the side curtains so we fitted in pieces of one inch boards about eight or nine inches wide. These were something like fore doors only they did not open. One had to step over them but that was not hard and it was a lot warmer for the feet. As one looks over his truck with the idea of making the cab warmer ideas will come to him and it will not be a hard job to improve it a lot and add much to the comfort of driving.

On this truck we were bothered in winter weather with the radiator



ARRANGEMENT OF THE EXHAUST HEATER

freezing and we did not care to use anything but water in them, so we stretched a wire or rather two wires across the front of the radiator and hung a piece of wool blanket over the upped wire and under the lower one this kept the blanket in place. The blanket was double. Our hauls were short so it was thought best to let the engine run idle when loading and unloading. If the engine was stopped every time it would cool off and take quite a little cranking to start.

We also thought it would be well if we could have some heat in the cab as long as we had gotten it fairly tight, so we rigged up an exhaust heater. Of course they have heaters on the market but I do not think that they are adapted to trucks. The exhaust pipe on this truck is on the right side and the driver is on the left side, so the first thing we did was to cut a hole in the slanting foot board, about twelve inches long and about six inches wide. These measurements need not be followed closely but they can be adapted to the car you are working on. It would be best to take this board out to cut this hole, and the right side edge of the hole wants to be over the exhaust pipe. The exhaust manifold is a casting, and we did not want to cut this so we fitted a cut out valve into the short piece of pipe that goes from the manifold to the muffler. The cut out opening was pointed up towards the floor board. Into this was fitted a piece of two inch pipe made like a close nipple and and the an elbow was fitted to this and a piece of pipe about ten inches long was fitted to this and a return bend fitted to the other end of this then another ten inch piece fitted to this and an elbow on the other end and this was pointed toward the ground with an elbow on this pointing toward the rear of the car. This piping about filled the hole that we cut in the floor board and to keep the board from burning we lined the edges of the hole with asbestos board and let it extend underneath for a short distance. The pipe was supported by pieces of flat steel bolted across the lower side of the hole. Now when we wanted heat we opened the cut out and the hot gases went through this pipe which heated it very hot and the breeze that the fan kicked up drove the warm air into the cab. Of course it made the motor sound as if the cut-out on the muffler was open but we ran with it open a good deal anyway only when we were in the village so we did not mind this. Without much extra labor we could have piped the end of our coil back into the muffler, and we could do it yet if we were running in the village much .

BEATITUDES FOR BUSINESS

Blessed are the poor in spirit for they shall be peptimized.

Blessed are they that mourn for they shall be comforted—in learning that they keep the laundries busy without hurting business progress.

Blessed are the meek for they do make business a cinch for the rest of us.

Blessed are they which do hunger and thirst after business for they are the little go-getters who keep the coffers replenished.

Blessed are the merciful for they remember that income and other taxes do embarrass even the mighty. and ninety days grace oftentimes tideth us over.

Blessed are the pure in heart for they shall preserve business in the days when the blue sky artists, the securities swindlers, and the Bolsheviki descend upon us seeking whom they may devour.

Blessed are the pacemakers for they put us to the speed test. Verily, more power to them.

Blessed are they that are persecuted for business' sake for they shall be moved, and profit thereby exceeding much.

Blessed are ye when men shall revile ye and condemn ye for your optimism. Rejoice and be exceeding glad; for great is your reward in the near future: for so persecuted they the successful men before you.

Yea: Rejoice and be exceeding glad for there's a great day in sight.

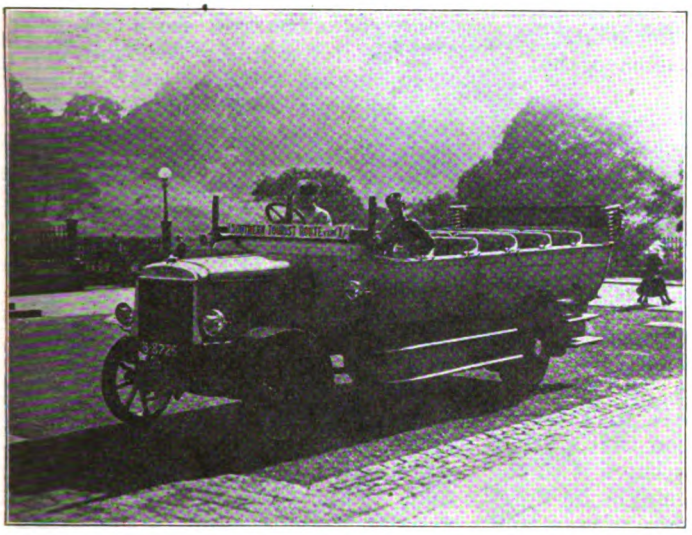
—Vance.

Scottish Tours and Touring

John Y. Dunlop

IN taking up the question of civil motor enterprises under all heads in England at the present time I think we are able to appreciate the international aspect much more than we were able to do before August, 1914, when the vast majority of our people were untravelled and therefore, of inevitable insular outlook.

While labor has not yet become educated to the influence of the international factor precisely because those concerned with the key of industries remained at home and took advantage of our dire national plight not to make sacrifices but to raise their standard of living, motor users generally have both a better record and an intellectual reward in being able to appreciate the international factor in design and therefore, the possibilities of construction and use. They know how foreign made cars stand up to the severest tests and to the severest conditions of service which can be provided over our ruined roads of today and many have formed such a high opinion of the imported article that they prefer it to the British made car, even for home service but given a chance by labor, British designers and manufacturers can develop as well as foreigners in any desirable direction. They can make cars which will stand up alike to the Continental patterns and I may say that the better the designer and the keener the builder they are the more anxious to have done with trials over billiard table surfaces. Therefore, in arranging our motor competitions of all sorts for the coming year there will be no lack of severity of tests. The real problems of trial organization in England today is how can we make trials sufficiently severe from the point of the machine and not of the rider. Certainly it will exercise the ingenuity of the various committees concerned to solve the problem.



ONE OF THE NEW FLEET OF LEYLAND CHAR-A-BANCS ON THE TOURING ROUTES FROM PRINCESS ST., EDINBURGH

At present we have to makeshift with what style motor vehicles are available for us and fortunately we can use them with any of the known brands of motor fuel that are beginning to be reintroduced into the market in token of the fact that the public is nearing the end of its period in working off the vast stocks of Government imported motor fuel. Government fuel is now distributed to the retailers' current stock of their own selection, purchasing and importing. It should therefore follow that once the retailers' current stocks are exhausted it would be possible for the various classes of motorists to return to the use of their former brands of fuel. This is essential to restore the balance of demand for the various grades. For example at present the majority of commercial motor vehicle users are buying first grade fuel. We need to restore the proportion of demand as a first step towards reduction of cost.

Now that the touring season is in full swing in Scotland we are having many fine designs of char-a-banc, handed over to the various motoring companies.

Most makers have long waiting lists for the delivery of these machines and I am afraid that the season will be long past before many get delivery.

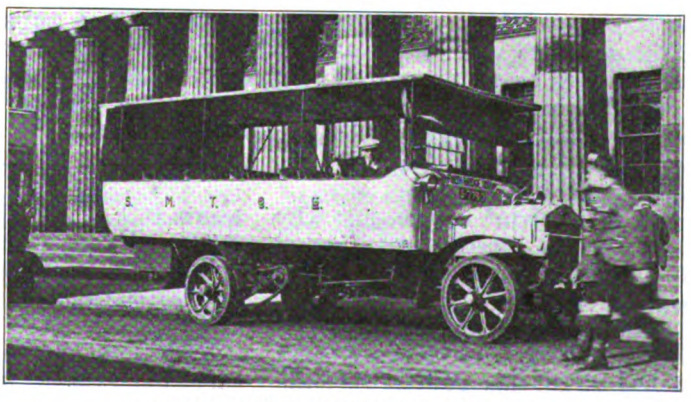
The handsome 27 seater Leyland de Luxe char-a-banc shown is one of three of those in order and also twelve single deck buses of the same make for the Edinburgh Corporation Tramways.

These cars are mostly on the motor routes along the Forth and are well patronized over a long touring season.

AIR LEAKS IN THE SUCTION SYSTEM

The common methods of testing for air leaks in the suction system of the engine by means of smoke or oil are not always very satisfactory, as the leak is often too slight to make itself noticed at a light pressure. I tried the following and was surprised at the exaggerated effect that was produced:

The carburetor was detached, and a blind gasket (i. e. one without a central hole through it) was inserted between the carburetor and the intake pipe. This may be cut out of card or mill board. On now turning over the engine by hand the effect of the suction is greatly magnified, and the slightest leak will hiss like a basket of snakes. This is due to the suction attempting to create a vacuum throughout the system and the consequent rush of air at high speed through any leaking spot.—J. U.



ONE OF THE ALBION FLEET

Teaching Bill the Efficiency Game

D. G. Baird

Don't it beat all how folks hate to take advice? I reckon it must be the natural reaction from our constant experience with the groceryman, traffic cop, tax assessor, health—and fire inspector, and the committee from the ladies aid society. We just must assert ourselves occasionally "lest we forget," as the poet sings; meanin' by that we should at all times bear in mind the great and glorious privileges that're ours of votin' the republican ticket and receivin' free garden seed from Washington and readin' all about the filibusters in the senate. Anyhow we hate to take advice and when some well well meanin' friend comes along and offers us a bushel or so that he don't happen to be needin' just at the time we most usually thank him real polite and vow to ourselves not to take it just the same.

Well, that's the way it was with Bill Higby when I tried to show him how to be rich and happy, tho a blacksmith. Bill had his mind all made up that blacksmithin' was obsolete, non-remunerative, confin', laborious, et cetera—but that's what I'm goiin' to tell you.

It all came about this way Me and Bill had been good friends ever since the time he came up to Detroit and tried to show the gentle Detroiters how the yellow journals say they live and I had to pull him off of six or eight cops and bail him out of the town hoose-gow. So when I happened down Ridgewood way this summer on my vacation one of the fist places of interest I headed for was Bill's blacksmith shop.

Bill grets me real cordial and gets a new piece of white pine board to whittle on and goes on explainin' to Ed. Smith, the leadin' gentleman of leisure of the thrivin' village, just why the dagoes've already got enough "fumes", with their garlic and their spaghetti and all.

After awhile I get tired of settlin' the affairs of nations, so I catch Bill off his guard when he halts to expectorate thru a crack in the floor and put in one of my highly original remarks. "Bill", says I, "how's blacksmithin' by this time?"

Say, you just oughta seen Bill's countenance fall at that remark. You'd of thought he was a jew pawn broker tellin' you the price of a motheaten suit of old clothes. "Blacksmithin'!" he says real indignant like, "say a blacksmith's about as popular as a houn' dog in a revival meetin' these days. And just about as prosperous. Nobody's got any use for a blacksmith any more; it's the garage men that've got the graft now."

Now I've got several reputable friends that're blacksmiths, so I don't specially appreciate Bill's remark and I tell him so. But it seems that Bill's got about five thousand tied up in his shop and couldn't get help and was only makin' about five dollars a day clear, so he had decided to sell out and go into the garage business.

About this time in comes a youngster and wants to know if Bill can fix his wagon that's broke and Bill tells him to leave it to the followin' week and maybe he'll get to it. Then in comes a man and wants to know if his double-tree is ready. It ain't, but when he begins to get peeved about it Bill pitches in to fix it right away.

While I'm wonderin' what's to be the ultimate fate of the high and noble callin' of blacksmith I take a stroll around the shop and watch Bill fix the double-tree. There was so much work stacked around, I could hardly pick my way thru it. Besides, everything was in a mess; coal and ashes from the forge layin' around on the floor and all mixed up with shavin's and tools, and kegs of horseshoes here and there about the place, chains and bolts and old shoes and pieces of timber and wagon tires and anatomical specimens of various vehicles—all scattered about and mixed up till it would take a week to straighten it all out.

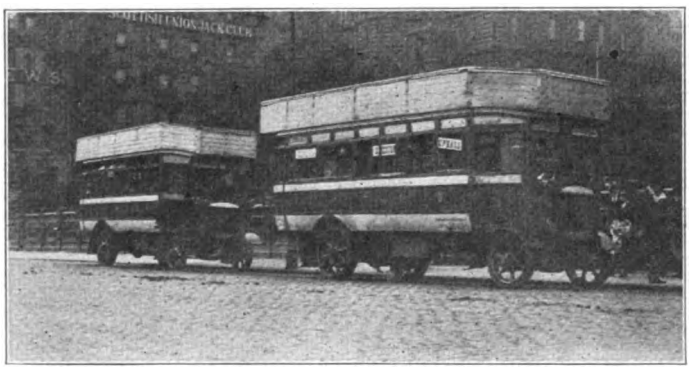
Now I'm always willin' to give my personal friends the advantage of my invaluable advice, so I says to Bill when he gets back to his whittlin' again, "Bill, why don't you try blacksmithin' for a change? I think it's a noble vocation and there oughta be some real money in it in a place like this."

Bill looks at me suspicious like and says "Aw quit your kiddin'," and goes on with his dagoes: "Now as I was sayin' before that cranky old duffer butted in—"

"But I'm givin' it to you straight," I put in. "You say that you're only takin' in about five per day here, and I know that a man of your unusual ability for chewin' star and devastatin' the white pine forests oughta be far more handsomely rewarded than that. That's why I proffered my valuable suggestion anent the gentle art of the anvil.

"I guess you mean to delicately insinuate that I ain't blacksmithin' as it is," Bill comes back." I'll have you understand I've been a smith ever since I was big enough to hold onto my daddy's finger and toddle to this here very shop. He run it long afore I was born and I been runnin' it myself nigh onto twenty year. Ask any man, woman or child in—

"I assure you I'm not interested in your family catalogue," I informs him real polite," neither do I impugn your reputation for bein' persona grata with all the said children, women, and men of the immediate vicinity, but as a knight of the sledge, Bill, you're about as good a imitation as nearbeer is o' beer. You look, smell and act like a blacksmith, but you don't do the work no more than the said nearbeer.



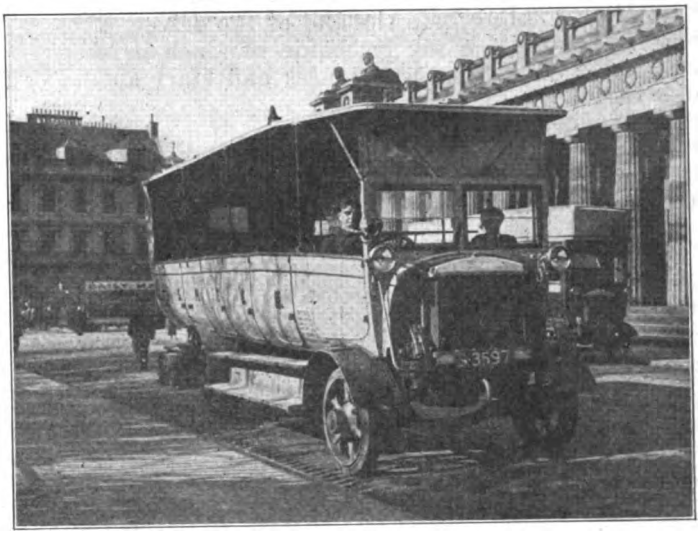
GAS OMNIBUSES ON THE TOURING ROUTES. DAILY TRIPS ARE MADE FROM EDINBURGH COAL GAS IS STORED IN THE RECEPTACLE ON TOP OF THE CAR AND IS USED INSTEAD OF GASOLINE. THIS IS ONE OF BRITAIN'S WAR-TIME IDEAS MADE NECESSARY BY THE SHORTAGE OF GASOLINE

"Maybe you can tell me wherein I fall short of the high standard of a blacksmith," says Bill gettin' sarcastic.

"Well, yes," I says, "I can do that in just one word, William, you are lackin, in that all important respect which we denominate efficiency. Now I watched you fix that double-tree a while ago and it took you about twice as long as it should to do the job. When you started to draw it down you couldn't find your drawin' knife, and when you did find it it was so dull you couldn't do no good with it. Then you had to hunt a bit to bore the holes with and every time you got thru with a bit you threw it down where it would get covered up and lost and had to look for another one and that had already got lost that way. It took more than twice as long as it shouud have to bore them holes. Then you had to have a bolt and nut and you hunted about five minutes for one that'd fit and when you found one it was rusty and you had to cut threads on the bolt and in the nut. Then you went to the store room and got a die and cut the threads on the bolt then back to the store room and got a tap and it wouldn't fit and you had to go back again and —well, you made three trips to that store room and back for a tap to bore a hole in a rusty nut. Why don't you have a place for your taps and your dies and your bits and saws and bolts and everything where they will be handy and you'll know to find them? And when you get thru with a tool why don't you have a place to put it and put it there?

"Then there's all this mess scattered round; why don't you send for the clean up squad and put things where they belong? And all this work waitin' for you—don't you ever do a job till the customer calls for it? And that old hand bellows—why don't you get a forge wtih an eléctric fan? And coolin' tubs—say, you got two anvils and only one tub. And—oh pshaw! You ain't blacksmithin; you're a standin' entertainment committee for all the loafers in town."

"I always heard," Bill says when I slow up to get my wind, "that talk's cheap. Now, I just naturally don't like nothin' cheap. Gimme a man what don't do too much braggin' but what's always ready to deliver the goods. Now this here shop—lock, stock and barrel—is for sale at the flat price of five thousand iron men. I done been offered four and a half for it, but I ain't got but the one price.



MINERVA—KNIGHT MOTORED CHAR-A-BANC

Since you seem to be so well versed in the matter of doin' the gentle blacksmith stunt, why I suggest that you take over the business tomorrow mornin' bright and early and proceed at once to make your future and your fortune.

"I suppose you think I couldn't do it, eh?" I throws back at him.

"Well now, I ain't makin' no charges and I ain't castin' no reflections on nobody's ability. My offer's before the public and I thought maybe from the way you talk you'd be interested in the opportunity."

"You know good and well I ain't got no use for your old shop," I say beginnin' to get warm under the collar. "I don't claim to be no blacksmith, but I do claim to recognize brass coated inefficiency when I see it."

"My offer's still open," Bill comes back sweetly and goes on whittlin.

I never like to get the worst of anything, so I'm determined to get even with Bill and before I know it I'm offerin' to bet him five hundred that I can take the old shop and make her clear twenty-five a day for three weeks (that bein' the limit of my vacation). Bill sees that he can't lose on the proposition and takes me up and I get busy. I'm to have full charge of the place and do as I like so long as I don't wantonly destroy property.

Well sir, it was almost too easy to be interestin! Bill had been so inefficient and sociable that he hadn't done hardly anything except lose his customers. I first looked up two good blacksmiths and hired them at $5 a day. Then I put a "ad" in the county paper sayin' that the shop had adopted a new system and hereafter customers would receive prompt, efficient, and cheerful service. Then I hired a helper and a laborer and I was all ready for business.

Next mornin' I was down bright and early plannin' out my new arrangements. When the men come I punt them to work on the jobs tha're piled all over the shop and I take the laborer and clean house. In the meantime I'm makin' plans and diagrams and all; layin' out a efficiency scheme that would make Henry Ford want to come down and take lessons. When the loafers come around I speak to them sociable like and go right on with my work.

The idlers report the news around town and pretty soon most everybody is droppin' in to see what's goin' on. But I don't waste no time with them, tho I'm always polite and sociable. Pretty soon first one then another begins to come in and want to know if I can get their work out right away as it's been in the shop anywhere from a week to two years, and in every case I try to oblige them and they go away pleased. I pretty near worked them blacksmiths to death, but five dollars is good money in Ridgewood and they didn't kick none.

Well sir to make a long story short, I had every tool in the shop in perfect condition and in a rack or a case right where it would be most needed and it was kept there; I put in another slack tub and had the store room cleaned out and everything indexed and put in a certain place; I arranged every detail of the work so's the men wouldn't have to take a single extra step; I had a special place for new work that was brought in and everything took its place in line

unless it was a rush job and then I charged a little more for it; and I discouraged loafin' around the shop.

There was enough work on hand to keep us busy for ten days and by that time the news had got around and new work was comin' in right along. The first week I cleared $27 a day and the second I cleared $31.20. About the middle of the third week I threw up the job as you will see and agree.

Everything was goin' lovely and I was seein' the look on Bill's face when he should fork over the five century note, when he and a ugly lookin' bird comes in and Bill hands over $500 and says real jovial "You win, old top; here's your coin."

"But what's the big idea?" I say all bewildered. "My three weeks ain't up yet and I—"

"This is Mr. Jacobs," Bill puts in. He's been wantin' this here establishment for a long time, but didn't see that it was worth the small sum of $5000. Howsomever he's changed his mind lately and decided to pay me the small sum of $7500 for the business seein' that its doin' so well."

I had to sit down on a brick and let it soak in for awhile. Finally I mustered up enough courage to articulate weakly so I says in a stage whisper, "But you idiot, what did you want to sell at all for?"

"Well," he says, "I been wantin' to get into the garage business for quite a spell now—it ain't so strenous as smithin'—so I thought as how I would dispose of this property and invest in a more up-to-date business."

About this time Jacobs puts on airs and says to me: "Mr. Blowhard, I have been very gratified to see how you have improved this business. As I now become proprietor of said business, I would be glad to make you an offer for your permanent services—"

I didn't wait to hear the rest; I was on the way to the bank with my $500.

Anyway it wasn't a bad vacation and I taught Bill the efficiecy game—but he won't play it.

SCREW DRIVER KINKS

In working about the various parts of the motor or the chassis the average mechanic meets with a need of such handy kinks as shown here for easy manipulation of the many small machine screws. The ideas are all ones that have proven their use and are the inventions of garage mechanics made to lighten their tasks, therefore are of sufficient importance to merit trial by those motorists who tinker with their own engine troubles.

As in Fig. 1, by riveting a short piece of clock spring to the blade of an ordinary screw driver, it adapts it to grip the slotted screw holding it to the end of the driver, enabling the mechanic to reach in out of the way places and start a

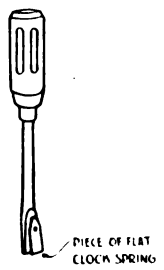


FIG. 1

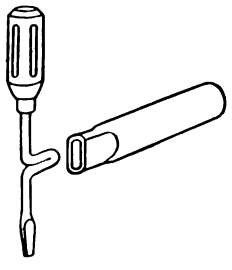


FIG. 2

screw that would be very troublesome otherwise.

Fig. 2 illustrates a very practical way of applying additional leverage to a screw driver. A long handled screw driver is used for the purpose, the handle being bent to a short crank, and on the arm thus formed a piece of pipe is used to supply the leverage for starting stiff screws.

Fig. 3 shows a very useful angle screw driver that enables getting

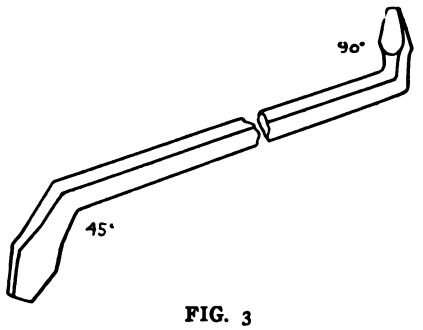
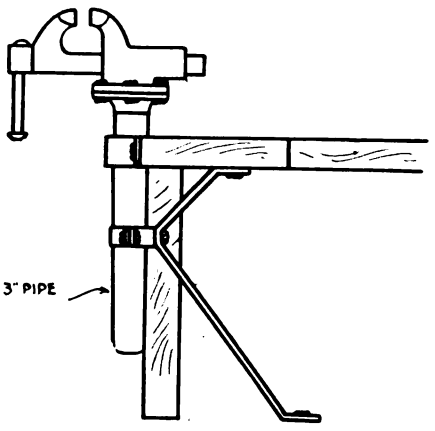


FIG. 3

at screws in close quarters where long handle straight drivers could not possibly be used.

ADJUSTABLE HEIGHT BENCH VISE

Regardless of the variation of height of all the different mechanics, as a rule the shop bench is a certain height and the bench vises secured to them often seem unhandy to a tall or short man. I noted several short fellows standing on pieces of plank to enable them to comfortably work at their vise, and the tall fellows were bent over in a cramping attitude with



VISE, ADJUSTABLE FOR HEIGHT

no means of relief. In shops where several men use the same vise it would pay well to alter the vise installation as shown in the accompanying sketch. This home made affair permits the vise to be raised and lowered as well as swung to any degree in a circle. It consists of mounting the vise on a post made of a short length of 3 inch pipe and a flange, bolting the base of the vise to a flange.

The post is secured by half circular bands, these bands being made especially small to bind them

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When many an article is sold the door has been opened by the customer for another sale of something to go with the first purchose. If you want to make a game of it keep track of 100 consecutive sales and see how many customers are represented by those sales. Fix the stakes at: 100 customers poor; 75 customers fair; 50 customers good; 40 customers excellent; 30 customers super-excellent. This will encourage the habit of selling several things to each individual patron. Try it.

Is your business improving—that is to say, are you doing more business than ever before and doing it in a more satisfactory and more profitable way than formerly? If not, it's high time that you call a halt to discover just where the trouble lies. For trouble there surely is, and in this day of keen competition, we must move forward steadily if we are to keep in the line of march. Getting your full share of business is up to you. Do not be satisfied for the tide to turn of itself.

Queries-Answers-Notes

THIS department is the meeting place where you are free to ask for information, answer questions, discuss shop matters and business conditions and any other notes you feel would be of interest to a fellow mechanic. Make use ofthis Department as often as desired.

Welding Sickle Bars—Some iron bruiser has asked about welding sickle-bars and the best way that I can find is to get another old bar that is long enough for the short piece, mark betweeen the holes and weld this way. There is no welding in the holes and it makes a good job.

I take the long piece and a short piece, make a mark half way between the holes, stove each other up a little and scarf with a short bevel and weld. When it is cool I lay a section on it and if not long enough I reheat and draw the weld out a little. By taking an old piece of sickle bar and welding this way it saves drilling more than one hole for the holes will all match except the last hole in the knife head. There are some around here that I welded three years ago and are still holding out. The paper has helped me over several tight places and is all O. K.

Clint Gilland, Arkansas.

Charging Batteries From Ford Magneto.—I am writing you to know if there is any way of charging a storage battery from the magneto of a Ford car and if there is any company that makes an instrument for the same.

P. W., New York.

Owing to the fact that the Ford magneto supplies a low tension alternating current which is converted into a high tension current in the coils, it is not possible to use the current from a Ford magneto for battery charging.

For all battery charging purposes direct current only can be used as the positive and negative poles of the battery must be connected to the positive and negative sides of the current supply, and since alternating current has no constant polarity (for which reason it receives its name, the polarity alternating from positive to negative in 60 cycle systems sixty times a second). In charging batteries by direct current, the amperage rather than the voltage of the current must be considered, as the standard measure of the energy put into or taken out of a battery is in terms of ampere-hours. Thus a flow of ten amperes, maintained for eight hours, amounts to 80 ampere-hours.

Making a Bick Horn.—For making small chain links, or other small work, the horn of an ordinary anvil is too large, or if the end be small and sharp, it wears away with years of use and becomes far too blunt for a lot of work which must be done. The writer has often found a very convenient tool for small work to be a small size tinner's stake which has been fitted to stand upright in the hardy hole of the anvil. If you have not a small stake such as mentioned, a bick-horn can be easily made with a square end to fit the anvil. Have a tapering horn, not vertical, but with a bend to one side, and you will find it handy to work on as the bend allows you to hammer vertically.

J. Hodgson, Kansas.

WAUKEGAN GARAGE OWNERS FIX AIR PRICE

"As free as the air" means nothing to Waukegan motorists. In the future the garage owners will have a slot arrangement in front of their places of business and a nickel will have to be dropped in the machine before the tourist will get any air.

In speaking to a number of garage owners in Racine the majority of them did not favor the idea. One garage in this city tried the experiment for a few days but discontinued the idea. It is expected that Racine automobile owners will be more fortunate than their Waukegan brothers.

The motorists in Waukegan are already complaining. One of them said: "The idea of tacking a price on air, and you have to wrap it up yourself." Racine, (Wis.) News.

Shellac Varnish—Can you tell me how to make good shellac for putting on cylinder head gaskets, etc.?

Howard L. McKeen, Maine.

The shellac varnish generally used in automobile work is composed of gum orange shellac which is dissolved in wood or denatured alcohol, in which the shellac gum is allowed to stand until dissolved.

The proportion in general use is three pounds of gum shellac to one gallon of alcohol, although the proportions can be altered to meet individual requirements for a thicker or thinner preparation. Thick shellac can be thinned out by the addition of a little wood or denatured alcohol.

Parts for Orphan Car.—Can you please inform me where I could obtain repairs for a Firestone-Columbus car?

E. W. White, Canada.

Parts for the car mentioned are obtainable from the Puritan Machine Co., Detroit, Mich., and the New Columbus Buggy Co., Columbus, Ohio. The first mentioned is the more likely to be in a position to give prompt service.

Making A Wrecking Tool—I am sending you a picture of a wrecking tool that comes in handy for a great variety of uses and have made quite a number of them for other people.

This tool is made of ¾ inch octagon steel. The flat point at A should not be sharp as it is liable to injure the hands, but if drawn down to a dull point it is often convenient to use as a pinch bar. The point C should be split and shaped

like the claw on a good sized nail hammer. By shaping as at B there is a good chance to strike the tool with a hammer and drive it under a piece that is to be loosened. Each end of the tool should be tempered to about cold chisel temper.

J. C. Higgins, Calif.

Cold Chisels — Having read in the journal several articles on cold chisels I am persuaded to give my methods of making. The cold chisel is the most abused tool in a mechanic's kit, it has to split castings, stone and wherever a wedge is needed and if it does not stand up under all its manifold uses and abuses the poor smith has to shoulder the blame. The first piece I read was too elaborate, the cost too high and very few campanies would stand for the time, the other two were about the same, it took too long to make them, but again most chisels are made in too much of a rush. A helper rushes into the smith and says: "here Bill fix up this chisel, I'm in a hurry." The chisel is repaired and when put into use it does not stand up and again he takes it to the smith.

I always keep a supply on hand so as not have to stop, for many times the smith is on work where he is not fit to work on steel, a fact that many foreman machinists do not seem to understand.

I make a number at a time. Most smiths cut up a number cold but this is not the correct thing to do as steel should never be cut that way as it is dangerous to smith and helper and injures the steel and sets up strains and cracks that do not show until the tool is put into use. I do not even mark them cold. I set my dividers to the length I want them to be and cut hot and finish the head at the same heat as they have to be heated for the heads there is nothing lost after the heads are all finished.

I then draw out the blade, this I prefer to do on the anvil with the sledge, even taking two heats, as I believe the steam hammer is too heavy and draws too fast after drawing out the blade. I cut across the end and lay aside and take another until I have the whole lot done and then take the first one, snip off the end cold where I had marked it. I then finish up the edge, lay on the fire to relieve the strains that have been set up and lay aside till all are done. I then start with the first again and temper. I heat for about an inch and a half back and dip straight down for about an inch and keep moving. When they are cooled the end is polished and the color is allowed to run down to a blue for general use. Of course it makes a big difference what the heat is when you dip. My

practice is to harden at as low a heat as the steel will harden. I have followed this method for many years and have always had good results.

H. N. Pope, Connecticut.

Smithing Coal—The smithing coal situation has not been relieved a great deal and we are frequently asked what kind of coal makes a good smithing coal. Of course, the absence of sulphur is understood to be the most desirable quality but there are others as follows:—

1—Coal must be of high coking nature, clean and free from impurities such as slate, fire-clay and mother coal.

2—Coal for smithing purposes must have high heating value in order to make the proper welds and to utilize the least possible amount of draft, especially where high grade forging is required.

3—Sulphur is the most difficult constituent to contend with. The fuel therefore, should be as low in sulphur as possible on account of the fact that where sulphur comes into contact with the two parts of the metal to be welded, pitting will be caused and a misweld will result.

4—The percentage of ash in smithing coal should also be very carefully taken under consideration, not so much from a welding standpoint but from the fact that it clogs the tuyeres of the forge and causes intermittent draft at times when a constant draft is essential, which will naturally result in irregular heats and consequent decreased efficiency of the forge.

Give us your views.—In our issue for August, I was particularly struck with your editorial entitled "The Editor Wonders," in which you cite two cases which have come under your personal observation. In the first case you mention a man who is not a mechanic, does not pretend to be, still he is making easy money managing an automobile garage. In the other case the man is a first class mechanic, but you say this man's business is gradually getting less and is likely to dwindle to nothing.

The one is catering to a class that is getting more numerous every day, "the auto owner", while the other is catering to a class which is getting smaller every day, "The horse owner". Is not that the case? Mr. Editor, Now Sir, what I want to get at is this. I have been a blacksmith and horseshoer since I was 15 years of age. I am now fifty, and I consider myself a fair mechanic, having learned the trade in Scotland, and I am doing a fairly good business. Last year when help was impossible to get, I did a gross business of $2,300 or thereabout without any help. Now since my son came home from the war we are doing considerable more, but the point is, my son does not like shoeing (neither do I for that matter), but would like to go into the auto repairing. What I was thinking of doing was to rent the blacksmith shop in the spring, get into some good repair shop and learn the auto repair work, then build a garage in a vacant lot which I own south of the shop. I live on Yonge Street, in the village of Richmond Hill, about 10 miles from the City of Toronto, and on an average I should say 200 autos pass every day and on Saturday and Sundays there is a regular steady stream. There are two garages already in the village, four gasoline pumps and tanks, and I may be something like the second man mentioned in your editorial, reluctant to throw up an established business for one I don't know anything about. I was thinking that perhaps you could give me some advice on the matter, or perhaps some of your numerous readers may have gone through the same experience and could give me some practical hints, on this subject, through the columns of your paper.

If you do not think it of any use to print this, put into the waste paper basket, but I thought there might be a good many in the same quandary as I am.

H. C. R., Canada.

Editor's Note.—Here is a question that is an interesting one in several ways and and the editor would be very glad indeed to devote one or more pages of the next number to suggestions and information from other readers on this letter—come on with your advice.

"THE SWEETEST STORY EVER TOLD"—To an Editor

"Can you tell me why a man who meets his other obligations promptly will not take care of the small amount he owes a first class journal in the same manner?

"Since I am one of this multitude I am not qualified to answer, but send herewith a check to be placed to my credit, and when the 1/1/20 rolls around will try to include this item in the good resolutions.

"On account of the local scarcity of blacksmiths, our shop has been closed for one year, but we will reopen it at an early date, and not the least important part of our equipment will be the old reliable journal."

W. R. Sanderfur, (Texas).

Remedying Overreaching.—Overreaching rarely happens except when the horse is going fast, hence is common in trotters and running horses. In the former the fault usually shows when breaking from a trot to a run. The outside heels and quarters are most liable to injury.

The coronet at the heel or quarter is bruised or cut, the injury in some instances involving the horn as well. Where the hind foot strikes well back on the heel of the forefoot—an accident known among horsemen as "grabbing"—the shoe may be torn from the fore foot or the animal may fall to its knees. Horses accustomed to overreaching are often "bad breakers", for the reason that the pain of the injury so excites them that they cannot readily be brought back to the trotting gait.

If the injury is but a slight bruise, cold water bandages applied for a few days will remove all soreness. If the parts are deeply cut, more or less suppuration will follow, and, as a rule, it is well to poultice the parts for a day or two, after which cold baths may be used, or the wounds dressed with tincture of aloes, oakum and a roller bandage.

When an animal is known to be subject to overreaching, he should never be driven fast without quarter boots, which are especially made for the protection of the heels and quarters.

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. When circumstances will permit of their use, the fore feet may be shod with the "tips" instead of the common shoe, as in treatment for contracted heeels.

AUTOMOBILES IN THE UNITED STATES

Motor vehicles registered in U. S. January 1, 1918	5,148,000
Motor trucks in use in U. S.	435,000
Number of persons in U. S. to one motor car	21
Persons to 1 car in 11 Middle West States	21
Persons to 1 car in 11 Eastern States	17
Percentage of cars sold to farmers in 1917 (estimated)	40
Automobiles in U. S. to each mile of public road	1.72
Automobiles in U. S. to each mile of surfaced road	14.77
Automobiles in U. S. to each square mile	1.4
Automobiles in use in all countries outside the U. S. in 1917 (Jan. 1)	719,246
Horses in U. S.	24.000,000
Acres of land required to sustain horses at 5 acres per head	120,000.000
Horses displaced by motor truck in use (estimated)	2,000,000
Acres of land released for production of human food	10,000,000
Motor Vehicle manufacturers in U. S.	550
Capital invested	$736,000,000
Workers employed	280,000
Wages and salaries paid	$275,000,000
Wholesale value of vehicles produced	$1,249,390,618

AMERICAN BLACKSMITH AUTO & TRACTOR SHOP

VOLUME 19 NOVEMBER, 1919 NUMBER 2

BUFFALO, N. Y., U. S. A

THIS is a time when the common interests of a community will be served by patience, forbearance, cooperation and a spirit of social loyalty and patriotism. There is need for loyalty and patriotism in the management of community affairs as well as in fighting a foreign enemy.

Modern society is a very complex and highly organized affair. It has become so because as population increases it is necessary that industry shall be specialized and made more productive. It takes on the form of a great co-operative organization, in which each person does some one thing for the common welfare, exchanging his services for the services that all the others render to him. Each one owes loyalty and fidelity to the organization. They are all exchanging day's works. The organization is far from perfect, but nobody planned it as it is; like Topsy, it "just growed," and nobody has the power to make it suddenly different. At this time there is disorder and confusion which cannot be immediately remedied, but everybody can help by doing his honest best in his own work. If each one will do a litlle better, the whole organization will do better, the production of common comforts will be greater, and social progress will be faster. On the other hand if every one tries to do less and to make all the trouble he can, this highly organized social machine can be made almost helpless. There is no need for any group of people to demonstrate that it has the power to cause mischief; that is conceded.

The Twentieth Century Limited represents the highest development in transportation, but anybody can wreck it. It is possible for a small minority of people to embarrass the entire body, but they cannot benefit themselves.

The time is an extraordinary one in history. The world is desperately in need of production. It is no time for radical innovations which increase the disorganization and diminish the output. It is a time for emphasis on the fundamenal truth of the social order that the best results for every class are to be had by policies which increase the total social product.—From National City Company Booklet.

IT'LL BE SOME GARAGE, ANYHOW.

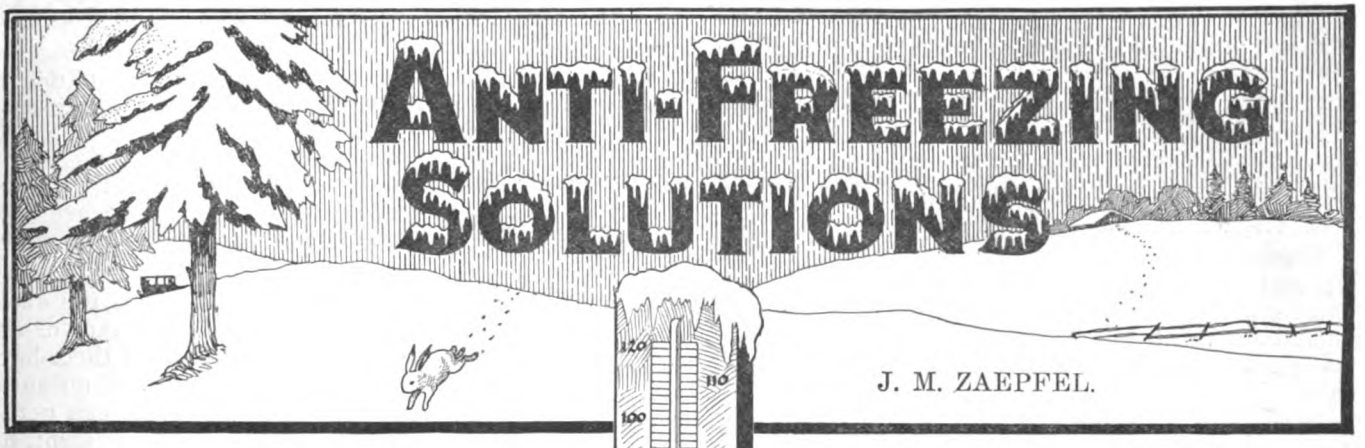
We have a distinct recollection that on the entrance of this country into the war there was immediately created an enormous demand for walnut lumber for military purposes. Naturally enough this demand considerably reduced the visible supply and tended to shoot up the price of walnut for other widely used purposes.

Now, in view of the present cost, scarcity and great demand for walnut, notably in the furniture trades we come across this interesting clipping taken from a Missouri newspaper to the effect that:—

> "Mr. Blank is building a garage of solid walnut lumber. This seems a little extravagant, but the lumber is some that Mr. Blank had sawed while on the farm a few years ago and could not sell at what he considered a fair price."

We're rather inclined to believe that the builder of this "solid walnut" garage like some others (may their tribe decrease) we know and have heard of, has no idea of what constitutes a "fair" price on anything he may have for sale. But should he buy anything from anyone else—"Robber!"

A JOB



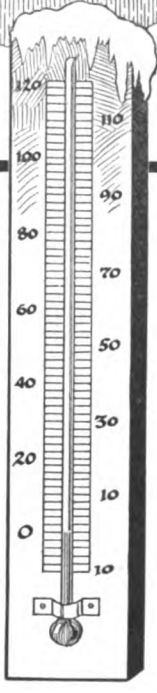
OPINIONS vary as to the best solution or method to employ to prevent the water of the automobile cooling system from freezing during the cold period. It is essential however, that some preparation be added to the water or some protective heating device installed on the car or in the garage to either lower the freezing point of the water or prevent freezing by keeping the water at a temperature above the freezing temperature, or 32 degrees Fahrenheit.

Some automobile users and makers prefer a 30 per cent solution of denatured alcohol and glycerine, others like the glycerine alone and some few there are who prefer to use kerosene oil in their cooling systems but as a rule and for the most part motorists favor the use of a solution of which calcium chloride is the base.

The opinion is cherished by some that alkaline solutions such as calcium chloride are productive of an electrolytic action wherever two dissimilar metals are utilized such as the brass tubing of a radiator and the soldering metal used at the joints; likewise the iron water jacket of the cylinder block casting and brass or aluminum pipes or fittings and while this electrolytic action is, to a certain extent, to be expected and is unavoidable where two metals of different potentials are used together, yet the deleterious action which might result is practically negligible if the Chemically Pure Calcium Chloride is used, as the solution is employed but a few months.

In the selection of an anti-freezing solution of any sort the following features should be borne in mind:—

1—Where extreme changes occur—that is in some section where the weather is mild for a few days which is followed by a sudden drop in temperature well below the freezing point of water it is advisable to use a solution capable of meeting this temperature range.



2—It should have no marked corrosive action, nor should it in any way prove injurious to the component parts of the cooling system.

3—The ingredients used must be readily dissolved or mixable with water.

4—It must be reasonably cheap to prepare and not subject to rapid waste, due to evaporation.

5—It should not deposit sediment or foreign substances.

6—Its boiling point should be as high, if not higher, than that of plain water (221 degrees) and it should not freeze at temperatures ordinarily met with where it is used.

Denatured Alcohol — While denatured alcohol combines readily with water, such an anti-freeze solution has the disadvantage that it boils more readily than water and consequently the loss by evaporation is considerable, particularly if the solution be prepared for freezing temperatures in the neighborhood of 0 and is used where the thermometer frequently registers above the freezing point. Also the odor given off is objectionable to many. As the alcohol evaporates more readily and at a much lower temperature than water it is necessary to keep adding alcohol to preserve the efficiency of the solution.

Glycerine and Alcohol Mixtures—This combination, while favored by many also has its share of disadvantages, because the glycerine preparation will not boil as easily as water. It is also more expensive than alcohol alone or calcium chloride and water to prepare. Also, the fatty composition of glycerine in any proposition has a decided tendency to attack the rubber hose, packing, etc., of the circulating system.

Kerosene Oil—There are some automobile owners who have used kerosene oil in their engines. Kerosene has the advantage of cheapness and will not freeze at any winter temperature we know of. However the objections to its use are sufficient to prevent its ever being popular. It boils at a very low temperature, it attacks the rubber parts of the system with speed and consequent damage, the gas from heated kerosene is rather combustible which makes its use for this purpose more or less dangerous. Also, the odor of kerosene is quite objecctionable.

Of the preparations on the market there is no one solution that combines all the desirable features and so it happens that the preparation universally recommended is the calcium chloride solution and we give below the various combinations of calcium chloride with water for temperatures ranging from freezing (32 degrees) to 39 degrees below zero which is about as cold as it will get any place automobiles are used:

Quantity of Chemically pure Calcium Chloride to be used for each gallon of water used.	Temperature in degrees Fahrenheit.
1 lb. 5 ou.	32 deg. to 20 above 0
1 lb. 12 ou.	20 deg. to 10 above 0
2 lb. 4 ou.	10 deg. to Zero.
2 lb. 12 ou.	0 to 10 deg. below 0
3 lb. 4 ou.	10 to 20 deg. below 0
3 lb. 12 ou.	20 to 30 deg. below 0
5 lb.	30 to 39 deg. below 0

Calcium chloride is usually put up and sold in dry form in containers as small as five pounds and sometimes printed instructions for its use accompany it, such as the table above.

In buying Calcium Chloride in bulk, precaution should be taken to insurse getting only the chemically pure calcium chloride and this grade should be specified when ordering and it is always best to purchase the article from a concern who will guarantee the purity of its product. Under no circumstances should the crude calcium chloride be used as there is then danger of corroding the metal parts of the cooling system.

To use the calcium chloride solution, the radiator should be thoroughly flushed out to remove any sediment before adding the anti-freezing solution and the radiator then filled with the mixture. A proper preparation of calcium chloride and water should be kept on hand to supply any loss due to leakage or evaporation and the solution should be kept in the radiator continuously during the months when freezing temperatures are likely to occur.

Calcium chloride is not volatile, that is, it will not evaporate and lose its efficiency. The water will evaporate but the calcium chloride remains, it is absolutely odorless and clean and has practically the same boiling point of water.

Calcium chloride of a suitable quality can usually be obtained through automobile supply houses and jobbers or through wholesale drug houses or from the manufacturers direct in any quantity.

Some Dangers of the Street

Parents and children largely to blame for the great number of accidents to children by motor cars. Look at the pictures and notice the potential danger of practices frequently seen.

THE American small boy usually feels abundantly able to take care of himself,—and he does, in fact, display considerable ability in this direction. We must not assume, however, that he possesses the sound judgment that will (or should) come to him with increasing years and experience. The city boy, in particular, is most unfortunately situated, inasmuch as there are few places in which he can safely take his recreation. City officials are giving an increasing amount of attention to this subject, yet although playgrounds are multiplying in a highly encouraging way, it is hardly possible to provide enough of them to accommodate all the children of a city, and it os often exceedingly difficult to locate them in convenient and readily accessible places. The result is that many of the children (and especially the boys, who are interested in forms of play that call for incessant physical activity) are forced to use the public streets as playgrounds. This exposes them to constant danger from passing vehicles, and with distressing frequency they are run over, or badly injured in other ways.

The small boy regards the automobile as a promising means of obtaining free rides, and if there happens to be on the back of an automobile a place where he can perch and be out of the driver's sight, he is fond of roosting there and stealing a ride. Sometimes he can do this without special danger, but at other times he is exposed to a considerable hazard. When he jumps off he may run directly in front of another automobile, the driver of which had no reason to expect that a small boy would suddenly pop out in front of him, apparently from nowhere. The automobilist who refuses to allow a boy to ride behind him is commonly classed, in juvenile philosophy, as a sour fellow who never was a boy himself and who has no sympathy for the pleasure that such a ride brings. This, of course, is usually far from the truth, because most of us would be glad to take a whole street-full of boys along with us, if it were practicable and wise to do so.

With the discontinuing of the interurban trolley lines that is notable in many parts of the country at the present time, the facilities for local travel have been seriously reduced, and a person who wishes to make a short trip is often forced to wait a long time for a train, or to

Fig. 1. THE STREET AS A FOOTBALL FIELD

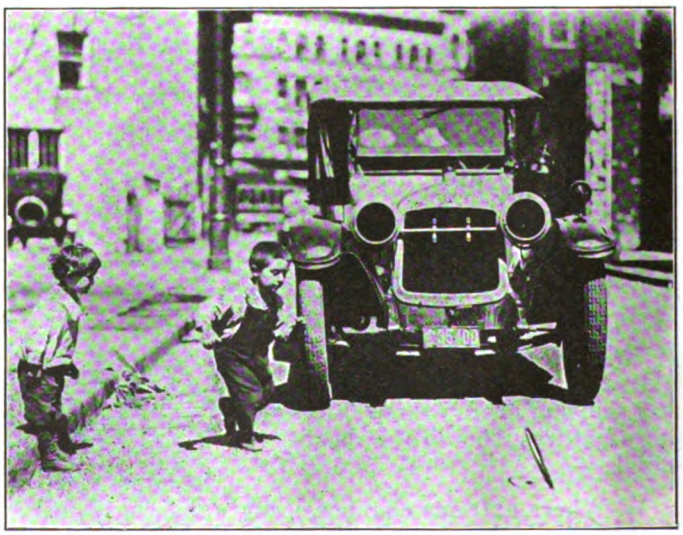


Fig. 2. ENTIRELY OBLIVIOUS OF DANGER

ask the driver of a passing automobile to "give him a lift." Legitimate cases of this kind usually involve adults instead of children, but boys now often beg rides in this way, although they usually do not need the transportation in the least. They ride away from town in one automobile merely for the pleasure of the thing, and then ride back again in another one, if they find a driver who is willing to take them in. The wisest course is to decline to pick up children who are unattended by parents or other responsible adults, because this course tends to minimize accidents. Moreover, in the event of an accident in which injury befalls a child who has been taken in without proper authority, the driver is sometimes put in a very embarrassing position. We recall a case, for example, in which a careful driver took in a boy on a country road because the boy asked for a ride in an unusually polite and winsome way. Something went wrong with the steering gear, the car overturned, the occupants were thrown out, and the boy had both legs broken. The accident occurred as the automobile was approaching a small town, and a group quickly gathered around. Criticism of the driver was emphatic and free, and for the time it looked as though violence would be done to him. He had the boy taken to a hospital, and provided the best medical and surgical services that could be had. This, however, did not cancel the fact of the accident, nor did it prevent the boy from making a long sojourn in the hospital.

It is exceedingly common for a bicycle rider to take hold of some part of an automobile, so that it will tow him along without effort on his own part. Automobile drivers should not allow this to be done. Refusal to countenance it is commonly misinterpreted by the bicyclist, but no attention should be paid to this aspect of the case. The danger involved should be the paramount consideration. If the automobile should suddenly swerve when the bicyclist is not expecting it to do so, an accident is likely to occur at once; and the same is true even if the automobile should merely stop suddenly or slow down quickly, in order to avoid collision with another car starting out from the curb or approaching from a side street or appearing unexpectedly in any other way. The large and influential bicycle clubs that were common in the earlier days of bicycle riding are now things of the past in most parts of the country, but wherever such clubs exist they should do what they can, systematically and persistently, to educate their own members to keep away from automobiles and trolley cars, even though they thereby miss a certain amount of free towage. The slight saving of muscular effort is dearly bought when it is measured by the danger it involves.

Another thing that often produces accidents, in cities having smooth streets, is the "hooking on" of a boy wearing roller skates. In certain college towns students old enough to know much better do this thing regularly, and probably use their skates for nothing else. In one particular city there is a certain smooth street which comes to an end abruptly and turns a sharp corner, and we have frequently seen students, at this place, engage in the sport of allowing themselves to be rapidly hauled down the smooth street by an automobile for the evident purpose of seeing whether or not they could keep their feet when the machine made the turn at the end of it. We have even seen a line of them on skates, holding hands, and vying with each other in their efforts to avoid being piled up in a heap. Some observers who have noted this practice have said that a student who would do such a thing should be spanked and put to bed, instead of being allowed to continue in college. However that may be, the automobile driver ought to do everything possible to prevent roller skaters from exposing themselves to danger in such ways.

Little boys with small carts or wagons often steal rides by clinging to vehicles of the slower-moving type, and every now and then this practice leads to a bad accident through the approach of another vehicle under conditions similar to those shown in Figs. 4 and 6. The roadway is a bad place for a boy to navigate a play wagon, even though he is not stealing a ride. Boys sometimes coast in such wagons down inclined walks or passageways, from which they suddenly roll out into a traveled street where they may collide with an unexpected or unnoticed automobile.

School teachers who are doing safety work among the children should bear all these various possibilities in mind, and endeavor to cultivate in their pupils a proper spirit of caution. Parents should also do the same. The police are expected to exercise general supervision over the use of the streets, not only by children but also by others, but they cannot be in all places at all times,—and the boys know this fact quite well.

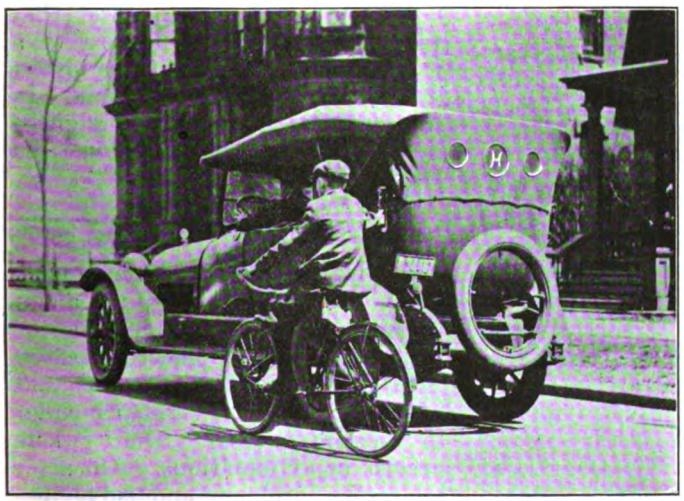


Fig. 3. EASY BUT DANGEROUS

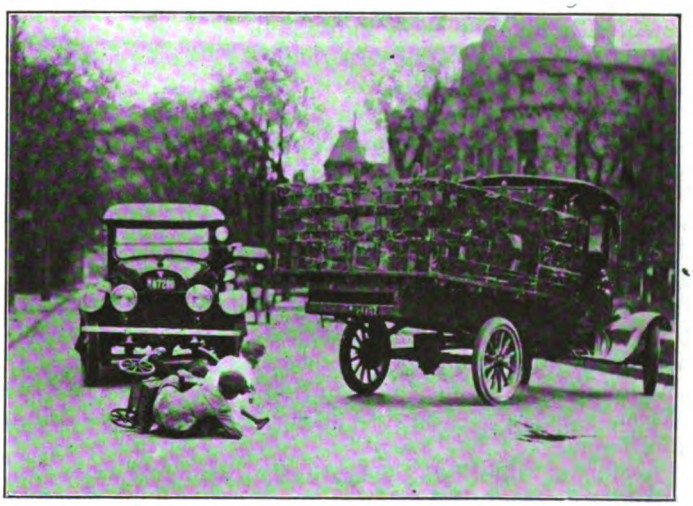


Fig. 4. IT ALL DEPENDS, NOW, ON THE BRAKES

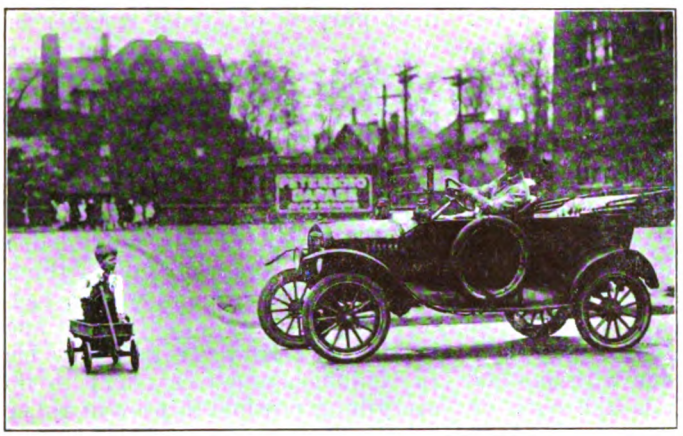


Fig. 5. COASTING INTO THE DANGER ZONE

Fig. 6. THE DANGEROUS HABIT OF "HOOKING ON"

Special care should be taken to avoid striking children who are crossing the street. The danger is strongly marked near school buildings during certain hours, and in cities traffic officers are often stationed at crossings of this kind at times when the children are most likely to need assistance. City schools have done good work in the way of training the older and larger children to assist in the protection of the smaller ones whenever and wherever it becomes necessary for a number of them to cross the street at one time. Parents are also alive to the dangers to which children are subject in crossing streets, and many of them give their children positive instructions as to what they must do in such cases.

It is highly important to train the children to do all that they can for their own protection, and we strongly approve of such training and advise that it be extended and systematized and made as effective as possible. The children certainly must do their part, and more than their part A still greater responsibility rests upon the driver of the automobile, however, because he is the individual who places the engine of destruction upon the streets and who controls it, and his judgment, by reason of his greater age and experience, is presumably better than that of a child. There are times, it must be admitted, when children spring in front of automobiles or trucks so suddenly and unexpectedly that accidents can hardly be avoided; but it is part of the business of the driver to remember, at all times, that children have this habit, and he must govern himself in strict accordance with such knowledge.

Accidents due to thoughtlessly stepping in front of moving automobiles are by no means confined to children. It is altogether too common to see a grown-up person who certainly knows better but who is pre-occupied or inattentive, step out from the sidewalk or from between standing vehicles that afforded an effective place of concealment, and go quickly in front of an oncoming automobile in such a way that an accident is almost unavoidable, even though the automobile is proceeding at a moderate and reasonable rate of speed. Every person who has occasion to cross a street should give due heed to the dangers that are associated with street traffic, and should make sure that he knows what he is doing. In large cities it is especially important to use only the official crossings, where automobile drivers have reason to be specially watchful for pedestrians. Many of the accidents that occur in such cities are due to the fact that the pedestrians leave the sidewalk at unusual points, where automobile drivers do not expect to encounter them. It is no great hardship for a pedestrian to proceed to the proper walk before crossing the street, and any small delay that may be involved is wholly insignificant in comparison with the attendant advantages.

Thoughtless pedestrians sometimes stop suddenly in the direct path of traffic and thereby invite accidents. Perhaps two friends meet unexpectedly, and stand in the highway while they shake hands and exchange greetings,—oblivious of trucks and automobiles. In towns where jitney service prevails it is also common to see prospective passengers step quickly out into the street to see whether the conveyance they want is coming or not. Persons who do this are usually blind to every other car except the one for which they are waiting. Dangers of this kind could be signally reduced by establishing regular stopping places for the jitneys, just as certain of our larger cities do in connection with motor omnibuses.

The illustrations used in connection with the foregoing article were taken for the Detroit Sunday News, during the recent "Safety First Campaign" in Detroit. The accompanying article is copyrighted by the Travelers Insurance Co., and is reproduced by permisssion.

GOGGLES ARE CHEAP—EYES ARE NOT

In grinding work, or in gas welding, the blacksimth who does not protect his eyes is taking a big risk. Industrial records show a steadily increasing number of eye accidents, many of which could be avoided by the use of goggles. According to the tables of percentage of disability recently published by the U. S. Government, the loss of one eye is equal to 30 per cent disability, that means if you lose one eye, you are only 70 per cent the man you were before the accident. It means you are a cripple. Why take a chance? Why not wear goggles? In the blacksmith and gas welding business your eyes are an asset that you must protect. The cost of a pair of goggles is about the lowest protective insurance on earth. In welding they save your eyesight—in grinding they protect you from possible blindness.

The man who fails or is only commonplace, usually uses up about half of his energy explaining the reason to people. The real reason is (whether he tells it or not) that he didn't apply the right principles to warrant success. Don't waste breath in explanations. Go after your own problem and solve it—for there is a solution—and it's up to you to find it.

The Editor Builds a Blacksmith Shop

FROM time to time the Editor receives letters that read, in substance, as follows:

"Can you furnish us with any ideas regarding the proper construction of a blacksmith and woodworking shop?

"We are considering building a new shop in the near future and would like to know the best kind of building to put up."

Of course, being an Editor, he is expected to respond to the request—and does, and although he never built a blacksmith shop he has been sufficiently observant to see wherein the average blacksmith shop lacked the desirable qualities that should be present in such a building. Entirely too many such shops are of ramshackle, wooden construction, which, through years of neglected decrepitude, appear to be on the verge of collapsing around the ears of the occupants of its gloomy and forbidding interior. Besides, such a building removes a great deal of the pleasure of work, is an insurance risk that the most venturesome insurance company will hesitate to take a chance on. As a result the owner is frequently unable to obtain insurance, except at prohibitive prices, and one day awakens to the fact that his building has burned to the ground with its contents.

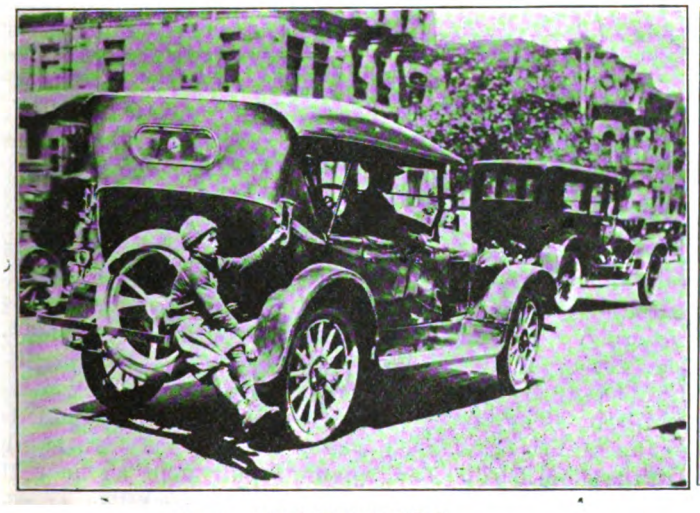
At the outset it should be unnecessary to state that the ideal shop the Editor has in mind should be built of brick, concrete, or hollow tile blocks, or poured concrete, wherever possible. A building of such materials is built to last—a wooden building, almost from the day of its completion, begins to disintegrate, due to the perishable nature of all organic substances, and as it is generally regarded as a waste of time and effort to paint the village blacksmith shop, wooden construc tion, heartlessly exposed to the elements, rapidly gives way and in the course of a few years what was a sturdy and neat appearing structure develops into another of those architectural eyesores that are the disgrace of every town in the land.

Second, the building should be erected with an eye to the future, that is, it should be built sufficiently large, funds permitting, to allow for increased business or the installation of additional machinery without the necessity of an addition to the shop.

Convenience and comfort should be as greatly desired by the workman at his bench as he does amid the comforts of his home. As a rule the shopowner does want those things that add to his efficiency, but either from lack of funds or because the building won't stand altering without caving in on him the changes are never made and he spends his working days ruining his eyesight and his health generally by working in a shop that is insufficiently lighted at all times, never adequately ventilated, usually smelling like a screech owl's nest, and as a rule never comfortably warmed in winter.

Having settled, to your satisfaction, what the new shop is to be built of, whether of wood or more enduring substances, and having decided the size of the shop you can afford to build, give more than passing attention to the matter of lighting the shop. Light is the one thing that every shop needs and which in many shops is too sadly lacking. The general custom is to put in a lot of windows that are entirely too small, both as to width and height. By the use of steel sash, as suggested in the accompanying illustration, and which extend almost from the ground to the roof, not only is a considerable saving in building cost effected but the sides of the building are practically all glass. There are a wide variety of styles and sizes of steel sash on the market to suit every requirement of use and construction. Never lose sight of the fact that you cannot get too much light into your shop. If the light is too strong, window shades will subdue the light, but if you have no light you must spend money for light or either work in more or less complete darkness and ruination of your eyesight.

Don't feel that all the light should come from the sides of the building. If possible, have some of the light enter the building from the top, and for this purpose the glass skylight is provided. Also. it will be observed that small windows are provided, primarily for ventilation, although they will admit a considerable amount of light as well. The illumination of the interior of the shop



F'g. 7. THE FREE RIDE

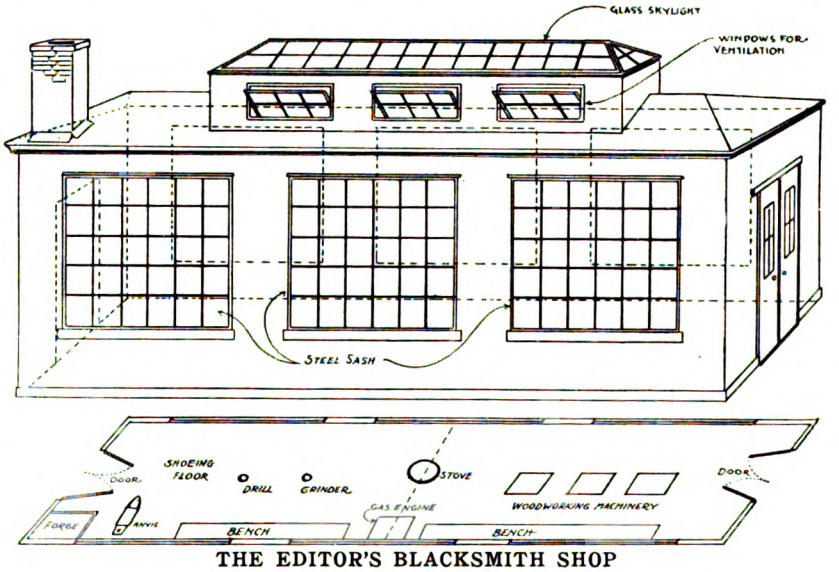
Fig. 8. INVITING A FALL

Fig. 9. UNCERTAIN LITTLE PEDESTRIANS

Fig. 10. THE HORN MEANS NOTHING TO THEM

should be uniform and with the light coming from the top and sides this uniformity is obtained and can be regulated very simply by the use of common roller shades.

It would seem that the roof was an item of minor consideration, but the selection of a proper roof for the shop building is of considerable importance. In the first place a shingle roof should never be used. Shingle roofs require frequent attention and renewal and besides, a stray spark from the forge chimney lodging among dry shingles has dry shingles has been the cause of hundreds of disastrous fires. The best material for a roof covering would obviously be one of the better known and more reliable kinds of prepared roofing. This material is impervious to sparks, is lasting, requires a minimum of attention, and can be applied by almost anyone.



THE EDITOR'S BLACKSMITH SHOP

The floor by no means should be overlooked, and a great deal of unnecessary discomfort and actual physical fatigue are caused directly by the wrong kind of floor. Everything being considered, a wooden floor is best and should be used wherever possible. The best all around floor for such purposes as a blacksmith shop, is creosoted wooden blocks. Such a floor has merits that only too few shop owners are familiar with. The Editor doesn't know the comparative cost of wood blocks against the ordinary wooden floor, but he believes that all things being considered the wooden block floor is the cheapest and most satisfactory flooring material even should the cost be slightly higher.

The arrangement of forges and machinery in all cases must be accommodated to the size of the shop and the peculiarities of the owner; however, these things should be so located that there is plenty of light and that there is sufficient room around each machine to avoid crowding.

If the town has a water supply and sewer system, a hydrant or sink should be provided, and while this is by no means necessary to the proper conduct and operation of the shop, it will nevertheless be quite a convenience.

When you build your shop, and you'll probably never build another one, build the best shop you can possibly afford to build and embody some of the modern ideas of shop construction in it and make it a fit place for you and your men to work in.

CANADIANS ADOPT STANDARD WAGON

Representatives of the wagon manufacturers in Canada agreed to adopt the standard track wagon, as now endorsed by practically every wagon manufacturer in the United States. The Canadian manufacturers, it is reported, will abolish all other measurements not later than January 1st, 1920.

The most radical change is the adoption of a single width of track. The day of wide track and narrow track has passed. All farm wagons and farm trucks are now to be made of one track (auto-track width), viz., 56 ins., from center to center of the standard automobile width.

All wagon beds are to be 38 inches in width and there are to be only two combinations of wheel heights, viz., 40-inch front and 44-inch rear, and 44-inch front and 48-inch rear. All tires on wood wheels are to be oval edge. The standardized wagon will simplify work for the wagon repair man as he will have fewer sizes to stock.

HOW TO GET THE BEST OUT OF YOUR TRUCK TIRES

M. H. George

This is a question which is of in terest to every man owning a truck or company that owns a fleet of trucks. One fellow has it that there are three things that have to do with big tire mileage. I should think that there were more than this, but admit that these three make quite a start toward big mileage. The three things to be considered are; the tire, the road and the driver. Of course the tire must be suited to the work to be done, and this is usually done at the factory. A truck that is to haul heavy material will have solid tires of the right size and one that is to do fast express work will have pneumatic tires of the right size. Roads have a great deal to do with the way tires stand up. Some places where a truck does its work is on good road all the time, while other trucks are at work in all kinds of materials from crushed granite and sharp cinders to mud and sand.

The driver has more to do with tire mileage than one would think at first. If the roads are in bad shape and full of ruts and rough, the driver should go slowly over these places and wait until he comes to a smooth place before he tries to make time. In starting with a heavy load he should try to start easily and without slipping his wheels, and if he gets into a soft place and sees he cannot get out alone, he should not keep trying and spinning the wheels, as this will cut tires badly if there are any sharp pieces of stone around. The driver should see that his truck is not overloaded and should drive carefully and not exceed the speed the manufacturer recommends. Car tracks do a great deal of damage to truck tires and if there are cuts in the tires they should be attended to.

Overloading is a thing that a truck has to contend with a great deal, and this same overloading causes a great deal of trouble even with solid tires. A man that owns a five passenger touring car would howl loudly if he were asked to carry ten people and do it at the same speed that he would carry the five, but this is what happens to the truck. A man will buy a ton truck and in a short time you will see him with two tons aboard and going as fast as the truck will go. In a short time he will be in to tell the salesman that the tires that came on the truck are no good and that he is going to try another make. One of the bad features of overloading is that it makes the tire weak. Any tire is going to get cuts on its surface, and with the common load these will not cause much trouble, but with an overload they will stretch and tear and will soon spread until the tire is ruined. It seems that the base of a solid tire is hard, that is harder than the tread, and overloading will cause this base to split and you will see a small crack appear. As the overloading is continued this small crack grows larger and finally a large piece will split off from the tire. All this tends to make the operating costs higher.

Did you ever stop to think that speeding a truck is just the same as running over a very rough road? It is much the same, as it makes the bumps appear just so much larger. If the truck is driven as near the speed recommended as it can be, the tires will take care of the shocks, but if you go twice as fast the shock will be four times as great as it was at the recommended speed. If you are a truck driver you will notice that there is a speed at which the truck seems to go very smoothly, even if the road is quite rough, this is the speed the truck should be driven at.

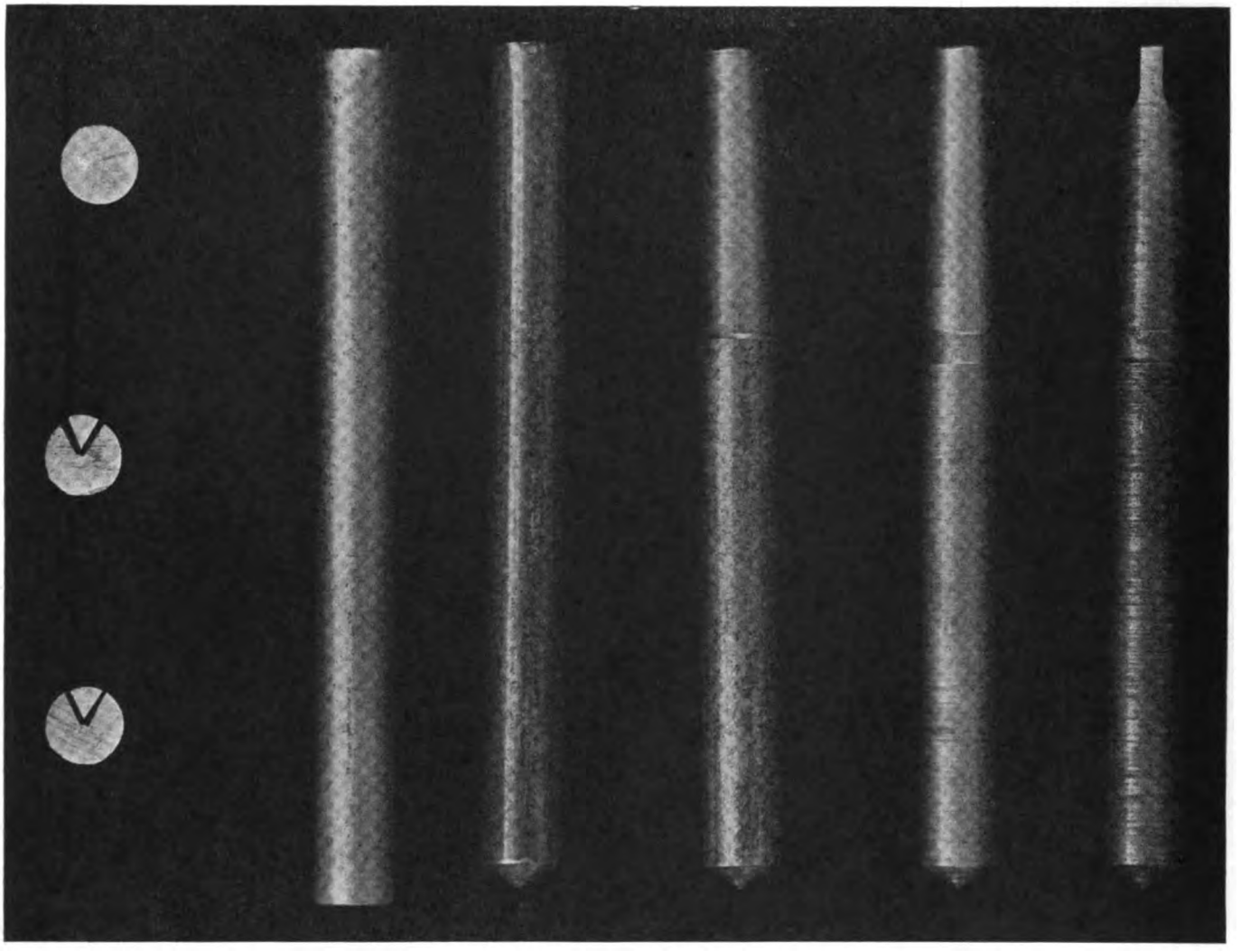
A habit that many city truck drivers indulge in is driving on the car tracks. You may be sure that the owner driver does not do this, or if he does he does not know the damage he is doing. After driving this way for a number of weeks the driver should look at his tires and see what is happening. You will find that instead of a four-inch or a three-inch tire, you will have a three-inch or a two-inch tire. When the tires get ground down this way, it is just as bad as overloading and tires soon show the effects of overloading. I have spoken of rough roads and bad cuts. These kind of go together. On bad roads you will get more or less cuts, even with careful driving, but these cuts should be taken care of. When a cut appears near the edge of the tire it will develop into a large crack and if left to itself will tear off and make a bad looking place. When these places appear near the edge they should be trimmed off smoothly. In driving on the roads and you come to a very rough stretch your speed should be reduced and the rough place taken slowly. By following this practice you will find the tires will look much better and wear longer.

We have all seen tires on touring cars with the tread worn off. I am speaking of the front tires. Nine times out of ten it will be

Fig. 12. WHY GOSSIP IN THE MIDDLE OF THE STREET?

Fig. 11. DREAMING, INSTEAD OF WATCHING THE TRAFFIC

PRINCIPAL MANUFACTURING OPERATIONS ON A ONE INCH TAPER SHANK DRILL—



The above discs are cut from a bar of steel as received from the mill. The small segment is polished and etched for the purpose of microscopic examination. The remainder of the disc is hardened, broken in two pieces and the fracture examined under the microscope. If this does not show satisfactory structure the steel is rejected.

Operation No. 1—The stock bar after being annealed, is cut into drill blanks of the proper length, ready for the manufacturing operations.

Operations 2 and 3—Consist of centering the blank at one end and pointing it at the other in preparation for the various machine operations . This preliminary work is followed by another inspection.

Operations 4 and 5—At one end of the blank a taper shank is turned and chamfered.

Operations 6 and 7—The barrel is turned and the recess added between the barrel and the shank. Another inspection follows this work.

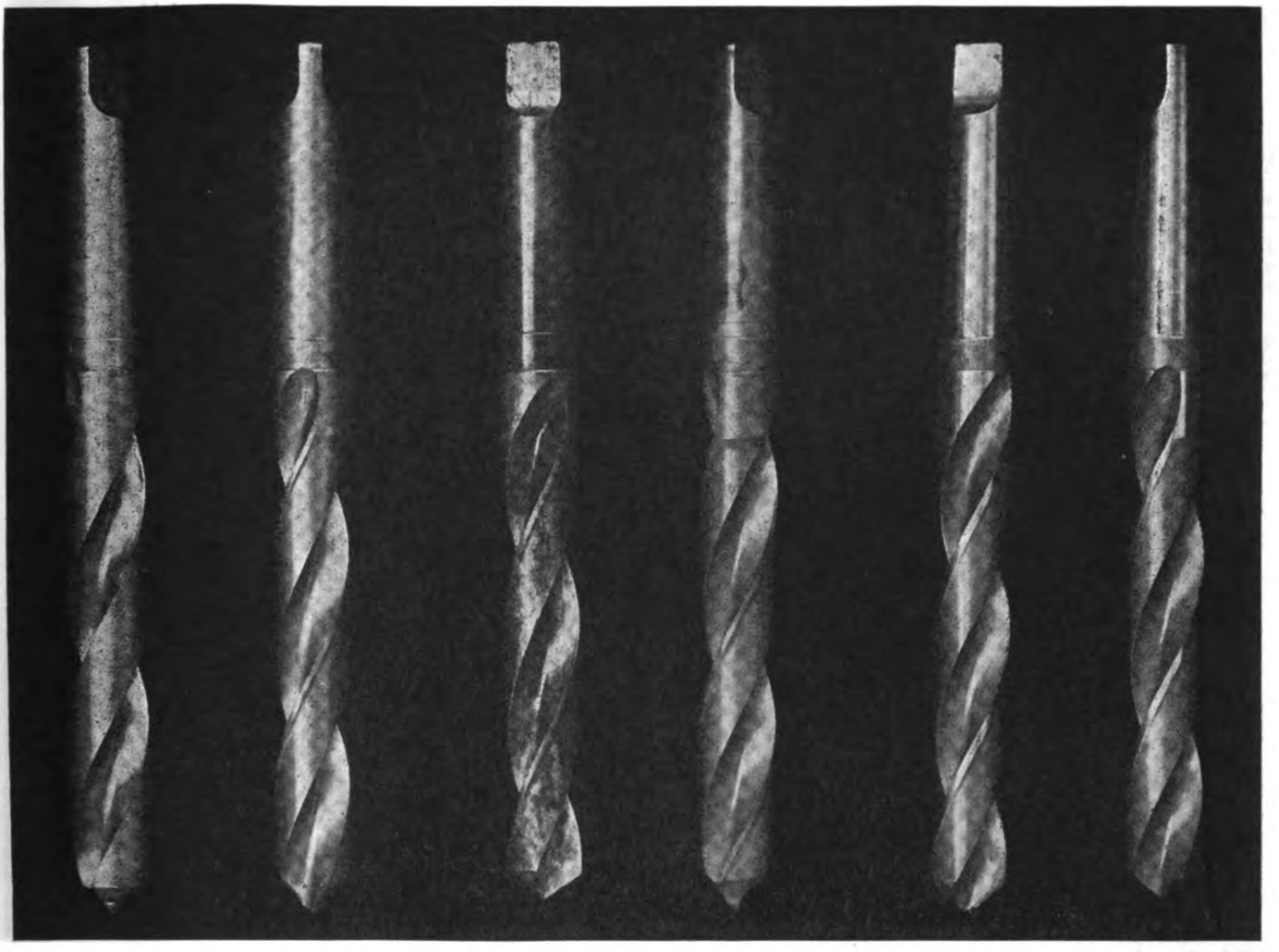
found to be caused by the tie-rod being ben or not of the right length, or a wheel or the steering knuckle may have been bent sometime. As soon as a tire shows wear of this kind measurements should be taken to see that the wheels line up as they should. I do not think there is anything that will wear tires as quickly as this trouble and it should be remedied as soon as discovered. Another thing that gets truck tires is non-skid devices. There are many different makes on the market and they are all the best according to the advertisements. But I will say from my own experience that a kind that is not hitched solid to the wheel is the best in one way, that is, it will not damage the tire. There is no doubt but that a fixed chain or block will hold in the mud and snow better than a loose chain, but the solid block or chain brings a small surface for the load to rest on and this soon cuts the tire badly. All of these things tend to bring the cost of operating a truck up when every truck owner is trying to keep the cost down . A truck driver should be able to tell what is easy on his truck and load with this in view. On short hauls where the road surface is smooth large loads can be carried safely and without much damage to truck or tires, but where one has a long haul over all kinds of roads the loads should be about the capacity of the truck and not go at touring car speed. If these few suggestions are followed the cost of truck operation will be lowered considerably.

FINISHING SPRING LEAVES

In finishing off a leaf spring that has been welded care should be taken always to grind off the weld lengthwise and not crosswise. When the spring is hardened and tempered, it takes very litle inducement in the shape of a crosswise scratch or fine groove, such as the wheel leaves on the surface, to cause the spring to break off short at the crack. Grind lengthwise and evenly, curving the spring against the stone.

Be willing to be patient and to wait for results. Be willing to make every move necessary to bring about or hasten those results.

Illustrations by courtesy of Cleveland Twist Drill Co.



Operations 8 and 9—The shank is milled to provide the tang. The name, number and trade mark are stamped on the recess. Following this the tool is again inspected.

Operation No. 10—The flutes are now milled in the body part, and the tool is carefully examined under a microscope for defects that may have appeared during this operation.

Operations 11 and 12—After it has been given body clearance in another set of milling machines the tool is calipered and inspected from end to end and the point is roughtly cleared.

Operations 13, 14 and 15—The drill is hardened and tempered. This is perhaps the most important operation in the production of a high class drill, the value of which depends so largely upon the scientific knowledge and accuracy brought to this work. The burrs left by the milling cutters are next removed, after the tool is straigtened and again inspected.

Operation No. 16—The barrel is now put through a cleaning and finishing process to dicate the discoloration caused by the hardening and tempering solutions.

Operation No. 17—Consists of grinding the drill accurately, body and shank. In this operation the drill is given longitudinal clearance, in other words, it decreases in diameter from the point towards the shank by an amount varying from .0001 to .0015 per inch of length of the fluted part.

Operations 18 and 19—The point is ground and finished ready for actual service. The tool is covered with a thin film of oil to preserve from rust. It then undergoes a final inspection and testing. The finished drill is wrapped, labeled and put into the stock bins from which orders are filled.

PROTECT YOURSELF

By regular habits of right living and moderation in all things.

By dressing according to the weather, and by taking a sufficient amount of outdoor exercise.

By protecting your property by adequate fire insurance based on present values.

By automobile or other insurance of whatever type you need in order to prevent sudden loss from unexpected disaster.

By carrying accident and life insurance to protect yourself and those dependent upon you.

By never laying yourself open to the charge of whining, for people are always ready to give the whiner a swift kick.

By being broad-minded enough to be able to get the other fellow's point of view, and to recognize what is good and worthy in it.

By being willing to learn more all the time, but never acting as though you were the sum of all wisdom.

By suitable persistent and consistent advertising in order to keep yourself in the public mind and on the map.

By making your business and your service a little better than that of anybody else, so that you are sure of a profitable and permanent following.

By going after the unattached business in your territory.

By keeping your credit good.

By guarding your reputation zealously from all tarnish.

By being so thoroughly alert that you never get into ruts.

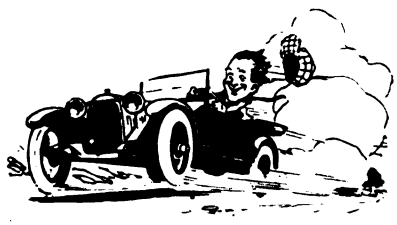
By taking nothing for granted, by actually knowing facts before you act.

By association with people of unimpeachable charcter.

By spending less than you can.

In dealing with a small screw that refuses to yield to the efforts of a screw driver, try holding a hot soldering iron against the head. This will often do the trick by loosening the rust between the metal surfaces. Heating a screw driver head as mentioned and then soaking it with kerosene will bring out practically any screw.

High Spots



Though he does nothing but be around and yawn forty times an hour, many a man does his hardest day's work on Sunday.

A whole lot of married couples are as perfectly mated as a 13 collar and a 16 shirt.

A wise wife does not insist on having her own way. She merely has it and lets it go at that.

It makes a man mad to have to wait on his wife when he is going to take her to a show. But he doesn't care how long it takes her to get ready if he is going to take her to church.

Fat folks are usually good-natured—unless you happen to be married to one of them.

A small boy feels as miserably when he is dressed up as a small girl does if she isn't dressed up.

If a girl believes all that you tell her the betting is that she is under 10 years of age.

There was a time when the younger sisters in a family had to wait until the oldest sister got married before they could cop out a prize. But nowadays it is a case of catch-as-catch-can.

After a man has been over the jumps for about 60 years he never thanks any one in advance for their assistance.

The family tree is merely made up of chips of the old block'

The man who is clothed with authority should see that it fits.

Even the advertising expert must admit that all that glitters isn't sold.

The fact that talk is cheap is perhaps what makes it so expensive in the end.

The man who neglects to tip the waiter is apt to pay for it in indigestion.

Don't count your chickens before they are hatched and you won't have to eat crow.

It is the way of humanity to take a man's word with a grain of salt, and swallow his obituary unseasoned.

Just because it's hard to keep a good man down, don't jump to the conclusion that it is hard to boost a bad man up.

The pen is mightier than the sword, but does might make write?

It is just as well to remember that the hand of fate is usually clenched.

You never can tell. Many a bride is gifted without getting a lot of wedding presents.

Ask a doctor the difference between theory and practice and he will point to his income.

About the only time many a fellow gets a gait on is when he starts to run through a fortune.

When an actress has a quarrel with her manager she generally has an understudy to take her part.

Even the people who have money to burn hate to spend it for coal

You never can tell. Even the prohibitionists might squeal to find themselves in hot water.

It's a lucky strike if you can get a light from the modern safety match.

A thirst for knowledge can be quenched cheaper than any other kind.

An expression that is bound to become immortal is "Them was the happy days."

About the only similarity between a plunger and a sponge is that they rhyme.

Many a man has stubbed his toe running to meet trouble.

The surest way to keep the wolf from the door is to dispense with the door.

A man naturally has his suspicion about a woman who isn't afraid of a mouse.

The girl who puts powder on her face takes reckless chances about meeting her match.

It's all right to plan ahead, but success never comes to the man who is always going to do it tomorrow.

The principal difference between luck and pluck depends upon whether it belongs to us or to our neighbors.

Also where ignorance isn't bliss, 'tis folly to be unwise.

The hardest thing in the world to beat is your way through life.

Unfortunately, elocution merely teaches us how to speak, not when.

Time and tide wait for no man, but the race is not always to the swift.

Experience is the best teacher. No man is ever quite so conceited after he has attended his own wedding.

The pugilist may be as quick as lightning, but that doesn't prove he never strikes twice in the same place.

Vision is governed by distance, notwithstanding which the closer we get to some people the smaller they seem.

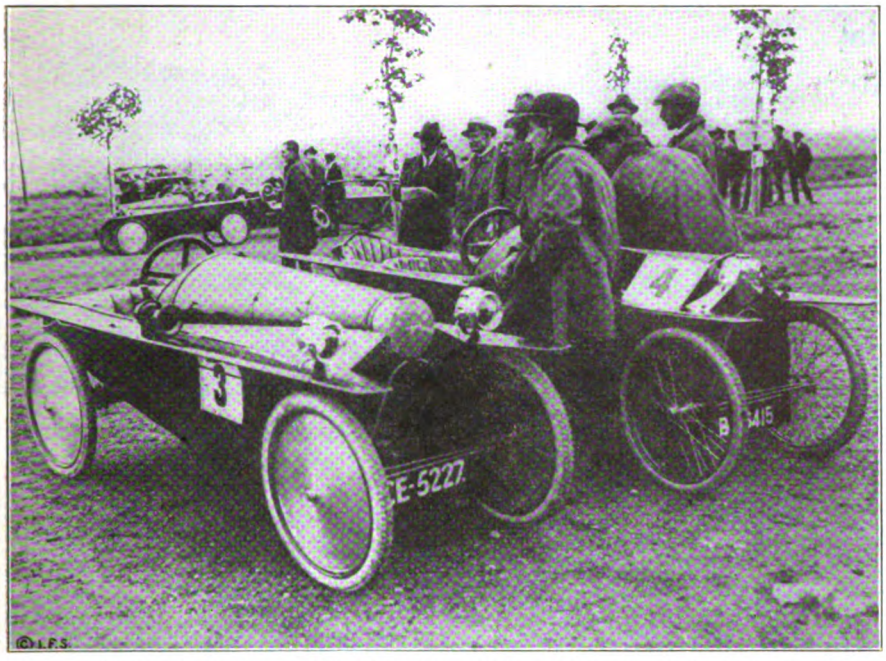
The real definition of an average man is the fellow who is just about as good as he is bad.

The war has upset many time-honored traditions, among them that of the "deadly cigarette."

Heaven will undoubtedly be full of surprises consisting principally of mutual amazement at seeing each other there.

Camouflage is a comparatively new custom, in spite of the fact that the devil has been addicted to it ever since the world was young.

Light Cars the Favored in England



THE LIGHTER THE CAR THE BETTER THEY LIKE IT IN ENGLAND. THE PHOTOGRAPH MADE AT BRANSHOTT, SHOWS A NUMBER OF THE LIGHT, FREAKISH THINGS THAT WERE TESTED OUT UNDER THE SUPERVISION OF GEN. NIXON AND COL. CHARLES

What Mob Rule Means

THE DISREGARD OF THE MOB SPIRIT FOR LAW AND ORDER IS RATHER NEATLY TYPIFIED BY THIS TWISTED PILE OF JUNK WHICH WAS ONCE A POLICE PATROL OF THE OMAHA POLICE DEPARTMENT

If anything should happen that an airship with an anchor dragging from its tail should pass by where you are, and the anchor should neatly hook under your collar and bear you away to parts unknown, could your family or executors close up your business affairs with ease and dispatch, or would they be in an everlasting tangle?

Benton's Recipes

Frosting Glass—A good frosting for glass that imitates ground glass quite well is made up of the following: Sandarac 18 parts, mastic 4 parts, benzol 40 parts and ether 200 parts. Clean glass thoroughly before and apply by pouring the mixture on the glass and flowing evenly.

To Finish wooden handles, gun stocks and similar articles of wood and at the same time to preserve them, soak the articles in linsed oil for a week or so and then give them an occasional rubbing at intervals of a day or two until the desired polish is obtained. This preserves the wood and gives a natural finish that many consider greatly superior to the udual artificial finishes and colorings.

Filling for Blow Holes in Cast Iron.—One part red lead, and 1½ part litharge. Mix with glycerine to consistency desired.

To Prevent Scale in Hardening Fine Dies.—It is possible to prevent the formation of any scale in the impression of fine jewelers' dies and the like, and retain the finished brilliancy of surface, by applying a mixture of powdered ivory black and sperm oil, mixed to the consistency of paste. It is only necessary to apply a thin coat.

Finishing Holes.—A good and easy way of finishing holes of any diameter is to first drill or bore from one- to ten-thousandths under the required size. Now turn up a steel mandrel and taper one end, rounding the corner at the other end to prevent swelling. This should be case-hardened and highly polished. Press or hammer the mandrel through the hole, and a straight, highly burnished hole will be the result, similar to the finish given by wear. Do not use this method on light castings ,or they may crack. If a running fit is required for a shaft or spindle, the mandrel must be slightly larger than the shaft. A mandrel like this will make a good job of expanding short lengths of tubing to any desired size, leaving a finished hole, superior to that produced by drilling or boring.

Acid Pickling for Forgings.—To remove scale from drop-forgings which have to be machined, dip in a pickle composed of hot water 24 parts, sulphuric acid 1 pint.

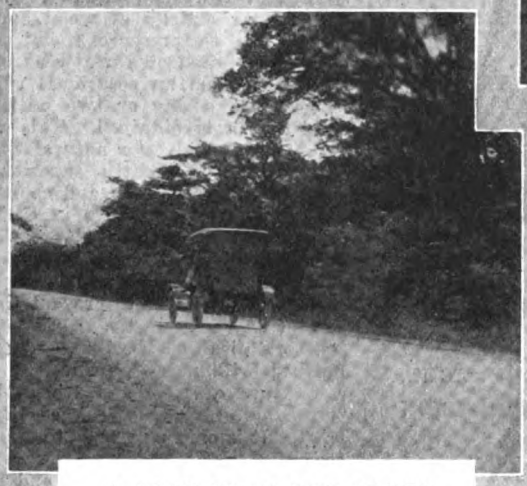
STEADY RESTING A KEY SHAFT

This kink will be found handy to those mechanics who are called on to do lathe work. It is simple yet valuable to know, for it saves time and makes the task of steadying a key-way shaft easier while working on it.

The section of the shaft key way where it revolves in the rest is filled with babbitt metal hammered in and scraped to the circumference, as shown. This permits the shaft to revolve smoothly in the fingers of the steady rest.

South America's material growth and prosperity are being rapidly developed by good roads and automobiles.

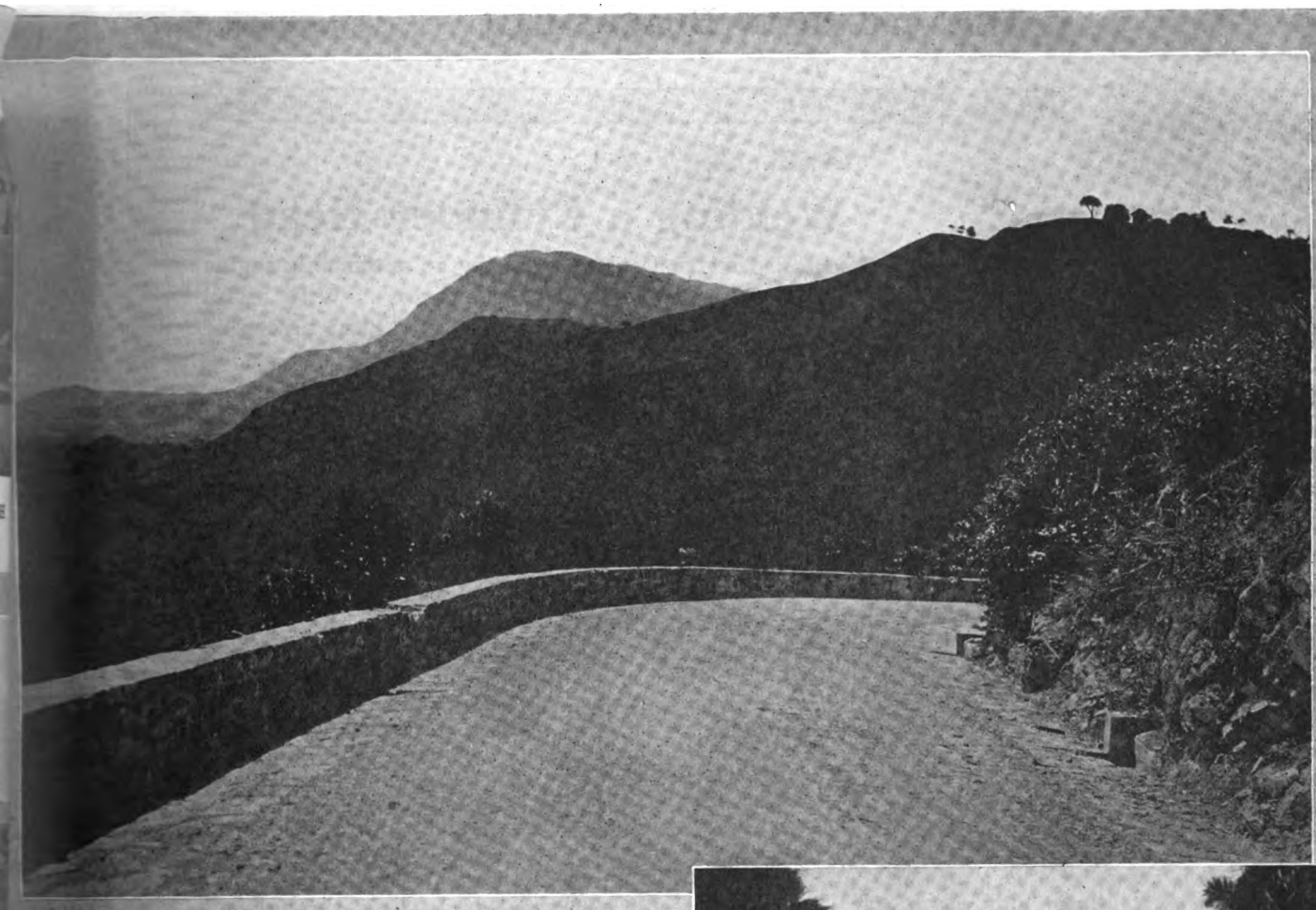
THE MOTOR TRUCK MAKES ITS ADVENT IN SOUTH AMERICA



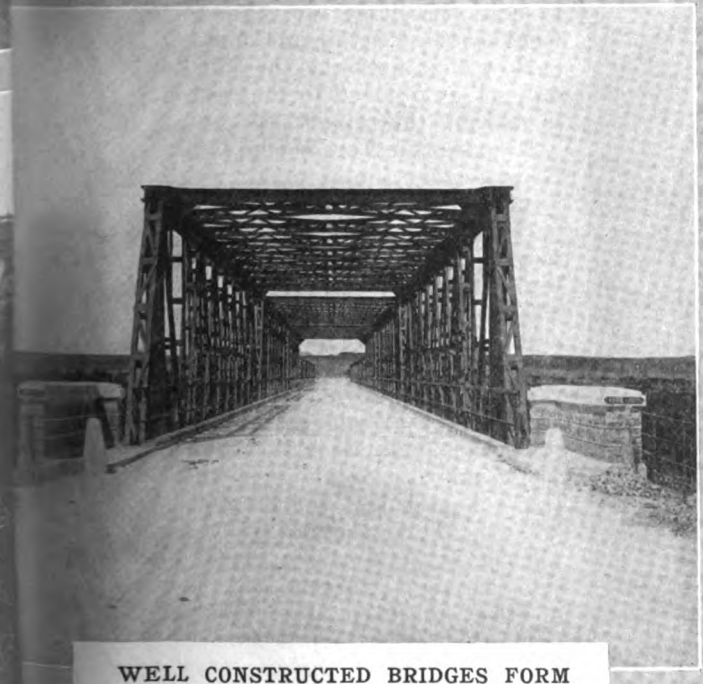
A ROAD NEAR SAN CRISTOBAL, DOMINICAN REPUBLIC

A GOOD ROAD NEAR MENDOZA, ARGENTINA

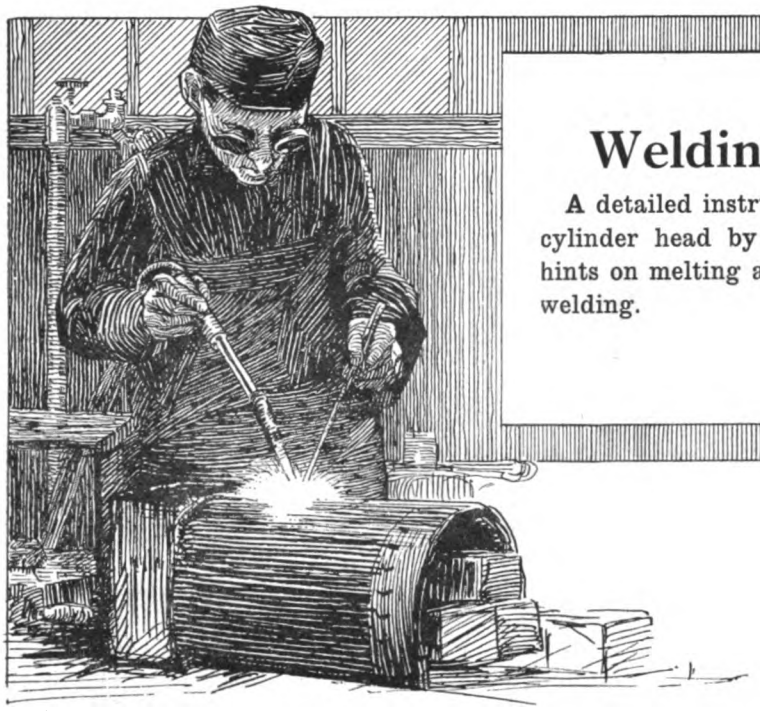
AN EXCELLENT ROAD IN URUGUAY



PICTURESQUE ROADS IN THE ISLAND OF CUBA



WELL CONSTRUCTED BRIDGES FORM PART OF THE SPLENDID URUGUAYAN ROAD SYSTEM



Welding a Cylinder Head

A detailed instruction for repairing an automobile engine cylinder head by the oxyacetylene process. With useful hints on melting and fusing cast iron during the process of welding.

—David Baxter.

NEXT to the crank case, the cylinder head of an automobile engine seems to be the worst about getting broken. And the blacksmith who owns or operates an oxyacetylene welding plant will undoubtedly be called upon to try his hand at repairing one sooner or later. The smithy who is not a torch operator would be forced to turn this profitable piece of work away, because, aside from soldering, which is but a makeshift repair and not to be recommended for this class of work, welding is the only method of repairing a broken cylinder head. And since this method is becoming more into use every day it behooves the up-to-date blacksmith to install a welder and learn to operate it.

To anticipate that time when a cracked cylinder head will enter your shop a set of instructions by which the repair may be made is herein outlined. To illustrate this the case of a common head broken in the usual manner is taken. A few are broken a great deal worse, many are not so badly fractured. The process, however, is much the same in all instances. Of course some of the instructions given are not arbitrary, but may be varied a little to suit the individual or his shop conditions. This is immaterial so long as the fundamental principles of welding are obeyed.

If the smith is a beginner he may do the work according to this prescription with assurance of success. If he is fairly experienced he may find much that will help him to a better understanding of the method. And should the reader be an expert, there is still hope that he may learn some new kink, some different way of doing part of the welding from that he was accoustomed to.

Let us take this cylinder head from the time it arrived at the

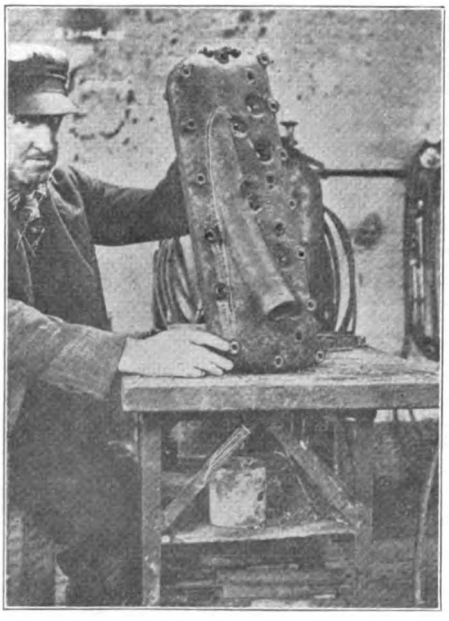


Fig. 1. LOCATION AND EXTENT OF FRACTURE

welding shop and follow it through to completion.

The Job.—In Figure 1 is shown the cylinder head and what is to be done to it. This picture shows quite clearly the extent and nature of the fracture. Notice that the crack extends along one side of a row of bolt holes, ending in an abrupt curve through two bolt holes on the other side. The metal thickness in the crack runs about three sixteenths of an inch, which is comparatively light for an easy cast iron weld. Which is to say that it is more difficult to weld cast iron of this thickness than if it were three eights or a half inch, on account of the tendency of cast iron welds to leak through pin holes that form in the added metal. Also, there is more danger of burning holes through the thin section, especially if a novice is handling the torch. Care must be taken not to hold the flame too close to the weld or too long in one spot.

Now that we have the job lined out, let us proceed to the first step in making the repair.

Preparation For Welding. — Nearly every job of repair welding requires a certain amount of preparation, both to facilitate the work and to insure a successful weld. In this case it consisted of cleaning and grooving the fracture, and preheating the casting. First, the crack was cut away on both sides until it formed a V groove about twice as wide at the top as the metal thickness in that vicinity; say a quarter of an inch wide at the top, and just touching at the bottom. This grooving was accomplished with a sharp chisel and light hammer; there being danger of breaking the casting had a heavy hammer been used. A square file is slower but probably safer on jobs like this for making the groove. Or a portable grinder may be the best of all.

Each end of the crack was sloped gradually to the surface. In other words, the groove did not end

abruptly but slanted easily to the level of the casting. This was for the purpose of insuring good welds at the ends of the crack; to weld past the end prevents an unwelded hidden part of the crack.

To protect the bolt holes a plug of graphite and fire clay was pressed in each one through which the crack passed. These plugs saved considerable machining after the weld was finished.

The Preheater.—In Fig. 2 is shown the arrangement for heating the job previous to welding. This device consists of an oven like structure of fire bricks loosely walled, with cracks between bricks to admit air for the fire. An aperture was left for inserting a gas burner to furnish the heat. The oven was built upon a brick top welding table to make the welding more easier. A casting of this sort is much more conveniently welded upon a table although it may be just as successfully upon the floor. And a fire brick oven is often hotter than a metal furnace for the reason that it may be shaped to conform to the irregularities of the casting. A covering of sheet metal may be placed on top, or, as was used in this instance, several sheets of asbestos paper may be spread over the top of the oven to confine the heat to the job and to afford some protection to the torch operator.

Fig. 2. PREHEATING ARRANGEMENT

Preheating The Job.—The second step in the repairing of this cylinder head consisted of heating the casting previous to applying the welding flame. First, the head was placed inside the brick oven with a brick-bat under each end of it. These pieces of brick raised the casting up from the table enough to permit the gas flame to envelop the bottom and sides of it, thus insuring an even heat in all parts.

When sure that heat would spread over all the cylinder head the gas was lighted and caused to burn slowly for several moments after the asbestos paper covering was in place. The reason for not turning the preheating gas on full force at the start was to cause the expansion to start slowly. When reasonably certain that expansion was reacting in all parts of the casting the gas pressure was increased until the job was red hot all over. The heat was ascertained by peeping under the asbestos. The darkened interior of the oven made the color of the heat readily perceptible.

A few words to the novice on the reasons for preheating may not be out of place here: All metal expands, or it might be said, enlarges upon being heated and contracts or shrinks to normal upon cooling. Now if the heat is concentrated and applied to one part of a casting this part alone will expand while the cold part does not. When the heated portion expands it must push away the other part or else warp up or down, in or out, or crush within itself, according to which offers the least resistance. The result is a fracture or at least a distortion. Now, when the heated part cools and shrinks it will tend to pull away from the cold part, resulting in an open crack providing the cold portion may not be pulled inward by the contraction. On the other hand, suppose the whole casting is preheated evenly throughout. The whole thing expands at once and contracts the same. It is obvious that there is little chance for one part to pull away from another. There are many other scientific and technical explanations connected with expansion and contraction, and there are many variations, controlling circumstances, conditions, etc., which govern its actions, but the short explanation just given should furnish a basis for estimating the effect on such jobs as cylinder heads.

Fig. 3. THE FINISHED JOB

The whole thing in a nut shell is that the reason for heating a cylinder head previous to welding it to circumvent the effects of expansion and contraction.

Welding.—To revert again to our particular cylinder head: When the casting was red hot the torch was lighted from the heat of the casting and the welding flame regulated to a standard neutral position. The operator endeavored to maintain the standard neutral flame throughout the entire process. It was sometimes necessary to increase or decrease one of the welding gases while welding due to several causes. Some of which are; the overheating of the torch tip, irregularities in the flow of gas, slight leakage in the line, worn valves, etc. These things and others cause a careful welder to keep a constant watch over the flame to see that it remains neutral at all times.

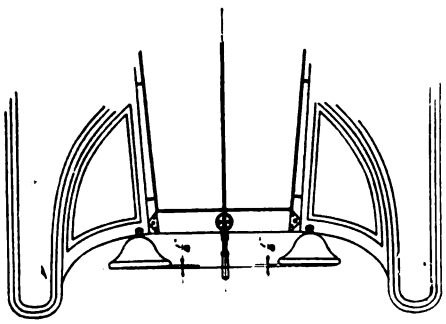
When the flame was perfect the operator employed a filler rod to open a hole through the asbestos paper directly over one end of the fracture in the cylinder head. This aperture was just wide enough to admit the welding tip and filler rod. Through it the welding was commenced as it progressed the paper was torn away along the line of the fracture.

A number five tip was employed which is about medium size for the average torch. The filler rod was three-sixteenth inch round cast iron. Powdered borax was used for flux to make the metal melt and fuse easier and also to cut and float the slag or dross which is usually present in any cast weld.

The flame was brought in close contact with the end of the weld until the bottom of the groove

started to melt then it was revolved in tiny circles over this section. In the meantime about half an inch of the filler rod was brought to a melting condition by holding it near the welding flame. As soon as the first inch or thereabouts of the groove was melted and flowed together the melting rod was dipped into it. The flame played over both as this was done. Care was taken to see that both sides of the groove as well as the bottom were in a melting state before the filler rod was added. The rod was given a twisting motion as it was introduced. This twisting movement was to help knit the weld also, to bring bits of slag to the surface and was maintained throughout the whole welding, al though the operator had to be careful not to push the bottom out of the weld while doing the twisting he endeavored to get the weld only hot enough to fuse as there was much danger of melting a hole through the cylinder head or blowing it through with the pressure of the flame. When the weld showed signs of being wild, or too fluid, he merely drew the torch back and waited a moment for the spot to cool.

The filler rod was continually twisted in the weld except when applying the flux powder. In which

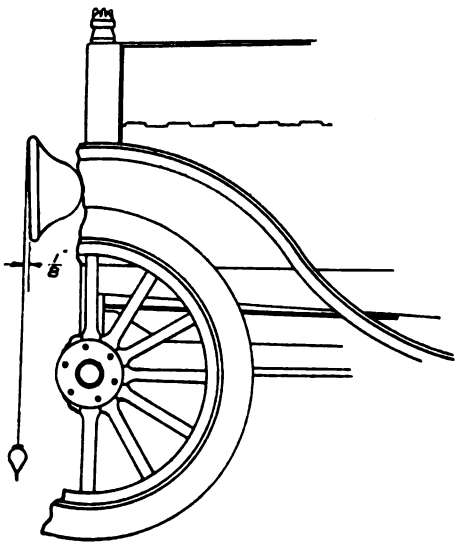


PROPER ADJUSTMENT FOR WIDTH

event it was dipped red hot in the flux and quickly returned to the weld, the powder adhering in sufficient quantities to clean about half an inch of the weld.

The first inch was melted full with a slight surplus piled on top. This extra metal was carefully sloped on each side to join the casting with a feather edge. The juncture being fused by melting both the surplus and the metal beneath it. In effect the filler metal was caused to sink into the casting. This sort of welding is accomplished by manipulation of the torch alone. It is turned first diagonally, then vertically, then diagonally again until the metal is blown into the desired shape.

After the first end of the weld was completed each succeeding inch was treated in a like manner



CORRECT ADJUSTMENT FOR HEIGHT

for the full length of the groove. This does not mean that the weld was a series of short meltings, for each inch was securely knitted to the preceding one as well as to the sides of the groove. In fact the groove, filler, and the rest of the casting were one piece when the weld was finished.

At no time during the welding was the asbestos entirely removed from the preheater; the whole weld was accomplished through a slot in it. The weld might have been started as well at one end as the other since both ends of the fracture were surrounded by solid metal. It was merely a matter of convenience to the welder.

Cooling—When the last inch of the weld had been smoothed together with a painting motion of the flame, the slot in the asbestos was covered and the job allowed to re-heat several minutes before the preheating gas, which had been burning during the whole process, was turned out. This last several minutes of heating is for the purpose of evening up any expansion that might have been lost during the welding. If the casting starts to cool all at one time and no cold air is permitted to strike any part of it, it is pretty apt to contract evenly and come out of the preheater with no cracks, which often occur if the opposite is true. This cylinder head was allowed to remain in the oven until it would no longer hurt the naked hand. Which was probably an extreme measure since the job is usually safe when it will no longer fry a drop of water near the center. However the welder should be cautious how he tests the job with water, because he may crack it thus.

Finishing The Job—The welded head is shown in Fig. 3. But little grinding was necessary since the surplus metal had been "painted" smooth with the flame during the welding. A few high spots were ground off with an emery wheel. Then the whole casting was given a coat of paint its original color.

This painting is of doubtful value, however, for the simple reason that the customer is apt to be suspicious of the paint: he thinks it covers some defect in the weld. And perhaps a good many times he is right. Some welders would not bother with the paint if they didn't want to cover up something.

A weld that has been well finished while hot shows just what it is and is more likely to impart a satisfied feeling. Which always results in a lot of free advertising to the welding shop. The customer will talk and it is better to have him talk the right way. If the job must be painted, wait till after the customer sees it if possible.

FORD HEAD LAMPS

Headlights on any automobile to give satisfactory service should combine the following features: 1—sufficient light to illuminate the road for such a distance that the driver will have ample time to stop before reaching an object. 2—The illumination should extend to the side of the road near the car so that objects not in the path of the headlights may be seen as the car approaches them. 3 — Necessary penetratve powers in dust or fog.

In order to obtain these conditions, the lamps must be evenly spaced from the radiator and point toward each other and the ground. When holding a plumb line at the top of the door of the lamp, the lower part of the door should be 1/8 inch from the line. When holding a line on the outer edges of the doors, the inner edges of the lamps should be 1/8 inch from the line.

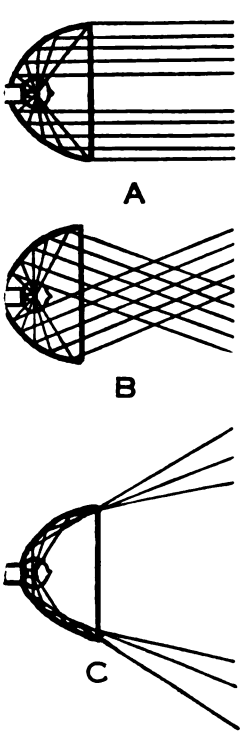
The lamps may be brought to this position by bending the lamp brackets, using for the purpose a bending iron or large wrench.

The lamps must also be properly focused and this is accomplished

by turning the screw in the back of the lamp housing just above the wire plug hole to either right or left. This adjustment is a matter of taste and driving conditions.

The illustration shows the distribution of light when the lamp is in focus, the light rays being projected in approximately parallel rays. This concentration of light produces a strong, far reaching beam of several thousand candlepower and provides adequate road illumination and also supplies enough stray light to distinguish objects near the side of the road. If the lamps are so moved that the filament is in front of the focus as shown at B the light is projecteo in the form of converging rays. Similarly if the filament is back of focus, the light rays are divergent and the broad distribution results as shown at C. Neither of these latter settings of the lamp provide satisfactory illumination. Proper reflecting equipment is also essential. The parabolic type of reflectors gather the light from the lamp and assists in projecting it in nearly parallel rays.

There is a wide variation in the voltage at which lamps operate, regardless of whether connected directly to the magneto or taking current from the generator or from the storage battery. This variation is due in the first instance to the speed at which the motor is running and in the second case to whether or not the battery is completely charged or partly run down. It is accordingly necessary to use a lamp which will give sufficient light when the motor is running slowly or the battery partly discharged, and that will not burn out when the motor is operating at high speed or battery fully charged.

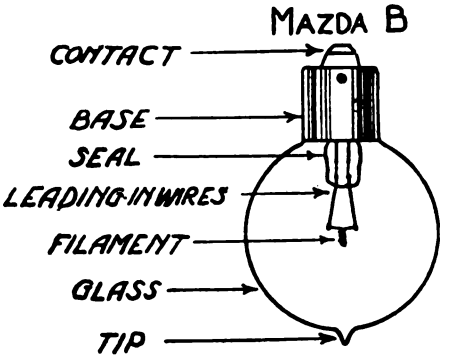


EFFECT OF IMPROPER ADJUSTMENT

Mazda B (vacuum) lamps made in what is know as the G-12 bulb have been adopted as standard equipment on the Model T Ford. In order to destroy the last trace of air which may remain in the bulb of the vacuum lamp to reduce the possibility of the bulb blackening a substance called the "getter" is introduced. This "getter"acts upon the substance which tends to blacken the bulb, decomposing it so as to make it colorless. The filament in Mazda B lamps, shown in the illustration, is wound in the form of a double helix and at present is made of tungsten which is capable of withstanding the vibration both when cold and when heated. There is very little in headlamps to get out of order except the bulb and they do not require any attention unless they meet with an accident or burn out. In all such cases replacement of the bulb is all that is required.

RUBBER PRESERVATIVE

A saturated solution of turpentine in alcohol makes an effective preservative for rubber when a drop of undissolved turpentine remains suspended in the alcohol and a little more of the spirit should be added to dissolve the turpentine. Rubber articles should be painted with this solution occasionally.



MAZDA B LAMP FOR FORD HEADLIGHT

Getting the Motorist's Money

FRANK FARRINGTON

THE average blacksmith gets but little of the money spent on automobile repairs. This is not because he cannot and does not do kinds of work the motorist wants done at times, but because the motorist does not think of going to the blacksmith. To the motorist the blacksmith is nothing but a horse-shoer.

The time is ripe now for going after some of the money of the automobile owners. The garages are in many towns completely swamped with work. There is hardly anywhere a garage that has not more work than it can do and this means long waits and in some cases hurried and unsatisfactory jobs.

What kinds of work do you do that are of interest to the automobile owner. Sit down when you get a chance and think that over carefully and make a little list of the jobs you can do that motorists sometimes want done.

You may be a useful man in this field and as you gain experience with cars, you will be able to increase the kinds of work you can do on them. You may start in with little more than welding and such heavier types of job and end by adjusting carbureturs.

Of course you know how to do the kinds of work that go with your own trade, but don't stop there. Get a good book about the gasoline engine and study it carefully. Learn one new kind of job at a time and learn to do it well. There may be no one in your city who can be depended upon to do a good job of soldering a radiator. Why not specialize on radiators? Get the tools to handle them and become the best man in town on that work. Just as soon as you are competent, announce the fact. Go to the garage people who do not pretend to do any radiator soldering themselves and tell them that you are equipped to do that job and do it right.

Hang out a little sign by the door "Automobile Radiator Expert". Don't be afraid to advertise your ability and to pose as an expert in certain lines. If you are too modest you will never be heard of.

In the same way you can specialize on work on springs. They are right in your line. Of course everyone knows that a welded spring is not like a new spring, but everyone knows that it may take weeks or even months to get a new spring. (The writer has had a new spring for his car ordered for three months at this writing and no signs yet of getting it). Most motorists, if the suggestion is made to them, will jump at the chance of

getting a spring repaired so the car can be used while waiting for a new spring. If you have an assortment of extra spring leaves, and many blacksmiths already have something of that sort in discarded wagon springs, you may be able to fix a spring by replacing a broken leaf with a substitute leaf that will hold satisfactorily, for a while, though a better quality of steel is required for automobile springs.

Many motorists have some extra leaves in their garages and one of these may be made to fit. The other day a man with a broken spring was confronted with the possibility of being minus his car at a time when it was very much needed. The garage people couldn't help him out. He dug into a pile of discarded parts in his own garage and found a spring leaf from another car he had once owned. He found too, a leaf from a wagon spring. He tried to get the garage man to fix up a makeshift spring for him, but nothing doing. He took the outfit to a blacksmith who drilled the extra leaves in the right place, put them all together and made him a spring that was perfectly satisfactory.

In a little town in the Catskills there is, or was a year ago, a blacksmith who had specialized on welding springs until he had a reputation that was bringing people from twenty miles away to have their springs welded by him. He was giving them good jobs, charging less than a garage would ask for such work and yet getting bigger pay than he would get for regular blacksmithing work.

The motorists, you know, are the best spenders, in the country. They either have plenty of money and have cars because they can afford them, or else they have the willingness to spend what money they do have. A real tightwad doesn't have an automobile—he rides with his friends, if he has any. Automobile owners part with their money much more easily than the farmer with no car and only a pair of horses to be shod now and then.

And the automobile owner with a broken part is always in a hurry to get that part mended. He wants his car made fit to run right away and he is welling to pay a higher price for labor in order to get it quickly. So you can expect to charge more for work on automobiles than for work on horses or wagons.

"THE DOCTOR OF FORDS"—SO READS THE SIGN

Willis K. Jones.

THE Doctor of the Fords", whose establishment is here pictured. is the son of a doctor to horses. The shop, when first built, was about a mile from the city of Montevideo, Uruguay. and the owner made money shoeing horses which came along the postroad to the capital city.

Gradually Montevideo outgrew its bounds and spread out along this road, which became *Calle* 18 *de Julio*, a principal thoroughfare. The horse-shoeing business grew dull. Large and imposing mansions began to crowd upon the blacksmith shop, but the owner, in spite of many offers made for the property, refused to sell and held his ground. Automobiles became more popular than horses. Business fell off entirely. To live, he had to rent part of his building, which a barber (*peluquero*) now occupies.

When the father died. and the son received the property, he looked over conditions, and decided that. in view of the 4000 Ford automobiles in Uruguay, he would become a specialist, and doctor to their ailments.

The house shown here is about eighty years old. It bears in its adobe walls marks of the many civil wars which disturbed the peace of the city when the two political parties, Whites and Reds, (long before the Bolsheviki had been heard of) battled for supremacy. The barber shop illustrates the barred windows common to Latin America. The heavy front door which used to keep out the prowling revolutionists has been replaced by more adaptable doors, and the *Medico de los Fords* keeps open house at all hours to minister to the frailties of the genus Ford. He says he has more to do than his father ever did, and is glad of the advent of the auto in South America.

There are not a few instances where blacksmith shops have developed into prosperous garages just by degrees, the blacksmith working into the automobile field a little at a time until he found that it paid him better than his original job. You may have no desire to turn garage manager, but you certainly do want to make money.

Suppose you go after the work on broken springs. Get a muslin banner painted, reading, "AUTO SPRINGS FIXED HERE" and hang that up in the position at your shop where it will be seen by approaching motorists. A small sign on the front of the shop close to the road will not be read. The driver is past before he has had time to notice it. A sign that faces the driver as he comes along stands the best chance, and it ought to be readable from far enough away so he will have plenty of time to think about it before reaching your door.

You will find it profitable to have some roadside signs made to put up along the highway, preferably at rough spots where there is the most likelihood of springs being broken.

The garages will often co-operate with a blacksmith, taking the welding jobs to him, and I have even been sent to a blacksmith to get a spring drilled because it was so hard the garage man did not want to tackle it with his drills. Every time a motorist does come to you, see that you do everything you can to give him satisfaction. Treat him so well that he will not only want to come back, but will send his friends to you for such work.

If your shop is located on a much traveled highways, you can help interest motorists by putting in a gasoline tank, but this may prove a disadvantage under some conditions. If you are short of help it would be a great inconvenience to have to leave your work to pump gas and there would be times when you could not leave a job, and you might find the motorist impatient

over the wait. And if you are getting considerable work from some nearby garage, you might lose that by entering into competition with them in selling gasoline. This matter of selling gas has to be decided on the merit of existing circumstances.

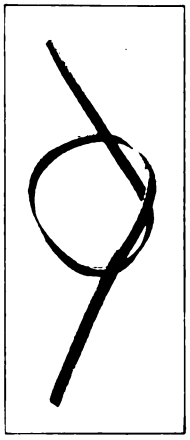
One thing you can do if you have plenty of water available is to put out a bucket and a sign, "Help Yourself to Water for the Radiator." This should bring you right in touch with the drivers who have leaky radiators and it might easily be made helpful in getting radiator repair jobs or even in selling some sort of radiator leak stopping preparation.

A young man who started a blacksmith business, or rather, bought one on the edge of a large town, had had some experience driving cars and he knew the annoyance to owners that squeaks and rattles give. He decided he would make a sort of side line of stopping automobile rattles and he advertised himself as a specialist in such work, "I Will Stop Automobile Squeaks and Rattles" was the way he put it in a newspaper announcement. He hung out a sign, "Does Your Car Rattle? Let us Stop the Noise."

He advertised his ability in this work by roadside signs which cost him little and as soon as he began to make good on the work, he had motorists sending their friends to him by the dozen. He was soon getting so much of this work that he left it to his helper to run the blacksmith end of the shop and has recently sold that part of the business and devotes himself entirely to his little specialty. The kind of noises he goes after, of course, are not noises that are due to engine troubles. He does not claim to be an expert on the gasoline engine and he refers all such knocks and squeaks to a garage expert—and he is good enough in his own line so the garage people often send a patron to him with a rattle they haven't been able to locate. You know, a squeak in a car may sound almost anywhere but right where the friction is that causes it. The noises are carried along the metal. The garage man could locate them in time, but frequently it means getting on the running board of the car while someone drives it over a rough street, and the garage man has more work than he can do right in the shop and he doesn't want to bother with these little rattles and squeaks. He has a lot of customers whose cars won't run at all and who are hounding him to get their work out.

So, you see, there are plenty of opportunities for the blacksmith to work into specializing on something connected with automobiles, and there is such a shortage of good labor on cars in most towns that if you can qualify for any kind of automobile jobs at all, you can get the work by telling the public you want it.

It is not a matter of location, though a location right on a state highway will give you an advantage. But if you let people know you can do the work and tell them where you are, they will come. It isn'a like walking to a store out of the business section. Motorists can get to any place quickly and it is prompt work they want. They don't care where the shop is.



"TREATING IT ROUGH". THIS PICTURE PROVES THAT THE STEEL POSSESSES REMARKABLE PROPERTIES AFTER HARDENING

It will pay you to take one or two automobile trade publications and if you start into this line of work, you will soon see many little additions you can make to your equipment and some accessories you can sell that will help in making the motorists pay your rent for you. There is good money in this direction and there is a rapidly increasing field for the work. If you have any idea of branching out this way, don't wait. Get in on the ground floor and begin reaping the profits.

Be generous. Some people are generous because they want to give pleasure to others; others are generous because they like to feel the joy of being a Lord or Lady Bountiful; still others are generous, to tell about it. The one who is truly generous serves for the sake of service and then goes on to larger service yet, forgetful of self.

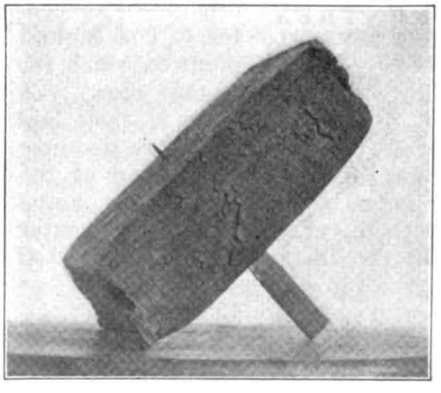
Do you suppose that a man like Edison ever thinks of his contribution to humanity as a gift, and yet what a benefactor he has been.

NEW ALLOY STEEL HAS REMAKABLE PROPERTIES

HARD enough to scratch glass and at the same time capable of being twisted and bent and otherwise generally maltreated after hardening without breaking are the unusual qualities of a new alloy steel.

It has long been the desire of users of chisel steel and other impact tools for a metal that is as near fool proof in heat treatment as possible and which in addition would not break down rapidly in service. This new alloy steel, it is claimed, meets the most exacting requirements, and from the illustrations it can be seen that the ability of this steel to "stand the racket" is clearly shown.

When hardened this steel may be bent over the edge of an anvil, if hammered carefully, and owing to the fact that it is believed tools made of it will withstand any usage to which they may be subjected in actual service, it is naturally estimated that its use will result in a large saving in the cost of re-forging. It is said that a chisel made of this steel will do the same work as orginally after one forging, and its salvage value would approximate its first cost. The steel flows readily when heated from a bright red to an orange color, and may be forged with ease. It has been found that the efficiency of the steel is not diminished by overheating, in the usual understanding of the term; in fact



NEEDLE POINTED CHISEL DRIVEN THROUGH CARBON STEEL

the hotter it is made, the harder it gets, when quenched in either oil or water.

The special applicability of this steel for such purposes as ship building, bridge building and railroad shops, especially for pneumatic chisels, beading tools and rivet snaps, as it will not break under the head or at the fillet. Cape chisels made of this steel can be bent without break-

ing and it is claimed that this steel will cut armor plate, nickel rivets and alloy steel billets satisfactorily, and will chisel cut steel that is almost file hard.

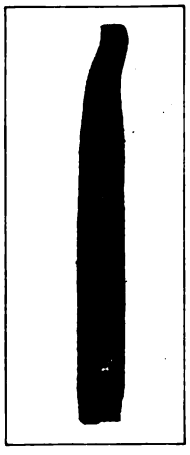
TIMING FORD VALVES

The method of accurate valve timing on a Ford Model T engine is to time the valves by piston travel according to the measurements given below.

Previous to 1913 Model:

Exhaust opens 3/8" before bottom center.

Exhaust closes 1/64" past top center.



CHISEL MADE OF NEW STEEL AFTER BEING DRIVEN THRU BLOCK OF .35 PERCENT. CARBON STEEL AND THEN BENT SEVERAL TIMES ON AN ANVIL

Intake opens 7/64" past top center.

Intake closes 3/8" past bottom center.

Later than 1913 models:

Exhaust opens 5/16" before bottom center.

Exhaust closes top center.

Intake opens 1/16" past top center.

Intake closes 9/16" past bottom center.

The piston of the cylinder being times is first brought to top center. (The highest point to which the piston rises). A scale is then laid across the piston and the distance from this scale to the top of the cylinder is measured. The engine is then turned to bottom center and the distance from the piston to the top of the cylinder block is measured again. This is the "bottom center". For example the top center is 5/16" above the face of the cylinder block and the bottom center is 4 5/16"—3 11/16" below the face of the cylinder block. On a 1913 engine the exhaust opens at a point 3 11/16"—5/16"—3 3/8" below the face of the cylinder block on the down stroke of the piston, the crankshaft turning in the direction of rotation of the engine and closes on top center. The inlet opens 5/16"—1/16"—1/16" —1/4" above the face of the cylinder block on the down stroke, and closes 3 11/16"—9/16"—3 2/16" —3 1/8" below the face of the cylinder block on the up stroke.

The method of determining when the valves open and close is as follows: With the spring assembled, close the valve. When it is closed, hold it with the fingers. Twist back and forth on the head while someone cranks the engine slowly. The instant the valve will turn, it has started to open. In the same way the valve may be closed. The valve turning until it has seated. Another way to check the opening and closing is to insert a .001 or less, feeler, or a thin piece of paper, between the stem and push rod. The instant the feeler will not move the valve has opened. The instant it will move after being held tight the valve has closed.

POSSIBILITIES FOR REPAIR WORK

In farm machinery and equipment lines there has been for the past few months a poor demand. Firms in this line believe that this is due to farmers forming an erroneous opinion that because the war had ended prices of implements and and equipment would immediately drop. There is not the slightest possibility of this for months to come. The plows, wagons and wood goods sold to-day are fabricated from materials purchased by the manufacturers at war prices, and the manufacturers are not likely to absorb a loss on that material. But because of procrastination in ordering, the farmer may face seeding time without necessary equipment, for last minute orders are little use as conditions are to-day.

This being so, it seems probable that there should be a considerable amount of repair work in the future. The farmer will have to get his old equipment put into working shape. He will want repairs seen to, and the blacksmith who has a weekly newspaper in his town would do well to advertise to his customers that they should bring in their repair work early, if they have not already done so. We all know how unsatisfactory it is to have work of this type come in all at once—and every man wanting his job seen to p.d.q. In this repair work those blacksmiths who have gas-welding outfits should be able to get a good run of work. Tractors and implements have to be in shape and thre are always breakages at the tail end of last season that have not been seen to. Verbally, or in the local newspaper, impress upon your customers the importance of getting this work to your shop early so that you will have a chance to get it out in time for spring operations.

CHISEL DRIVEN THROUGH .35% CARBON STEEL

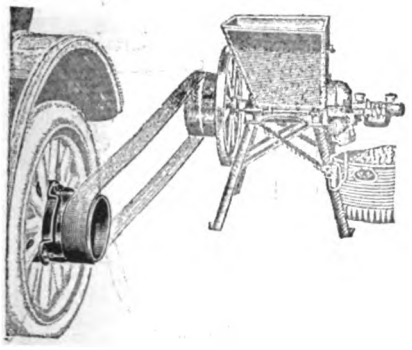
CHINESE BLACKSMITHS ADEPT AND SKILLFUL ARTISANS

Chinese blacksmiths do not believe in being cooped up in a close, smoky shop. They prefer to work in the open in front of their shops where they are handy for the patron passing by. The Chinese smith makes most, if not all, his own horse shoes and as a result American exporters find Chinese markets not very lucrative. The Chinese smiths do good work with the crudest tools and materials, and the prices they get for their work would not keep an American blacksmith in tobacco money. The Chinese smith makes all his own tools.—Monroe Woolley.

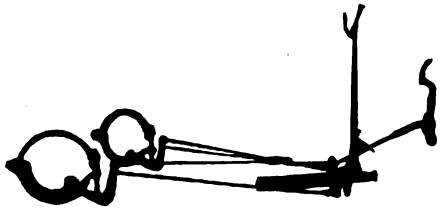
SELLING HOLES

Driving screw holes with a hammer is an idea as original as it is convenient. The holes are made of brass and can be used with either wood or machine screws to fit all sizes of screws. The head is removed after the hole is driven and the brass hole is left permanently in position. Obviously there are a great number of advantages in this form of hole.

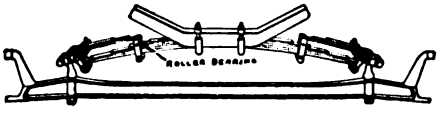
Some of the Latest Ford Attachments the Market Affords



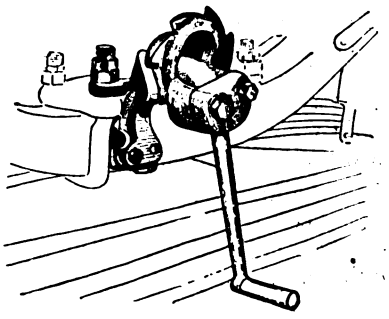
POWER ATTACHMENT DRIVEN BY REAR WHEEL. THE PULLEY DOES NOT NEED TO BE REMOVED BUT MAY FORM A PERMANENT PART OF THE CAR



FORD EXTERNAL CONTRACTION BRAKE



A NEW IDEA IN FORD SHOCK ABSORBERS



THIS DEVICE STOPS THE "KICK" WHEN THE MOTOR BACKFIRES

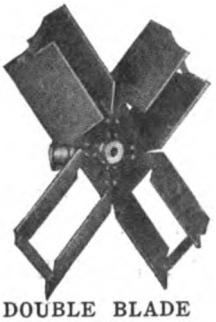
SIMPLE ADVERTISING METHODS THAT PROVE EFFECTIVE

W. J. Bryans

A good many business men pass up excellent opportunities to attract customers and trade by neglecting some of the simple methods of advertising which cost very little but which are effective as a supplement to regular advertising.

For instance, how many dealers there are who do not make the provisions they should for heralding their name and business to the passing public or informing the stranger or prospect of who they are or what business they are in. There are not a few who call themselves business men who neglect completely to erect a sign on their place of business while there are many others who merely put up a sign to designate the line of business they are in but give no information as to their own identity. A man should not be ashamed of his name or too modest to announce it, while he will find more people inclined to mention "Brown's Garage" than "the garage on the corner" and it will prove better advertising as well.

But the real, aggressive business man will go further than comply with these commonplace essentials in the matter of announcing himself. He will put up signs enough that the public will have his name and business brought to their attention no matter what direction they may approach from. It will be found good business to get away from the ordinary and erect one sign at least that will be sure to get the attention of the public. Electric signs are not overexpensive and the cost of operation and maintenance is not high, and they are certainly effective, carrying the dealer's message to the public both night and day. The flashing sign is also valuable in attracting attention.



DOUBLE BLADE COOLING FAN

Another simple yet effective method of advertising that is frequently neglected by those who are in a position to benefit to the maximum from them, is the use of road signs. These bring a message before the person who views them at a time when there is usually nothing else to claim his attention. The "mile" signs are especially valuable as anything is that give information as well as being an advertisement. Many business men find that suitable signs can be prepared by themselves or one of their employees in spare time and at small cost. Material that would otherwise go to waste can often be utilized for this purpose, so that the time it takes to make them and the cost of the paint is the only expense in connection with them.

The average dealer does not make the use of the advertising material supplied by manufacturers whose goods he handles in the way that he should. It is frequently allowed to lie around the shop or finds its way to the fire instead of being distributed in the manner warranted by the high character of its sales creating power that it generally possesses. High salaried men are generally employed to get out this advertising matter and the cost is often very high, so that the dealer who discards it is certainly throwing money away and neglecting excellent opportunities to interest prospective customers in lines he desires to sell. All this advertising literature should be stamped with the dealer's name and distributed to those who are likely to be most interested.

One dealer known to the writer keeps a supply of this advertising matter on the mailing desk and encloses some with every letter sent out to local people where it will not cause the letter to be overweight. Did you ever stop to think of the large number of letters that business men send out every year that are not of maximum weight and in which some advertising matter could be enclosed? Make up your mind that you will cash in on this opportunity to get your goods before prospects.

Every business man should do everything possible to connect himself up with the national advertising of big manufacturers whose goods he handles. Many of these firms spend huge amounts of money in advertising to the consumer in the national magazines and many of the people get acquainted with these articles by means of this advertising. But cutting these adver-

tisements out of these journals and pasting them on the window or putting them in a scrap book that is available to customers the dealer can connect himself up with nationally advertised articles and not only help in the sale of these lines but give the public a better impression of his shop because it gives a place prestige with the public when they learn that widely known articles are handled.

The sshop owner who maintains a service car for going out to the assistance of those who have motor trouble and cannot bring their cars in for repair, should play this feature up as strong as possible by having his name and the nature of the car emblazoned on it, playing up the service feature especially. It will prove an excellent travelling advertisement. One dealer known to the writer supplies free to customers, a pennant that carries the name of his town in large letters and his own name in smaller letters.

COST OF WELDING

The matter of cost of welding by the oxy-acetylene process depends upon many factors, and estimates can only be given by the repairman after he has had considerable experience with the process. Some work requires preheating and careful manipulation, some must be clamped to prevent distortion; in such cases the cost of the jig or fixture is apt to cost more than the welding.

MACHINERY AND BEARING SCRAPERS

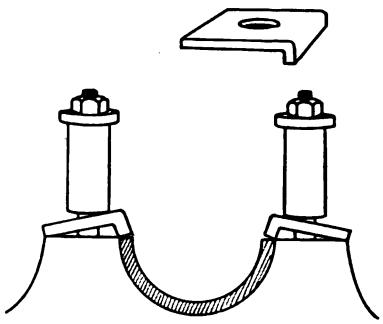
There is need in every shop where machinery such as auto, tractor, and truck engines are overhauled and repaired, for a generous supply and varied assortment of scraper tools for fitting new and refitting old bearings, scraping piston rings, pistons, carbonized cylinder heads, etc.

A very good set of such scrapers can be made up easily at the forge from various shapes of worn-out files, forging and framing roughly at the anvil and refinishing on the emery wheel. I have drawn herewith the most useful and popular shapes used by machinists in general.

After a set of scrapers have been made and tempered, a good leather or heavy canvas roll to hold each one in its individual place, patterned after the regular auto tool kit roll, is a most important requirement, to keep the cutting edges from being dulled, as they surely will be if they are thrown into a tool drawer on top of each other.

BEARING CLAMPS

To properly fit the bottom bearings of a shaft it must be pulled down tightly into its bed just as it will be pulled down when the bearing cap is in place. To pull the bearing down in such a manner and yet permit the scraping, it can only be accomplished by special clamps, and the simplest of these I have used are shown herewith in the sketches. They consist of two offset pieces of ¼ inch plate as shown, and these were used as shown by being forced down by the pieces of pipe and the



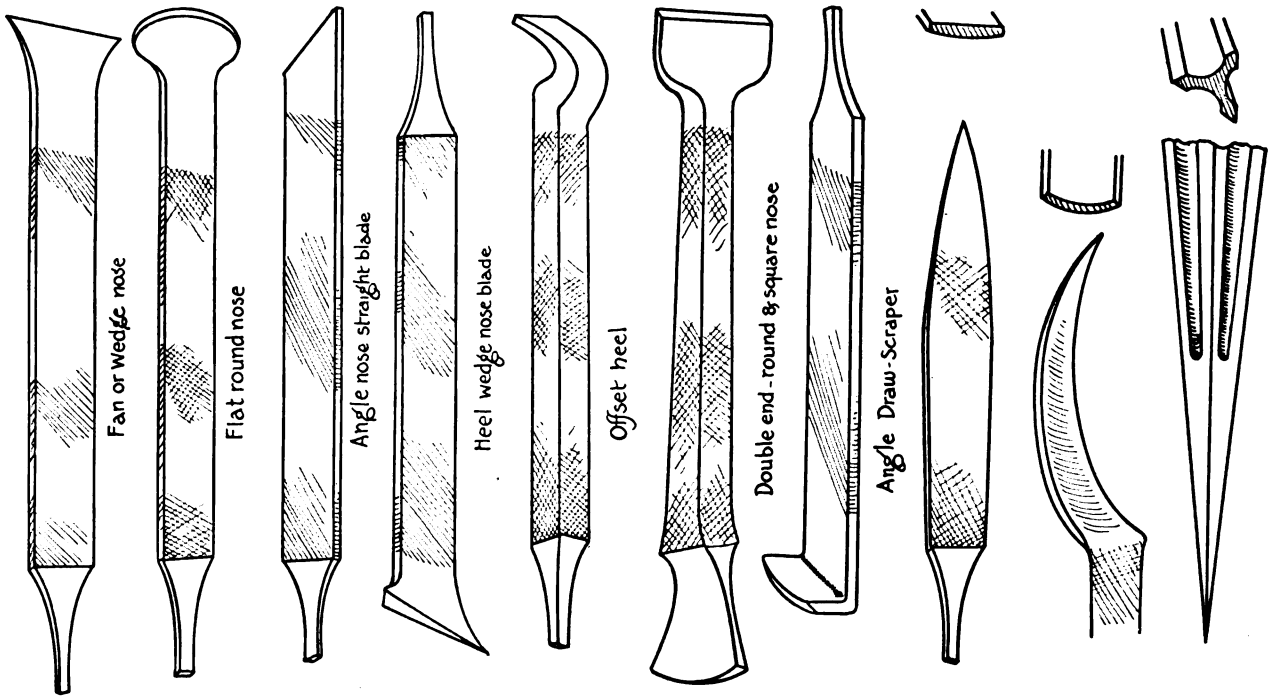
BEARING CLAMPS

regular bearing studs and nuts. These clamps should be used when refitting an old bearing or installing a new one.

If you intend to paint the shop or your home it may be that you are at a loss as to the number of gallons required. While the quantity of paint varies with the surface to be covered, the following method of measurement is an accurate guide:

A good grade of prepared paint will cover at least 350 square feet to the gallon, two coats.

First, measure the distance around the house and multiply by the average height; then divide by 350 and the result will be approximately the number of gallons to buy. Of this quantity one-fifth will represent the paint required for trimmings, cornices, etc.



MACHINE AND BEARING SCRAPERS MADE FROM OLD FILES

Queries-Answers-Notes

THIS department is the meeting place where you are free to ask for information, answer questions, discuss shop matters and business conditions and any other notes you feel would be of interest to a fellow mechanic. Make use ofthis Department as often as desired.

SEND A PICTURE OF YOUR SHOP FOR THE NEXT NUMBER.—I am sending you a picture of our shop to put in the paper. We have a power shop which consists of engine, band saw, wood turning lathe, ideal lawn mower sharpener, emery wheels, No. 16 Canedy-Otto drill, disc grinder, and all other necessary tools. I think the American Blacksmith is the best trade paper I ever read; I think no smith ought to be without it.

I do all kinds of work, horseshoeing, woodwork and general repairs. We are in the oil fields and have some oil field work to do . I never saw blacksmithing as good as it has been this summer in our country here.

Vansickle & Son, Illinois.

Horseshoers 2,000 Years Old Found by Explorers:—Some ancient relics have just been discovered in the excavations under the auspices of the Cambrian Archaeological Association at the Old Roman camping ground near Barmouth. The excavators have found pieces of earthenware and two horseshoes which in the opinion of the expert, are over 2,000 years old.

MUSTERED OUT BUSINESS AS USUAL—'Tis many years since I wrote to you and many great events have just returned after being away a good while and am starting the old smithy up again. I called in at Newport News, Virginia on my way over and wished I had managed to get to Buffalo to see you. As it was, I saw a fair bit of Virginia. Now, Mr. Editor, I would like to get in touch with a firm of iron merchants on the west of America, either at Vancouver or at San Francisco, and I want you to give me an address to write to. I want price list of anything in my line as farrier and general smith.

We are paying big prices for goods now and many items are hard to get. We are paying just now nine dollars a 112 pounds for iron; fourteen dollars for a keg of shoes, and 24 cents a pound for nails, so you see someone is making a big profit.

We are not getting as good prices for shoeing as you are. I intend to try and work as nearly for cash as I can in future.

When in Newport and Norfolk I met several Americans, and my word, they did give me a good time, took me everywhere, and even in Newport I was astounded at the amount of work and buildings, etc., which had been put up since America came into the war. The organization must have been near perfect.

Well, dear Editor, I hope this note reaches and finds you well. Best wishes to yourself and to our journal.

W. G. SIM, New Zealand.

P. S.—There were over 26 copies waiting to be opened on my return.

Information Wanted— Will you please give the address of the O. K. Hoof Remedy Co. (

E. W. Johnson, Kentucky.

THE HORSE IS STILL KING—SOME PLACES. MISSOURI, THE HOME OF ARMY MULES, COB PIPES AND THE SHOP OF VANSICKLE AND SON, DEMONSTRATES THAT THE HORSE IS STILL GOING STRONG, AND FROM THE PICTURE WE TAKE IT THAT THIS IS ONE OF THE MESSRS. VANSICKLE'S BUSY DAYS. IN FACT IT LOOKS AS THOUGH EVERY DAY WAS A BUSY DAY AROUND THIS SHOP

Will some reader be able to answer Mr. Johnson's inquiry—Thanks.

How Mr. Fox Does It—Having seen in the September number a receipt for drilling holes in plow mold-boards I find that the quickest way is to lay the moldboard in the fire and heat to a good bright red, then take the ferrule of a buggy single tree and set it where the hole is wanted and fill full of sulphur and blow the fire until the sulphur burns out. Repeat this process two or three times and it will be found that a common drill will cut easily.

J. D. Fox, Nebraska.

Beware—I would like to know about the—tires, whether I could rely on them and also about the company that sells them. Why is it that these tires are advertised so cheap. It looks as though there was something the matter with the tire. Will you tell me, if you can, also about those used tires. What does this word used mean? Does that mean that they have been used and then placed on sale.

E. D. Pendleton, Ohio.

In buying tires the best thing to do, in order to avoid regret is to buy a good tire and pay the price demanded by a company that will guard its reputation and that of its wares by a proper mileage guarantee.

There are all sorts of cheap tires on the market that are variously known as used, rebuilt, manufacturers seconds, blemished, etc. It is possible that you can get tires of this kind that will be thoroughly satisfactory in every respect but the chances are against you and if the tire goes up after it has run a hundred miles or so you have no comeback and the amount paid is lost which would have made a higher priced but reputable tire cheaper. You can buy any of the better known tires without a guarantee under the name of "manufacturers' seconds" or "blemished" tires. These tires have some slight defect in them that the conscientious manufacturer does not desire to put on the market as first class tires and consequently they are sold at considerable of a reduction over the price of a guaranteed tire. Sometimes the manufacturer when disposing of such tires removes his name from the tire and sometimes he don't, but in any case the buyer assumes all the risk of getting an unsatisfactory tire.

"Rebuilt" tires and "used" tires are just exactly what the name calls them. Rebuilt tires are old tires that have been cleaned up and furnished with new fabric and a new tread, and although ia is generally conceded that a retreaded tire is good for considerable mileage they are by no means the equal of a new tire and as such it does not pay to buy them. Car owners are the only persons who can really profit by having their old tires retreaded for spares, etc. Used tires come on to the market in all kinds of ways and ale like every second-hand article and surrounded by the same risk of unsatisfactory service.

Whether you are buying tires for your personal use or to sell to the motoring public, buy a good tire. The motoring public has learned by costly and exasperating experience that it can trust nothing but good tires. Of course there is always the man who will buy a thing merely because it is cheap and spend more time and trouble with it than a new article would have cost in the first instance and it is this class that keeps the junk tire business booming.

Expanding — The old Frank Wheeler shop has been converted into a modern machine shop and incorporated under the firm name of the Wheeler Mfg. Co., with the following officers; Frank Wheeler, president. A. M. Wheeler, vice president, And Earl G. Hutchinson, secretary and treasurer.

In a few months we will have a new brick building and new machinery so that we will be able to handle anything in the mechanical line. Our specialty will be trailers and wheel work.

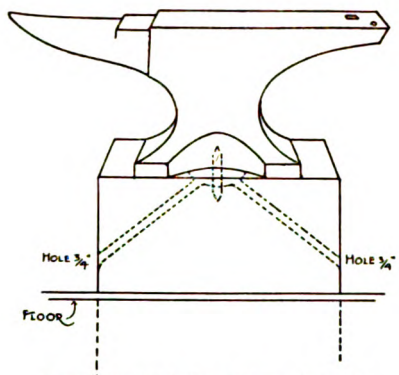
Ours is another case of the growth of

a blacksmith shop to a modern machine shop.

E. T. Hutchinson, California.

Wants Prices—I am anxious to obtain the prices of shoeing, wagon work, tire and implement repair work as I have just returned from overseas and want to get on in business.

Also, I want to describe a method of keeping an anvil solid on the block and I have applied this idea to several with



KEEPING THE ANVIL SOLID

excellent results althoug I have never seen or heard of the same being used by anyone else.

I first forge a piece to fit the square hole in the bottom of the anvil and drive it into the center of the block. I then take a long augur and bore the block from near the iron plug at an angle so as to come out just above the floor as shown in the sketch, on each side of the block. The holes are countersunk so as to let the dust work into the holes and go out through them to the floor and thus an anvil never needs to be lifted to clean the block as long as you countersink the holes.

H. H. Tye, Canada.

Army Materials For Sale.—The army quartermaster department has opened a store at Schenectady, N. Y., and will dispose of a great variety of government stores and supplies at very reasonable prices. Inasmuch as the government only purchases supplies of any kind under rigid conditions as to quality, purchasers may be assured of getting their money's worth.

All mail orders must be accompanied by either certified check, postal money order, express money order or bank draft, and should be addressed to "Officer in Charge, Quartermaster Retail Store No. 1, Schenectady, N. Y."

Among the articles that will be sold by this store occur the following items that will doubtless be of considerable interest to our readers:

Boots, rubber, hip (new), $5.25 per pair; Bags, rubber, hot-water (new), 65c each; Brooms, stable, with handles, 75c each; Brooms, corn (new), 60c each; Brushes, scrub (new), 15c each; Brushes, shaving (new), 15c each; Candles, tallow (new), 20c per pound; Cans, ash or garbage (new), assorted sizes, $3.00 each; Chairs, folding (new), 75c each; Cups, canteen 15c each; Drawers, wool, heavy, winter (new), $1.00 per pair; Drawers, wool, light (new), $1.00 per pair; Gloves, jersey knit (new), 20c per pair; Gloves, "barb-wire protective" (new), $2.00 per pair; Gloves, linemen's cowhide (new), $1.65 per pair; Goggles (new), 75c each; Griddles, No. 9 (new), 54c per pair; Handles, pick, railroad (new), 21c each; Hatchets, claw (new), $1.00 each; Hats, oilskin (new), 75c each; Hats, denim (new), 25c each; Hats, denim (reclaimed or renovated), 10c each; Kettles, camp, with covers (new), 80c each; Lanterns, folding, for candles (new), $1.00 each; Lariats (new), 65c each; Overalls, combination (new), $2.50 per pair; Overalls, combination (reclaimed or renovated), $1.25 per pair; Overalls, bib (new), $1.25 per pair; Overalls, bib (reclaimed or renovated), $75c per pair; Pencils, carpenter's (new), 40c per dozen; Picks, railroad (new), 70c each; Pritchels, blacksmith's (new), 20c each; Rakes, steel, garden (new), 70c each; Rope, ¾-inch (new), 24c per pound; Raincoats, commercial (new), $5.25 each; Safes, field (new), $21.50 each; Shovels, long handle, round point (new), $1.00 each; Spades, D handle (new), $1.00 each; Stocks and dies, ⅛ to ⅜ inch (new), $9.58 per set; Stocks and dies, ¼ to ¾ inch (new), $19.25 per set; Stocks and dies, ¼ to 1 inch (new), $23.50 per set; Stocks and dies, ¼ to 1¼ inches (new), $34.00 per set; Stocks and dies, ⅜ to 2 inches (new), $86.00 per set; Staffs, flag, 5-foot, sectional steel (new), $1.10 per set; Staffs, flag, 8-foot, sectional wood (new), $1.10 per set; Thimbles, saddler's (new), 8c each; Tables, folding, field (new), $2.55 each; Whips, Artillery (new), $1.00.

No orders will be accepted for an excessive amount of merchandise, the intention being that goods shall be sold to the individual for personal use only.

An Invitation.—We want your prices and every other blacksmith reader of this publication wants your prices on different kinds of work, not that the editor or smiths ever expect you to quote on any work but because prices are the subject of more consideration and discussion today than any thing else—not even including the League of Nations, the possibility of Herb Hoover being a candidate for the presidency and other weighty subjects.

Next month, that is to say in our January number, we want to publish a list of prices from every state in the Union and Canada, Great Britain, Australia, New Zealand and Wales, not to mention India and the Fiji Islands. Blacksmiths in other parts of the country want to know what you charge for your work and you are just as much interested in knowing what the fellow in some other state is getting for his work.

This isn't an editorial it's an invitation, so get busy and send us a list of prices that prevail in your neighborhood and anything else you can think of—we'll print 'em all. While we're on the subject, how about writing to the editor (small "e") every once in awhile and tell him how things are getting on in your neighborhood it may not be as much fun as writing movie plots and detective stories but it's darn sight more useful and besides—it gets printed.

THE PRETENTIOUS ESTABLISHMENT OF RATCLIFFE BROS., IN ENGLAND, WHO DO A LARGE AND VARIED BUSINESS IN AGRICULTURAL MACHINERY, MOTORS, AND VARIOUS DEVICES OF THEIR OWN MANUFACTURE. THE GARAGE HAS ACCOMMODATIONS FOR 100 CARS. THE RATCLIFFE BROS. HAVE BEEN READERS OF THE AUTO & TRACTOR SHOP FOR THE LAST TEN YEARS

AMERICAN BLACKSMITH AUTO & TRACTOR SHOP

VOLUME 19 DECEMBER, 1919 NUMBER 3

BUFFALO, N. Y., U. S. A

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WILLIAM F. WENDT, *President.* J. S. HAGANS, *Editor.*

SUBSCRIPTION PRICE:

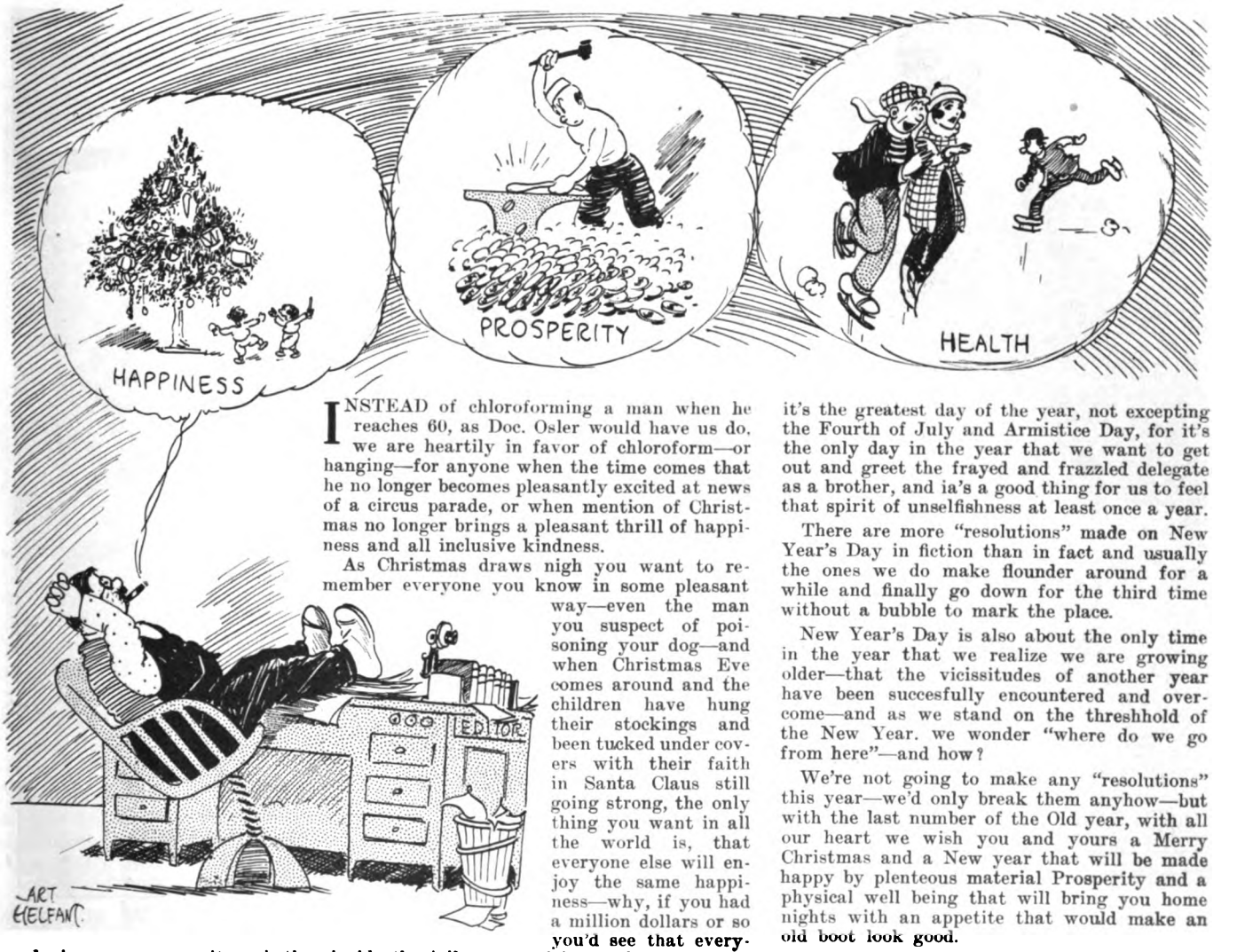
For $1.00 per year, payable in advance, The American Blacksmith, Auto & Tractor Shop will be sent, postage prepaid to any postoffice in the United States. To Canada, $1.25; to other countries, 6 shillings. Reduced rates to clubs of five or more on application.

Remittances may be made by money order, express order or checks payable to the American Blacksmith Company. We will also accept uncancelled postage stamps or currency, but for safety these should be sent by registered mail.

Correspondence on all smithing subjects solicited. Always give name and address, which will be omitted in publishing, if desired. Address all communications to the

"AMERICAN BLACKSMITH COMPANY"
BUFFALO N. Y

Cable Address: "Blacksmith, Buffalo"



INSTEAD of chloroforming a man when he reaches 60, as Doc. Osler would have us do, we are heartily in favor of chloroform—or hanging—for anyone when the time comes that he no longer becomes pleasantly excited at news of a circus parade, or when mention of Christmas no longer brings a pleasant thrill of happiness and all inclusive kindness.

As Christmas draws nigh you want to remember everyone you know in some pleasant way—even the man you suspect of poisoning your dog—and when Christmas Eve comes around and the children have hung their stockings and been tucked under covers with their faith in Santa Claus still going strong, the only thing you want in all the world is, that everyone else will enjoy the same happiness—why, if you had a million dollars or so you'd see that everybody in your community, whether inside the jail or out of it, would share your Merry Christmas with you.

While Christmas has lost a great deal of its significance as a religious holiday, it's the greatest day of the year, not excepting the Fourth of July and Armistice Day, for it's the only day in the year that we want to get out and greet the frayed and frazzled delegate as a brother, and ia's a good thing for us to feel that spirit of unselfishness at least once a year.

There are more "resolutions" made on New Year's Day in fiction than in fact and usually the ones we do make flounder around for a while and finally go down for the third time without a bubble to mark the place.

New Year's Day is also about the only time in the year that we realize we are growing older—that the vicissitudes of another year have been succesfully encountered and overcome—and as we stand on the threshhold of the New Year. we wonder "where do we go from here"—and how?

We're not going to make any "resolutions" this year—we'd only break them anyhow—but with the last number of the Old year, with all our heart we wish you and yours a Merry Christmas and a New year that will be made happy by plenteous material Prosperity and a physical well being that will bring you home nights with an appetite that would make an old boot look good.

Having Happiness, Health and Prosperity, what more dare we ask of an indulgent Providence?

MERRY CHRISTMAS

Means by which Garage Revenue May be Increased

ROBERT FALCONER

FIVE miles outside of a city on a main traveled road is a small garage. It is apparent that in order to secure the maximum amount of business this garage must offer attractions not offered by many other garages also located on this road.

This garage has built out over the gasoline pump which is located directly in front of the garage a roof large enough to offer protection to four cars. There are two driveways under this roof. One between the pump and the garage and the other between the pump and the road.

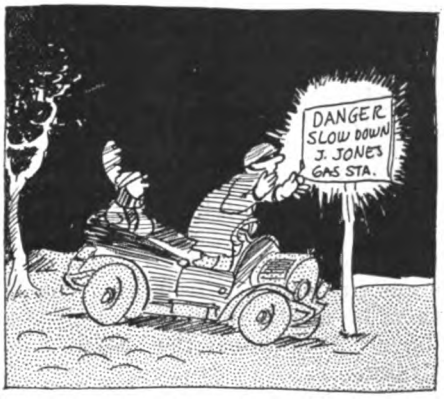
The roof is supported on the road side by two posts built of concrete blocks and there is a wall of concrete blocks between these two posts. This wall which parallels the road is about four feet high. The other end of the roof is attached to the front of the garage and the roof slopes towards the road.

It might be objected that such

DON'T DEPEND ENTIRELY ON SIGNS

an expense would not result in enough additional revenue to justify the expense, but this garageman has found that it has very materially increased sales on stormy days. No motorist relishes climbing out of his car into the rain in order to have his gasoline tank filled. Neither is he going to drive into a garage if he can save the time by merely driving under a roof like this one.

This roof protects him while he is having his tank filled and paying for the gas and it is so comfortable under it, that while he is there he will inspect his oil supply and have his other needs filled before he drives on. When he has



ROAD DANGER SIGNS ARE GOOD ADS.

completed his transaction he does not have to back out of a narrow dark doorway. He merely drives straight ahead and is soon on his way again.

This investment on the part of the garageman has added to the comfort of his customers, and saved both their time and his own. After they have made a few purchases in stormy weather they have formed the habit of trading with him and patronize him on pleasant days as well. His thoughtfulness for the comfort of motor car drivers has added very materially to his sales of gasoline and oil and has had a favorable affect upon tire and other accessory sales.

Show Windows for the Garage— A garageman realizing that the people who stopped in front of his building for oil or gasolene might buy other things if they were shown to them in an effective manner decided to remodel his front in such a way as to make effective window displays.

This man had the agency for a car so he partitioned off one front corner as a display room. The partitions were made of glass so that the car was visible from the outside, the driveway into the garage or from the inside of the garage. The display room was finished natural wood and kept scrupulously clean. In fact if compared favorably with the city display rooms where high priced cars are sold.

Before he placed a car on display in this way few people whom he did not call upon in the effort to sell them a car realized that he was the agent for such an attractive car. To be sure he had signs nailed up all around the establishment that he was agent for the car but people either did not notice the signs or took it for granted that they were old ones that he had not found the time to take down.

The display attracted so much attention to the car that he found it far less difficult to sell the number that he had to contract to sell in order to hold the agency in his community.

On the other side of the driveway he had established his office. At first he did not consider it wise to close in the front window and use it for display purposes. It would shut out the light and would prevent a view of the streets that he felt was necessary in order that the bookkeeper could keep an eye on the pump and have a man on hand to serve customers as soon as they stopped their cars alongside of it.

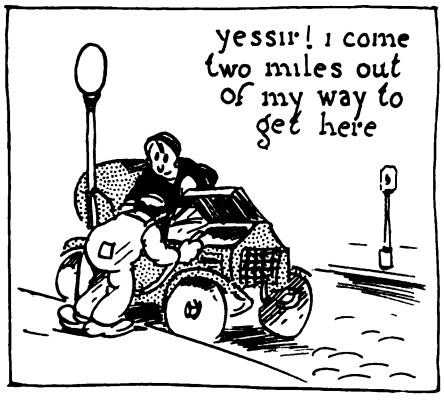
By building a large window in the side of the garage, however, he found that the office could be sufficiently well lighted. He also found that a mirror placed at the right angle at the top of the window would give a clear view of the pump and the road in front of the garage and would permit the building of a background high enough

THIS ROOF PROTECTS HIM

to make the most effective displays in the window.

Accordingly he boxed in the front window and each week changed his displays.

There, however, was still space along the driveway side of the office that he felt should be used to better advantage. Therefore, he



COURTESY AND SERVICE BRINGS THEM TO YOU

built display windows along this side of the office, lighted them up brilliantly and made displays there. He found that having a car display room on one side of the driveway and the lighted display windows on the other side also results in a far better lighted driveway than he had ever had before.

As a result of this arrangement he found that his sales of accessories increased very materially. Instead of being carried just as a matter of convenience for a few regular customers, they came to be a very profitable department in the garage. In fact he found it advisable to take more room for the office and fit up a portion of it as an accessory store.

The total expense of making these improvements was not great compared with the increased profits and the sales that resulted. Not only did accessory sales pick up but more people began to patronize the garage and repair shop. The place looked so attractive that people had more confidence in it than they had in the old days when the place was dingy and the driveway dark and forbidding.

Road Danger Signs—In a certain community there were a number of dangerous curves along the country roads and the motorists were not warned of danger ahead by means of suitable signs. Noting this fact a garageman saw an opportunity for advertising his garage. He had a number of signs painted and installed signs at each dangerous point in the road within a radius of fifteen miles of his garage.

These signs read — "Danger. Slow down for dangerous curve ahead." Beneath this sign he had painted his own business card. He found that all motorists read this sign and that his name and location became far more familiar to them than it had ever been before.

In remarking about these signs this man said. "They are by far the best kind of advertising to use. They remain in place for years, they require little attention, I don't have to prepare any new copy and everybody reads them. In fact after they have passed these curves a few times they appreciate what I have done for them and are more likely to come and trade with me. Even though the car owner knows the road thoroughly himself the signs protect him because without them he might be run into by some driver to whom the road was strange."

It would be very hard indeed to persuade this garageman that there was any other form of advertising as satisfactory as these signs of his.

Other men have found it profitable to put up road signs where there are no signs. Everyone appreciates signs that tell him where the roads lead to. It is not every person who carries with him a reliable road map and even if he does he sometimes gets off the trail and needs a road sign or two to set him right. The garageman who has the forethought to see that signs are put up at every cross road that show to which town all of these roads go finds that people will read the advertising that he adds to these signs to indicate the identity of the person who has gone to the trouble to provide them. If directions for reaching the garage are given and the distance also indicated it is found that many a motorist will go out of his way to patronize the garage. This may be to show appreciation or it may be to gain more information.

Information in Regard to Road Conditions—The more a garageman knows about road conditions the more business he is going to get. Now-a-days people are traveling more and more by motor car. As the cost of traveling by train increases and that of traveling by car decreases, automobile touring will become more and more common. One of the great weaknesses of our road systems is that there will be several miles of splendid road and then a section of road that is almost impassable. Again there will be sections that are being rebuilt and require a detour. Many of these detours are so rough as to spoil the whole day's drive.

If a garage man can give information in regard to the roads along the main routes, and on all side routes in all directions from his garage, car drivers and tourists will begin to go out of their way to visit him. It will not be many years before he becomes known to people from all parts of the country.

When a tourist lays out his route he does not find it possible to discover in advance the exact condition of the road all along the way. The safest way is to map out the route in such a way that it will pass as many garages as possible where reliable information can be obtained in regard to local routes and road conditions.

It is not difficult for the garagemen to gain much valuable information that he can pass on to these mortorists. If he will ask questions of his regular patrons and will do a little driving on his own account he can keep well posted. Local papers also will furnish a good source of information.

To make this information most effective it will be necessary to

THE CHEAPEST ADVERTISEMENT IS A SMILE

place a bulletin board on the front of the garage. This board should have a glass cover to protect the notices attached to it. Above it a large sign reading something like this. "Roads from this garage and their present condition."

Write with pen or still better typewrite all the reports received

in regard to the condition of surrounding roads and post them on this board. The glass cover of the board should be water tight and should be kept locked except when a new notice is being posted.

Such a board will not only make all the information available to all car drivers but will result in much information in regard to road conditions being supplied by motorists who would not think of passing their knowledge of the road conditions along if they did not have some such reminder.

The bulletin board and glass front will cost but little, the sign placed above it will also be inexpensive. If the information on the board is kept up to date it will attract many car owners who would go to other garages if it was not for this bulletin.

Smiles—The cheapest and at the same time the most powerful way to attract trade is to smile. People have been known to go several miles out of their way to trade with a man who greets them with a smile.

No one likes a grouch. No matter how good the service he renders may be, otherwise, people will not trade with him if they can find within convenient reach a man who smiles.

A smile costs nothing but it will build up thousands of dollars worth of trade. The smile, however, must not be upon the face only. It must not be a mask used to hide a sour disposition because such a mask will be transparent and will show what is beneath it.

The smiles must be in the voice, in the eyes and in the manner as well as on the lips.

Smiles make the revenue grow in exactly the same manner that sunshine makes crops grow. Smile and you can expect a good harvest of profits, grouch and you will find that, just as in a very wet season the potatoes rot before they ripen, your business will decay before your profits are ready to harvest.

The man who persisted in planting his garden in the shade when he could just as well plant it in the sun would be considered either a fool or very much inexperienced in gardening. The business man who grouches instead of smiles is casting an unnecessary shade over his future profits. Therefore smile and give your profits every opportunity to grow to prize winning sizes.

CLEANING SPARK PLUGS

Chas. H. Willey

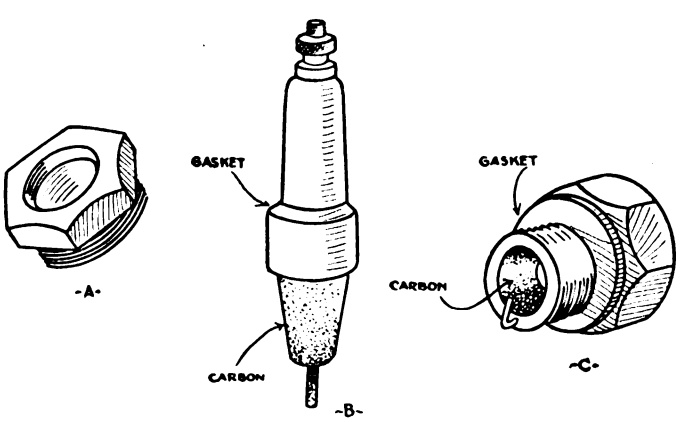
SPARK plugs of all types sooner or later, give trouble due to fouling of electrodes and insulator, or the cracking of the latter when it is of the porcelain type of construction.

Fouling is generally caused by either a too rich mixture, the use of an excessive amount of lubricating oil, or of a poor grade and oil working past the rings. These conditions are wasteful and harmful and when found should be given immediate attention.

The fouling is always in the form of soot or carbon together with such fine grit as may enter the cylinder with the gas mixture. This carbon coating on the outside of the lower end of the insulator causes trouble by short circuit of the electric current, for carbon is a good conductor of electricity, instead of the current jumping across the gap between the points of the electrodes, A, B, in Fig. I, it will pass from the metal plug shell C to the carbon coating on the insulator D, and thence on to the terminal, thus shorting the plug. With this happening there will be no spark to ignite the gas mixture in the cylinder to which the fouled plug is attached.

The cure for a fouled plug is removal and cleaning and if the plug is of one-piece construction the cleaning can only be done by scraping in around the shell walls and outside of the insulator with a narrow bladed jack knife or a narrow strip of tin, then cleaning with a wash of kerosene applied with a tooth brush. If the plug insulator is of porcelain it has a glazed surface and in cleaning, be very careful not to scrape this off or to rough up the surface, for the glaze is a part of the insulation and to rough it up will cause it to collect carbon more rapidly.

When the spark plug is of the built up type such as shown in Fig. I, the work of thoroughly cleaning it can be more easily and correctly performed. This style of plug consists essentially of three parts, shown in Fig. 2, the packing or lock nut A, the insulator B, and the plug shell C. The work of disassembling is simple. The plug is put in the jaws of the bench vise as shown in Fig. 3 and held by seizing the large hexagon shape of the steel shell and then applying a wrench to the lock or packing nut and turning the nut in the direction as indicated by the arrow to remove it. The insulator can now be removed; if it is porcelain work with care to avoid cracking. Clean the carbon off the insulator with fine emery cloth. Figure 4 shows the proper method for doing this.



COMPONENT PARTS OF TYPICAL SPARK PLUG

Hold the insulator in one hand, the emery cloth in the other and work the plug in half circles, gripping the emery cloth with just sufficient strength to clear the insulator without scratching. Clean the shell walls and polish the electrodes brightly. Wash all parts and re-assemble, first inspecting the insulator if it be porcelain, for fine cracks. Assemble with care and clean the gasket that goes under the packing nut.

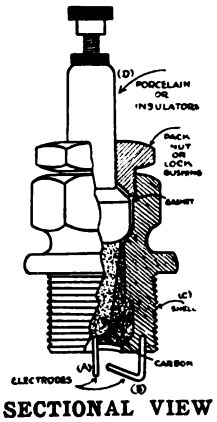
When setting up the nut be careful not to jam it too hard, for this will fracture a porcelain. If the insulator be of mica then there is no danger of drawing the nut too tight.

After the plug is assembled, measure the space between the electrodes; it should be approximately 1/32 of an inch, about the thickness of a smooth ten cent piece.

That mica insulated plugs require cleaning more often than do the porcelain type of insulator has been my experience, also that the mica plug absorbs oil and it is necessary to bake them to dry them out. The oil soaks in between the layers of mica, incidentally it is a

good tip to those who use this style plug to remember to keep oil away as much as possible.

There are several devices on the market for cleaning spark plugs but my experience with them has not been as satisfactory as the more laborious but efficient method here described.



SECTIONAL VIEW

Cracked porcelain insulators allow a leakage of current from the center electrode to the shell, thus reducing the size of the spark between the electrode points. A cracked porcelain should be at once discarded as there is no remedy for it. New porcelains can be installed without discarding the whole plug and thereby saving a considerable amount.

MISCELLANEOUS INFORMATION ON PLOW WORK

WELDING a plow point, make the point fit the plow share; then heat both plow share and point and when they are a good red remove from the fire and put a small piece of welding plate between the parts where the lap occurs. Then, with a pair of tongs, squeeze the parts together and they are ready to make a weld. In this way there is no slipping of the plow point and it can be turned in the fire, making a very nice job and from ten to fifteen minutes is saved on each job. Sometimes a little trouble is experienced in getting the first heat so that the point will not slip off in the fire. Special tongs are an advantage where much work of this character is done.

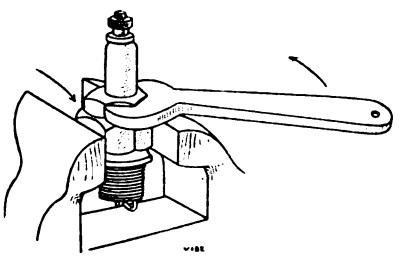
Tempering a Plow Share—Heat the share only on the edge so as not to spring it. Have a box two feet square and six inches deep filled with wet sand and after the share has been sharpened and straightened, heat the edge of the share and press the edge of the share about two inches deep into the wet sand and let cool.

Welding Plow Steel, Cast Steel or Tool Steel—Take a long lap, scarf edges thin; then take a chisel and cut a crease across each lap, so that one will fit nicely into the other and canot slip. Then apply welding compound on the top side as far back as the steel is hot and lay on top of the fire until it is entirely melted. Have plenty of charred coal under the steel and some on top. Take a slow heat — without too much blast. Let your heat come up slowly. When it comes to a bright cherry red shut off the blast. Let the steel lay in the fire for two or three minutes and then knock off the dirt. Then place together and strike until it is well stuck, then strike hard and always bring out. Hit on the anvil to strike so as to drive the weld together but never strike so as to drive the weld apart. Solid welds are claimed for this method.

Another method consists of using a mixture composed of four ounces of dry Venetian red or other dry mineral paint to each pound of pulverized borax. It is claimed that you can burn the edge of a tool and by applying some of this compound that it will weld with a good, solid edge. This compound is said to be excellent for welding plow shares or laying plow shares and all tool steel.

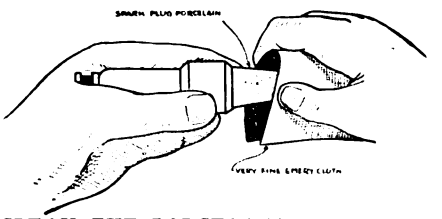
Hardening Shares and Shovels —It is necessary to use soft center shares and shovels. For plow work take a piece of 1½ by ½ inch wagon tire and bolt it to the back of the share. Then heat to a cherry red and sprinkle while on the fire with pulverized potassium cyanide, being careful not to inhale any of the fumes. Then plunge into the slack tub edge first. The tire iron on the back of the share prevents warping. Leave in the tub until cool and polish.

For cultivator shovels heat to a cherry red and sprinkle with cyanide all over the face, as above. Then cool the cutting edge of each shovel slightly for about 3/8 of an inch from the edge and then plunge into the tub. (It is assumed that everyone is aware of the highly poisonous qualities of cyanide and its fumes and will handle it accordingly).


MANNER OF REMOVING LOCK NUT

Repairing Plows—Take the old plow and set it on some level surface. See that it measures 16 inches from floor to hitch and has 2¼ inches land. If not, while repairing, bring it to that and then it will run right. In laying shares take hammer, lay steel 2 by 5/16 and use welding compound mentioned above. Do not make wing of share more than 6½ inches wide. For new shares, lay steel for share on plow, make wing 6½ inches wide, cut off on land side what you don't need. Now bend wing down to shape of the old one. Lay share piece under and weld up.

Hints on Plow Laying—Plow laying is a job that requires a considerable amount of skill, and the percentage of smiths who make a good fitting 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 the land side, but do not drill your holes. Take a small clamp and place on the plow so that the share can be fitted. With regard to the share itself nearly all smiths will have to make some changes in almost all of them, some by upsetting and some by setting down. After you have fitted the share properly remove clamps. Take the bar and share, without drilling any holes, and weld. Place the bar and the share in the tongs, heat with point up, then bend over and take a good heat. This is the time when you want to do your fitting. While it is good and hot, hold share on the point which will upset the bar and make a good point. To clean your work it is good to hot rasp it. Heat again and shape it as you work like to the point. Be sure that in so doing that you keep the bar straight.


CLEAN THE PORCELAIN WITH FINE EMERY CLOTH

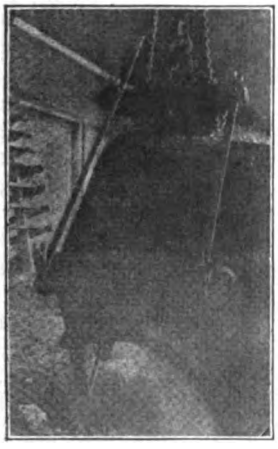
Every minute of this New Year has a money-making value. Make your working hours count in the biggest way possible, and make your recreation hours contributory to greater efficiency in business hours.

Welding a Large Crank Case

DAVID BAXTER

Complete instructions for welding a large cast iron crank case by the oxyacetylene process. Describing in detail and to some length the method, manner, equipment, and supplies utilized.

IT was my good fortune to witness the welding with the oxyacetylene torch of a very large tractor crank case. And to be able to get pictures of the work and of the broken and welded casting. Some of these pictures are not the best in the world owing to lighting conditions, but I believe they are clear enough for the welder reader to understand and benefit thereform. The bulk and weight of the casting prevented its being moved around much, that I might take advantage



CLAMPING ARRANGEMENT FOR HOLDING BROKEN PART IN POSITION WHILE WELDING

of the light in taking the pictures. Therefore it was necessary to do the photographing from whatever angle the position of the job decreed. But, as I say, the pictures will suffice, particularly if coupled with a detailed description of the job and how the work was accomplished.

I suppose to describe the manner of doing the preparing, preheating, welding and finishing of this heavy crank case, going enough into detail to furnish instructions to enable even a beginner to handle just such another job. And I hope to furnish a few pointers to the expert too.

Following my usual style I shall divide the article into successive steps or parts of welding procedure. Starting with a depiction of the job at the time it reached the shop and following the work from preparing the weld to the completed repair. Instead of attempting to tell how to do the work I find it better to tell how the work was done. Because there are nearly always two ways to do anything and sometimes both are right, taking into consideration circumstances and surrounding. To tell how a job was accomplished removes any inclination to be arbitrary.

The Job—The casting as illustrated in Fig. 1 was the crank case of a heavy duty farm tractor, with an estimated weight of fifteen hundred pounds. The metal thickness averaged not less than one inch. Through part of the fracture this thickness ran to an inch and a half. The size of the case is easily judged when compared with the mechanic holding the broken part in the picture. This part was one of the suspending brackets, or feet, by which the case was bolted to the frame. It will be seen that the shape of the break made necessary what might be termed a compound weld. In other words, three different welds had to be made that must be joined into one concrete whole—the three must in reality be one when finished. Three welds were made necessary by the braces or strengthening ribs connecting the foot to the body of the case as shown in Fig. 1.

The fact that three welds were necessary made it essential to change the position of the job several times during the welding. This, in order to facilitate the work by having each weld as near horizontal as possible when, melting it. Where the line of the weld was not level there was a tendency of the melted metal to overflow a part of it that was not in condition to receive the molten metal, resulting in poorly connected spots in the body of the weld; which is bad practice on any weld, especially one subject to strains or pressure.

The weight and bulk of the case made it a problem to change welding positions after the job was hot. The shifting was accomplished, however, with a chain block aided by crowbars. To save preheating fuel and welding gas the changing was done as rapidly as possible. At no time was the casting allowed to cool while changing its position.

The metal of which the case was cast was coarse grained gray iron. In other words, soft cast iron. The nature of this metal could easily be discerned in the structure of the break since it was still clean and bright when the job reached the welding shop.

Another thing that could be considered a part of the description of this job was the fact that the casting was literally covered with grease and oil. Which caused much discomfort to the torch operator by giving off blinding fumes during the preheating and welding. Also it made the case twice as hard to handle.

Preparing The Job For Welding

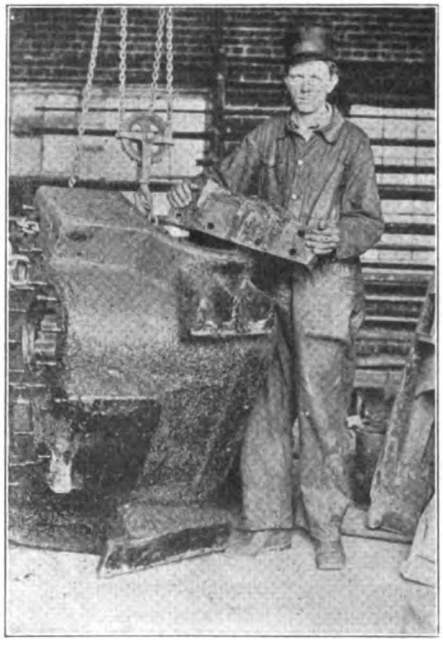


Fig. 1—LOCATION AND CHARACTER OF FRACTURE

—It is essential to make certain preparations for welding almost any job. For a casting this size the ned is imperative if the welder would produce a successful weld.

A casting that is well prepared is half welded. The first step in the preparation of the crank case was to clean away all grease from the vicinity of the fracture. This cleaning was accomplished with the welding torch. The flame was sprayed around over the grease until it burned to a cinder, then the surface of the metal was scraped clean and bare with a file. This cleaning was for the purpose of preventing any foreign substance from entering the weld. Where grease and dirt is allowed to remain in or near a weld it often causes trouble in getting the weld to fuse, due to a sort of chemical reaction. Slaggy or spongy spots and pin holes are often due to this.

The next step in the preparation consisted of chamfering the edges of the fracture. Or in other words, the walls of the break were beveled. This beveling was done until the sides of the break sloped enough that when the bracket was put in place the groove formed by the chamfering was twice as wide at the top as the thickness of the metal through which it passed. Both sides of the break were beveled but the side next the body of the case received a third more of the cutting. Small projections were left at intervals along the break for guides in fitting the broken part exactly in place before welding. Otherwise all of the metal of the fracture walls was removed. This description is for the main weld, or that running full width of the bracket.

The strengthening ribs were grooved in the same way as the main weld, viz.: the full depth of the metal and twice as wide at the top of the groove. The two outside ribs were grooved on the outside of the ribs. The center one was chamfered on both sides; the chamfering conforming to either of the other two. Two ribs were welded in one position whilst the case had to be turned over to get at the other one. This arrangement eliminated all but one pocket weld. This is a weld located in close quarters betwen steep walls. It is more or less difficult to weld due to overheating the torch.

The grooving on all parts of this job was done with an air chisel such as is used at up to date boiler shops. Layer after layer of the casting was chipped away until the desired slope had been given the fracture. Heavy metal like this could have been chamfered with the welding torch flame by melting and scraping the iron away. While it is a faster way it doesn't leave the groove smooth and clean like the chisel made groove. Nor is it to be recommended to the beginner.

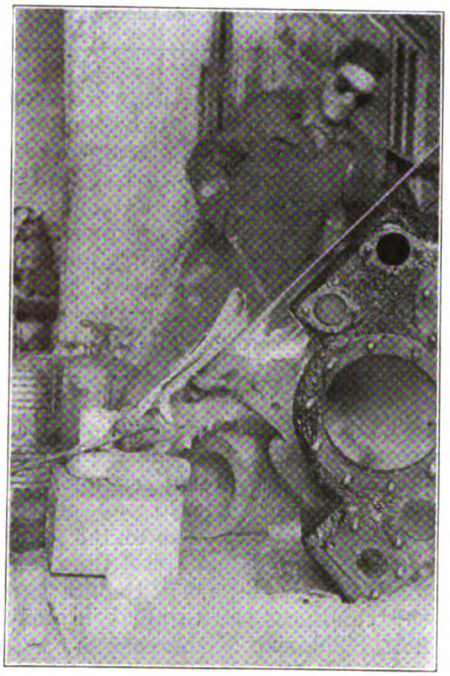


Fig. 2—PREHEATING AND FIRST WELDING POSITION

The main weld groove was made from the body side of the casting only, to the base of the ribs, with projection guides along the bottom.

Fig. 3—SECOND WELDING POSITION

It might be well at this time to caution the novice about estimating the cost of jobs like the one illustrated. He should not set his price based upon the actual welding because the grooving and other preparation of the casting take as much or more time than melting in the new metal. Such was the case with the casting under discussion; the grooving and cleaning together with the clamping required more time by a third than the welding.

The third phase of preparing this job for welding consisted of devising and arranging some means keeping the bracket in line during and after the welding. It was accomplished however, by an arrangement of two heavy flat bars of iron with holes bored at each end to correspond with the holes in the two brackets. The flat bars were first bolted and clamped to the unbroken bracket, then the broken one was fastened, after making certain it fit accurately. The bars held the bracket securely and yet permitted it to move with the expansion; the metal in the bars expanded in unison with the bracket when both were heated. The bars were left in place throughout the entire welding although they could have been removed after the bottom part of the weld had congealed. But with so much of the metal hot there was some danger of the heavy bracket dropping, therefore, it was safer to leave the clamping device in place.

Preheating—When the clamping apparatus was made secure the crank case was tilted to an angle shown in Fig. 2. This position was the first preheating position. Also the first welding position; but we will come to that later.

The angle shown caused the main weld to be upward and horizontal. From which position it was not changed until the main weld was complete.

After tilting the casting was wedged and blocked to prevent slipping. Then the preheaters were lighted and set. These consisted of two air pressure oil burners. They were arranged to throw the flames around and against the bracket weld. The body of the case for a foot or more around the bracket was heated, slowly at first, then with full pressure on the burners as the job reddened. No attempt was made to cover the job to prevent cracking or other results of contraction or expansion. A few pads of asbestos paper were arranged to protect the operator from heat radiating from the pre-

heaters and the weld after the work started. Previous to this a few sheets of iron enclosed the preheater in order to hasten the work and conserve the fuel. To get the weld bright red hot before applying the flame makes it easier to weld, due to the metal melting easier under the torch. Therefore, the welder was able to handle a larger body of new metal in the weld with no danger of misconnected portions.

There was no need to preheat the casting to take care of the expansion because there was nothing to prevent the bracket from being pushed outward as the weld expanded. And for the same reason it could contract without danger of cracking. Literally speaking, the melted weld swelled and pushed the bracket outward, then shrunk and pulled it inward again as the weld cooled. Of course there was some risk when the ribs were welded, especially the center one. But this was minimized by the red heat surrounding the entire weld. The ribs cooled in unison with the surrounding area, causing the contraction to equalize itself, so to speak.

The principle of expansion and contraction might well be illustrated by comparison with a familiar object; the metal absorbs heat like a sponge does water. As the water causes the sponge to swell, so the heat causes the metal to expand. This analogy may be carried further: as the sponge drys it gets smaller; as the iron cools it shrinks.

I believe I now have the subheading explained fully enough to take up the next step of the repairing. Besides I find I have been digressing slightly.

In strict conformity the next step of the work is the welding but I want to insert a paragraph of so on the material and equipment used; this mostly for the beginner. First; the filler metal was soft gray cast iron in rods three eights of an inch in diameter. In order to avoid much of the excessive heat two eighteen inch rods were welded end to end, thus providing an extra long rod which permitted the operator to keep his rod hand a goodly distance from the melting weld. A rod of the diameter mentioned furnished metal about as fast as the flame could melt it and keep the groove in condition to receive it. A smaller rod would have furnished metal so slowly that the danger of burning the metals, both the rod and the weld, would have been enhanced. A larger rod would probably have furnished the filler metal too fast. There is a happy medium for selecting the right rod for the right weld as a little experimenting will readily prove.

The flux used was a patented article widely advertised. It was applied to the weld by dipping the melting end of the filler rod in a pot of it. Just about the proper amount adhered to the filler at each application. This flux was designed to assist the fludity of the molten metal and to clean it of gross or slag, either that due to impurities

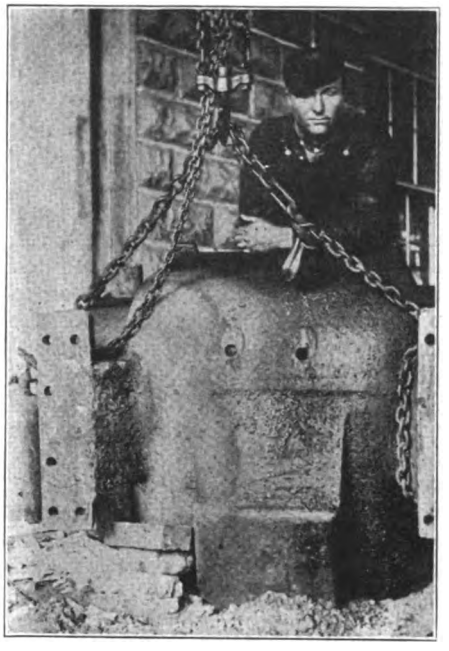


Fig. 4—THE WELDED CRANK CASE—GOOD AS NEW

in the casting metal or due to improper regulating of the flame. It was also supposed to protect the weld from impure welding gases. Coming in powder form it may be dusted on the weld or applied as stated.

The welding flame was the standard neutral, or half and half flame. Not only was it regulated thus at the start but the operator watched it closely throughout the job to be certain it never varied.

A large size tip was employed on an extension torch. The tip had an outlet of about an eight inch. It is useles to give the exact tip number because the sizes vary in the different makes of torch. An extra tip was close at hand in event of the first becoming clogged. Also a bucket of water was conveniently placed, in which the operator cooled the torch when overheated. He also dipped his hands in the water when his gloves became too hot for comfort. Common cotton gloves proved the best because they could be soaked without harming the material.

A fresh supply of carbide was put in the generator and a new tank of oxygen opened before starting the weld. Thus insuring against this vexing form of interruption.

When these things were all ready the welding proper commenced.

The Welding—In figure 2 is shown the actual welding in progress. Note the cheapness and simplicity of the preheating arrangement. This is the main weld and first position. The groove and surrounding position of the casting were red hot when the flame was applied to one end of the groove. Approximately an inch of the bottom was melted together with a small amount of the sides of the groove. Then the flame moved onward and attacked another inch, treating it the same. The flame was continually in motion, swinging sidewise in short strokes along the groove. No filler or flux was utilized while the total length of the bottom of the groove was melted together an inch at a time. Each inch was not separate, however, but one continuous line.

Then the flame was quickly swung back to the starting point to heat another inch of the weld together with about an inch of the filler rod, which was melted down and mixed into the molten bottom Drill the four holes (two in each of the groove, taking care to see that the sides of the groove were melted too. This procedure was repeated again to the end of the groove. Flux being added with each inch of the filler.

Once more the flame and filler were moved to the starting end. This time a wider space had to be filled, which necessitated cutting down the inch in length and adding to the width of the weld. Again being careful to melt and mix the slopes of the groove. It took longer to weld to the end this time and the flux was applied more frequently. The filler rod was in continuous motion, twisting and sawing in the melting weld to knit and clean the metal. At no time was it allowed to drip onto the weld but was melted only while in contact with the weld. For the melting filler to pass through even a short space of air causes cold spots of poorly connected metal. Therefore it was kept flowing directly into the weld.

This third layer was added approximately a half inch at a time from one end to the other of the groove. The fourth and succeeding layers were added somewhat differently: The filler was melted in overlapping pools. That is, the metal was melted and stirred in spots about the size of a dollar. Then another pool adjoining the first was melted in. Alongside the two a third pool was added. All three were made one. In this manner the whole length of each layer was melted in. The pools were kept in line along the weld, however. When the last was added the metal along the edges of the groove was melted also, probably an inch back from the weld proper. For the purpose of insuring a well connected weld. As the last layer was added the torch was given a painting motion, utilizing the pressure of the flame to blow the surface of the weld smooth and clean. The filler was manipulated to scrape away bits of slag, in conjunction with the smoothing action of the flame. Therefore, when the weld was completed the surface was comparatively clean. This was much easier than trimming the weld were after it cooled. The down ends of the weld were smoothed and cleaned by reheating and scraping.

The Second Position—As soon as the ends of the first weld were finished the case was hoisted with chain blocks and turned on its side as illustrated in Fig. 3. The preheaters were immediately readjusted so that little of the previous heat was lost. Only a slight delay resulted from shifting the casting. The oil burners were directed at each side of the bracket this time instead of at the whole weld. This was to keep out lateral contraction of the ribs. Just as soon as the whole bracket was red once more the flame was applied to the inside groove of the lower rib, which was welded after the manner prescribed for the main weld; an inch and a layer at a time till full. Then the upper groove of the middle rib was treated likewise. Followed by the inner groove of the upper rib. On account of the location of the grooves in the corners where they joined the body of the case a liberal fillet of new metal was piled up on the welds. The fillets added strength to the corners.

Just as soon as the last groove was welded the casting was quickly turned over again to bring the other rib grooves upward, where they were fused in the same way as the others. When welding in the pockets the operator experienced some trouble due to the torch overheating and this was remedied by dipping the end of the torch in water after first shutting off the the gases to prevent danger of explosion.

The Cooling—After the welds were all finished the casting was permitted to cool as it stood until cold enough to handle. Then it was turned over to take picture number 4. Herein will be seen the completed weld. Note the level appearance of the joint, the groove of which was about three inches wide on this side.

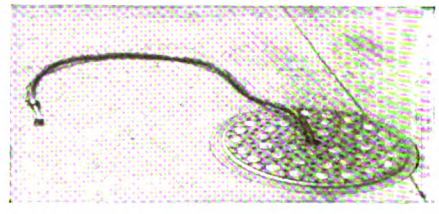
No covering was used while cooling this job, which is so essential on many welding jobs. There being no danger of cracks or strains due to unequal contraction, as I have already explained, the job was permitted to cool in the open.

Since none of the bolt holes or the bearing surface was damaged it was unnecessary to do any machining on the case after cold. The job was ready to go back in service almost as soon as it was welded. Just as strong as ever and looking almost like a new casting.

At least three weeks time was saved to the customer. And certainly a lot of metal was prevented from going to the junk pile. And the welder made a good profit too. So everybody was happy.

"Free Air"

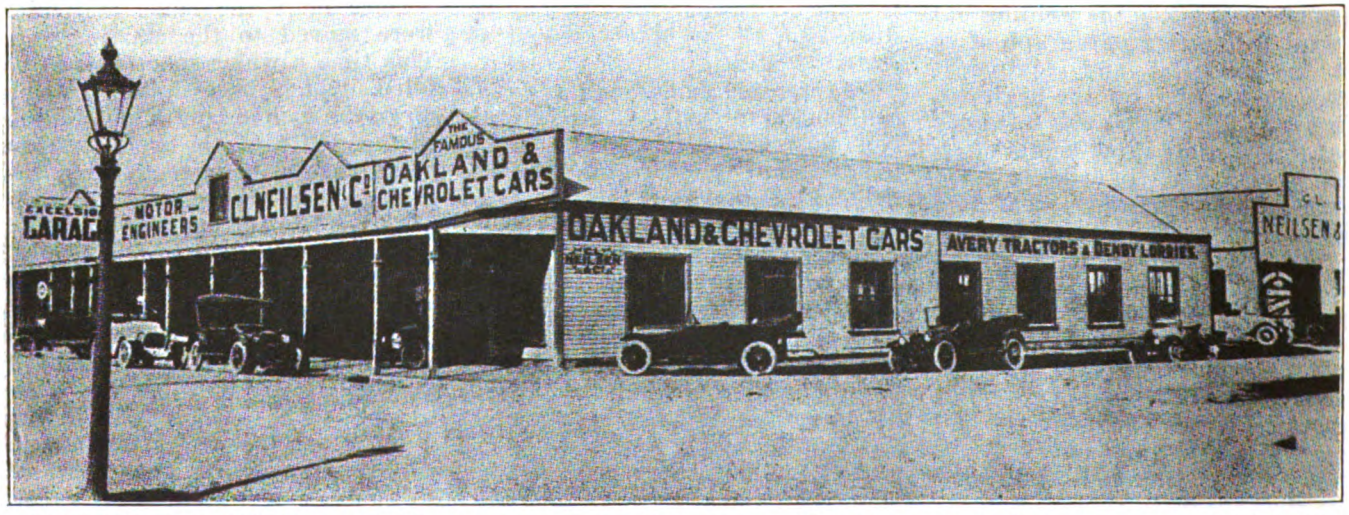
IN a previous article we discussed the kind and style of air compressors and their accessories and fittings for different requirements, and assuming that everyone is now equipped with an air compressor, it is the purpose of this article to tell something of the methods used for



AN UNSAFE ARRANGEMENT

dispensing air to the flat tired motorist.

There is nothing simpler. All that is necessary is to run the air line to the curb or some other location convenient to your trade and the illustration used for the heading of this article shows the simplest possible



A NEW ZEALAND COUNTRY GARAGE—The shop of C. L. Neilson & Co. Garage has accommodation for 70 cars. Plant includes body works, repair and welding plants.

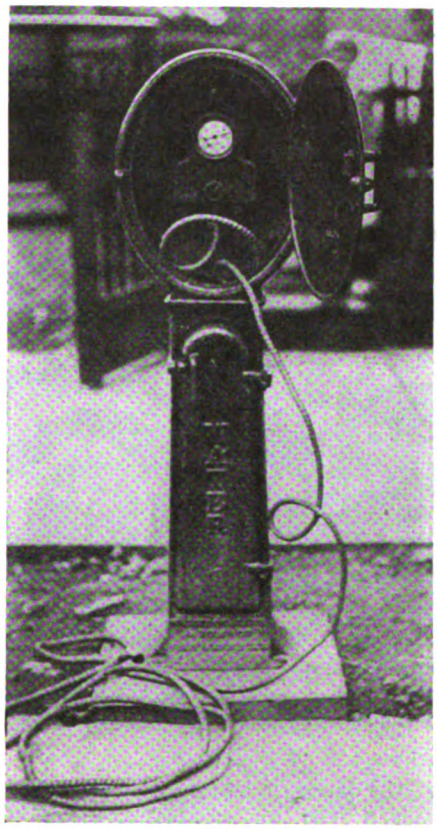
SIMPLE SHEET IRON BOX FOR PROTECTING THE AIR HOSE

arrangement that can be employed, and the boldly lettered sign bids the motorist help himself. If it were not for the sign it probably would not be seen, and while on the subject, it is hardly out of place at this time to say a word about signs.

There are many of us who don't believe in "signs", literally speaking, but if an automobile driver is short on air or gasoline he is more than likely on the lookout for such a sign—he might find them both without the aid of such a sign, and again, he might not and go along to your competitor. If you have a gasoline pump it will serve as a foundation for your "free air" sign, and the two together make an excellent combination. One purveyor of gasoline has an old tire attractively painted and supported on an easel beside his gas pump. Inside the tire is his "free air" sign. There are, of course, all manner and description of signs, but the idea is to make it not only attractive but compelling, as well as properly conscicuous.

One of the illustrations shows an air hose that is brought through an opening in the cover of a sidewalk coal-hole. This idea is a simple enough solution, but suppose someone walking along should fall over the hose and break a couple of legs or a neck or something, the owner of the establishment, in this case a tire store, would be legally responsible for damages because of his negligence in allowing the hose to lay on the side-walk. It is assumed that the hose is intended to be dropped back through the opening (the fixture prevents it from going through into the basement below), but if a motorist avails himself of this air supply and does not replace the hose, the responsibility still rests with the shop owner.

Another, although more elaborate and expensive arrangement is shown that consists of a cast iron standard with spaces for air and water hose, from which the passing motorist may fill his radiator or his tires from the same source. When not in use the air hose is coiled into the upper compartment.



AN ELABORATE ARRANGEMENT FOR BOTH AIR AND WATER

An idea for the disposition of the air hose that is commonly used ,with numerous variations, consists of a metal box large enough to contain the air hose, which, in the case of the one illustrated is above the level of the sidewalk and securely bolted into position. Another idea is to sink the container into the sidewalk and have the top of the box flush with the sidewalk.

One shop owner hung his air hose to a telegraph pole that was in front of his place of business and had the hose running over a pulley that was suitably counterbalanced with a weight.

Air hose is usually wound with steel wire and the primary object in providing a place to keep it is to protect it from damage. The steel winding protects the hose from undue wear, but should the hose be allowed to lay around and be run over by passing vehicles its period of usefulness is very greatly reduced.

THE LURE OF THE VILLAGE

By D. G. Baird

I've always been unsparing in the use of my remarkable talents, in the matter of solving the mysteries of the universe and the United States senate's acts in the interest of swindled humanity and I fully expect that my name will go down in the annals of science along with that of Steve Brodie and Doc Cook, but I have to own up that I have so far failed to explain why about seven-tenths of our population populates the inside of the corporation lines while the other three-tenths is just waitin' to get a little capital salted down in the local savings bank before makin' a bid for a line in the city directory. I used to think that it was the street cars and the gay white ways and the scandals of high society, but careful research has convinced me that my theory was all wrong.

I got hold of an old authority on the subject the other day and it knocked the props right out from under my theory. Why, among

AN INEXPENSIVE AND SATISFACTORY EQUIPMENT

other things, this aforementioned oracle cites a case that was settled out of court way back yonder before Ben Franklin invented the subway, the superway and the gay-whiteway.

It seems that a couple of fellows was in the cattle and sheep business together and was lettin' their flocks and herds run loose on the range and doin' a land-office business, but by'n-bye they get so prosperous there ain't enough alfalfa for all their stock and they have to dissolve partnership. Well, one o' them tells the other to take his pick o' the pasture and go his way and he'll go in the other direction. And what does this cattle man with his choice of the range do? He gets up on a high hill and looks all around, and off in the distance he sees the top of a skyscraper and that settles it. The next thing we know he's one o' the leadin' citizens of a place called Sodom and folks there have named their little parcels of ground after him and we've had city lots ever since.

BODY BUILT ON FORD TON TRUCK CHASSIS BY GEORGE DASH—This chassis retails in New Zealand for $1.175 or £235, and the body is built at a cost of $250, or £50. A Ford touring car sells at $1,285, or £257, and a Maxwell for £385, or $1,925.

Anyhow facts is facts and figgers is figgers, and all go to show that I'm right in my contention that many a man is makin' a bare livin' on land that sells by the square-foot when he might as well be livin' on the fat of land that sells by the acre.

There was Sanm Sparks, f'rinstance. In addition to bein' a friend o' mine, Sam had a little garage and fillin' station out on Warren Avenue in the same block as three other little garages and fillin' stations. You could tell which was Sam's place because it had his name on the sign over the door. Otherwise it was just like the other three in the same block and the other few thousand in the city; all had pumps with a sign on top and a free air hose beside it and a few tires and things in the window and a oily cement driveway, just wide enough for a Ford, leadin' to the interior.

I hadn't seen Sam for quite a spell till one day my Ford went on a hunger strike right near his place and I decided to renew our friendship by buyin' a little provender for my fliver and gettin' a little free air and advice at the same time. I have never yet been able to grasp the profound logic of carburetors and differentials.

Well, when I stop in front of Sam's place and toot my horn nobody shows up to serve me, so I get a little indignant and dismount and stride into the office real dignified-like intendin' to upbraid my careless friend for his lack of attention to business. But I didn't No sir, when I found Sam he was in the back of the garage tryin' to reason with his whole force that'd gone on strike for more money and shorter hours.

Sam was just explainin' to him the rent situation and the tax situation and the competition situation and a few other situations; and his force was explain' his rent situation and grocery situation and clothin' situation, and the labor situation in other shops and so on.

I see right off that it's a bad situation all round and I sympathize with them both, but it don't do no good to argue about the matter the way they're doin' so I tell the force that Sam'll give him a answer in about a hour and in the meantime he can go on with his work if there's any work to be done, and I get Sam by the arm and lead him into the office.

When we find boxes and were comfortably seated and puffin' away on cigars, Sam loosens up and tells me his troubles. And he had enough to make him wear a undertaker-look; only his troubles were so much like the brand most everybody's facin' these days it's a kinda borin' to listen to 'em. There's so much competition he ain't gettin' hardly any work; labor is scarce, poor quality, and expensive; taxes're outrageous and rent's worse; he's already behind with his rent and the owner of the place is goin' to raise on him; and the landlord that owns his flat has raised his rent.

"Well, Sam," I say when I've listened to the old story patiently, "I coulda spelt all your troubles with four letters: c-i-t-y. And there c-i-t-y. And there's just one remedy for you: get out of it."

"Leave Detroit?" Sam asks incredulous. "Why, man, Detroit's the best town in America today. Don't she lead the world in the automobile business? And ain't I in the automobile business? Then why do I want to leave and go to a worse place?" It is surprisin' how much civic pride one finds in these poor downtrodden city-dwellers.

"But, my dear sir," I reply, "It isn't Detroit alone, it's all the large cities. They're sappin' the very life outa the people and the poor deluded boobs don't know it. Detroit's just like—"

"No it ain't, either," Sam interrupts me just like he hadn't had proper trainin' in his youth. "I've been in a lot o' towns in my time, and I'm tellin' you Detroit's got 'em all beat a mile. Why just look at the growth of our city in the last ten years. Detroit's grown—"

"That's exactly what I am lookin' at," I put in. "Detroit, and all the other big cities have grown too fast—that's what's the matter with 'em. Why do you have such a hard time gettin' labor? And why is rent so high? And taxes? And real estate? And why do you have so much competition? C-I-T-Y! that spells the whole situation.

(Continued to page 75)

Ironburners of the Circus

JOHN B. WOODS

IN total darkness the long strings of flat-cars bump and rattle in upon the sidings, their engines are loose and sent away, and the circus train has made another town. Before daylight the teamsters are out and by the time the first milkman begins to wake folks along the uptown streets the downtown pavements are echoing to the rumble of baggage wagons, pole trucks, canvas carts, and the heavy commissary equipment. Strings of gray and white horses drowsily tug at their traces as they pull the heavy loads, or stumble along toward the —railroad yards for another trip, dragging their tackle upon the slippery pavements, while the drivers nod and doze on the backs of the near wheelers. Every now and again a noisy motor truck roars past the slower draft animals, towing three or four baggage wagons or speeding back to the yards for more. For the trucks and tractors handle six loads each morning and night, while the horse teams take but two each.

Among the earliest tents to go up is a long open sided affair with a complement of several boxes of tools and three portable forges. A tie-pole is fastened along the back side of the tent, a side wall stretched in place, leaving only the front open at last, and there is the circus blacksmith shop ready for business. Three blacksmiths and as many helpers put their tools out in orderly array and their day begins. Probably the boss smith has telegraphed an order ahead for such emergency supplies as may be needed for the routine work, and early in the forenoon a local delivery truck comes along with a load of assorted materials, ranging from horse-shoe nails to timber for wagon tongues. If the show has fallen upon evil days of rain and mud there very likely is a small supply of seasoned timber for whiffle-trees and eveners, for wagons must move in spite of mud, and the usual expedient is to hook on teams until the power is sufficient, which often results in broken tackle. And like as not there will be a dished wheel to rectify before a certain wagon can pull out at night under its six or eight tons of assorted equipment or gilded finery.

Ringling Brothers—Barnum and Bailey's combined shows are a monstrous aggregation of everything in the circus line. And when they pull into town and pitch their tops there is plenty for the blacksmiths to do. Two expert horseshoers are kept busy at that work alone, while there always are enough repair jobs to tax the speed of a third blacksmith. For this outfit carries more than five hundred horses. One hundred and sixty of these are draft animals, under harness throughout most of their waking hours, and ranging in size from Shetland ponies to giant western stock and European chunks. The ring animals of course are not used for hauling wagons, but they have their trials, and they must receive skillful treatment at the farrier's hands. Of these show stock this circus carries one hundred and forty or thereabouts.

And aside from the animals that come in to be shod there are a multitude of metal things about a show to get out of order. If the bars of the tiger's cage get bent in handling they must be straightened before the public is admitted to the menagerie. Maybe the friction disks on the stake driver have been worn down until the last stake of the set-up has to go down by hand. Snatch the frictions off and take them down to the shop where there is an expansion bit and a supply of friction paper, and if the boss-man is not too busy he will cut and drill some new sections! If he is, he will tell you where you can find the stuff and you can do it yourself! Shrinking rings upon tent stakes is a filler in of spare time—when there is any, for those stakes certainly do receive a world of battering during welding chains for elephant-fetters their journey about the land. And is an emergency job that cannot wait, whenever the need arises. Then there are the trucks and tractors, with their occasional breakdowns. All in all the shop is a center of feverish activity, serving everybody from the cook to the animal keeper. And the boss blacksmith must be somewhat of a diplomat, with a thick foundation of old time bad-man underneath, to keep peace in the circus and in his own tent at the same time. Needless to say he is one of the most valuable men outside the big top.

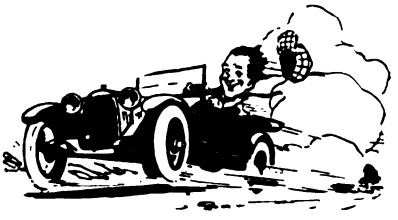
FACTS ON BELTING

When it is not convenient to measure with the tape-line the length required, apply the following rule: Add the diameter of the two pulleys together, divide the result by 2, and multiply the quotient by 3¼, then add this product to twice the distance between the centers of the shafts, and you have the length required.

If possible to avoid it, connected shafts should never be placed one directly over the other, as in such case the belt must be kept very tight to do the work.

It is desirable that the angle of the belt with the floor should not exceed 45. It also is desirable to locate the shafting and machinery so that belts should run off from each shaft in opposite directions, as this arrangement will relieve the bearings from the friction that would result when the belts all pull one way on the shaft.

High Spots



THE OPTIMIST

Who is the fellow with sand in his crop?
The Optimist.
Who goes after business and comes out on top?
The Optimist.
Who speeds up his efforts when others slow down?
Who wears only smiles tho' other folks frown?
Who keeps business swimming when it's trying to drown?
The Optimist.
Who helps boost the town and keep it alive?
The Optimist.
Who likes to see others than just himself thrive?
The Optimist.
Who knows that promoting the public welfare
And giving a lift to the other chaps there
Will help him as well to get his own share?
The Optimist.
Who studies his business by day and by night?
The Optimist.
Who's always alert for some new, better way?
The Optimist.
—Frank Farrington.

HOW DO THEY DO IT?

Advertisements are funny things sometimes for example, these, that were actually printed:

A respectable young woman wants washing.

I will make coats, caps and boas for ladies out of their own skins.

I want an overseer who can take care of 5000 sheep who can speak French fluently.

Wanted: A girl who can cook; one that will make a good stew.

I want a husband with a strong Roman nose with strong religious tendencies.

I will sell a fiddle of old wood that I made out of my own head and have wood left, enough for another.

For Sale: A small stock of the same whisky drunk by his majesty on his recent visit to Dublin.

One hundred dollars reward for the recovery of the body of Hale Short, drowned in the river on the night of the 17th. The body can be recognized by the fact that Short had an impediment in his speech.

Even the man who has money to burn will eventually meet his match.

Selfishness is a thunderstrom that curdles the milk of human kindness.

Economy teaches some people to keep everything they made except their promises.

When a fellow gets the reputation of being dead cheap even the undertaker avoids him.

Some people are puffed up with pride, others go to the expense of paying a press agent.

Sillicus—"Has old Colonel Bunkum ever done anything really heroic?" Cynicus—"Well, he has had four wives."

It's a mistake to suppose that a woman wants the last word. Some women won't even admit there is such a thing.

All things are possible. Instances have been known where men have been on the level and have still risen in the world.

Most of us ar willing to take a sporting chance, but the fellow who bets his bottom dollar doesn't always get to the top.

The difference between the profiteer and the ultimate consumer is that one is up and doing, the other down and being done.

The people who tell the truth, the whole truth and nothing but the truth evidently don't care whether they have any friends or not.

Many a man who isn't color blind can't tell black from white when it comes to a lie.

It is too bad that a man can't make a success of other things the way he can of making a fool of himself.

In the theatrical world a short run often means a long walk.

All good dancers are light on their feet. And a few of them look like they are light at both ends.

There was a time when the parents compelled the children to be obedient. But nowadays the children compel the parents to be obedient.

Once upon a time a man lived up to his wife's ideals. But he died the day he was married.

Any girl who has a muddy complexion can tell you that the peaches with the prettiest skins are not always the sweetest.

Two kinds of promises are never lived up to. One is the bride's promise to obey and the other is the candidate's promise made before election.

Modesty is often only chiffon deep.

When a man's conscience troubles him he is more likely to blame it on to something he ate.

And the man who thinks that he is a law unto himself always respects the law.

It takes a man who has never had one to tell you how to manage a wife successfully.

When a girl announces her engagement the other girls in the neighborhood can tell you that some men have mighty poor taste.

"PRESTO. CHANGE!"

Where, O where has my blacksmith gone—
My smith of the chestnut tree?
Look under that auto—'Presto, change."
Auto repairer is he.

The chestnut may be dead as e'er
Any coffin nail could be,
But brawny smith still lives and works—
O, a hale old man is he.

Once he worked for a dollar a day—
In time and change there's power,
For now he's changed to autos, at
An even dollar an hour!
—G. W. Tuttle.

No matter who a man is, you should treat him politely. The time may come when you will want to borrow money from him.

Any spinster can tell you that the fact that she is an old maid is no sign that she wasn't "asked" often enough.

EPITAPH FOR AN INTERNATIONALIST

HERE lies the body of John Smith. He was born an American; he died an Internationalist—that is to say, an enthusiast for all nations except his own.

He was constantly agitated lest his own country should grow too great, too prosperous, to proud.

His was the type of mind which education succeeds only in making turbid and cantankerous.

He did not believe in force—unless employed to supplant success by failure.

He hated war, unless for the purpose of imposing an untried scheme upon recalcitrants—then it must be pitiless.

He believed vaguely that there must be something fundamentally wrong with any system of government which has been found workable.

In political economy his notion was that the ideal wheel should have no hub; and that the direction of the vehicle should be decided by vote of the spokes.

He overflowed with sympathy for felons, bombers, jailbirds; but for the plodding honest citizen he had only a cynical smile.

All things foreign seemed to him admirable; all things at home undesirable.

As he decried patriotism as a selfish frailty; scorned national pride as weakness; spat upon flags, boundaries and homes—

And as he craved to live the broader life free from vulgar acceptations of honor, courage and chivalry:

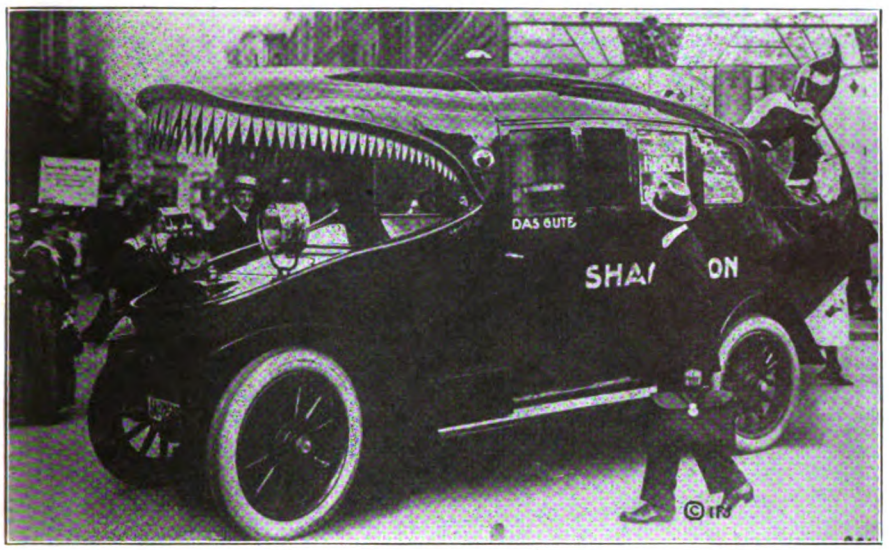
HERE HE LIES

In a land where his remains will not be disturbed by that vulgar acceptation of honor, courage or chivalry; where instead of a nation there is a flagless mob; where the wheel has no hub and the spokes vote early and often; where the last honest man was long ago murdered for his boots; where nobody is great, prosperous or proud:

REQUIESCAT IN PETROGRAD
—Sat. Evg. Post.

GOSH! THINK OF WHAT THE "MORNING AFTER" IS GOING TO BE LIKE TO THIS FELLOW

A "WHALE" OF AN AUTO



"MADE IN GERMANY" AND EXHIBITED AT A RECENT MANUFACTURERS' SHOW IN LEIPZIG

Benton's Recipes

Welding Compound—This process relates to the use of certain chemicals and ingredients which are dried and mixed to form a fine powder, and in this form are ready to apply to the iron or steel to be welded, when these metals are in a heated state and nearly ready for welding.

The chemicals and ingredients form a flux which spreads over the surface of the metal and prevents the steel or iron from burning if it be slightly overheated and in part so protects the heated surface from oxidation so that a clear, sound weld is easily secured, the flux being driven out from the joint, by means of the hammer, carrying cinder or other impurities with it.

To prepare this welding compound use the materials listed below and in the proportions specified.

Boracic Acid	11 ounces
Fused Borax	4 ounces
Fine Iron Filings	3 ounces
Fine Steel Filings	4 ounces
Carbonate of Potash	2 ounces
Chloride of Ammonium	½ ounce
Potassium Nitrate	3 ounces
Silver Sand	½ ounce

All the chemicals and ingredients given above are dried on a tray over a low flame, and then finely powdered by tamping with a hammer, and when reduced to a fine powder are intimately mixed together by sifting.

After mixing the various ingredients, unless wanted for immediate use, they should be stored in air tight metal containers.

In using the mixture, the intended weld is first scarred in the usual way, and when the parts to be welded approach welding heat withdraw each part from the fire and apply a small portion of the mixture to what will be the actual joint and then return it to the fire and bring the heat to a little less than the heat required for ordinary welding .

When the parts are then brought together, apply the hammer lightly at first, and then more heaily to complete the weld. If any part of the scarf be imperfectly welded, it can again be reheated and some of the composition sprinkled over the defective joint, and heat again to the desired point and complete the weld under the hammer.

Moisture Preventive Composition—This process relates to the preparation of a compound, the object of which is to prevent the condensation of moisture upon glass surfaces. The compound will be found especially serviceable when applied to automobile windshields, windows of engine cabs and other glass surfaces where the condensation of moisture is always objectionable and sometimes a serious matter.

Use the ingredients undernoted and in the proportions specified;—

Beeswax	24 ounces,
Japan Wax	8 ounces
Glycerine	1 pound,
Sodium Chloride (common salt)	1 ounce

The beeswax and japan wax is reduced to a liquid state over a water-bath or what is more commonly termed a double-boiler cooker; While melting the salt is gradually stirred in.

The glycerine is poured into a metal tray which has been previously warmed, so as to prevent a too rapid solidification of the waxes, when they are added to the glycerine.

The liquefied wax is then poured upon the glycerine in the tray and is rapidly and thoroughly mixed therewith. As soon as the mixture begins to set or harden, it is at once packed into metal molds of the desired shape.

The glass surface to be treated should first be cleaned and dried and the composition rubbed slightly over the surface. The glass is then rubbed briskly with a slightly warm cloth until all traces of the compound disappear.

The glass will then take on a highly polished aspect and the condensation of moisture upon the surface so treated is effectively guarded against.

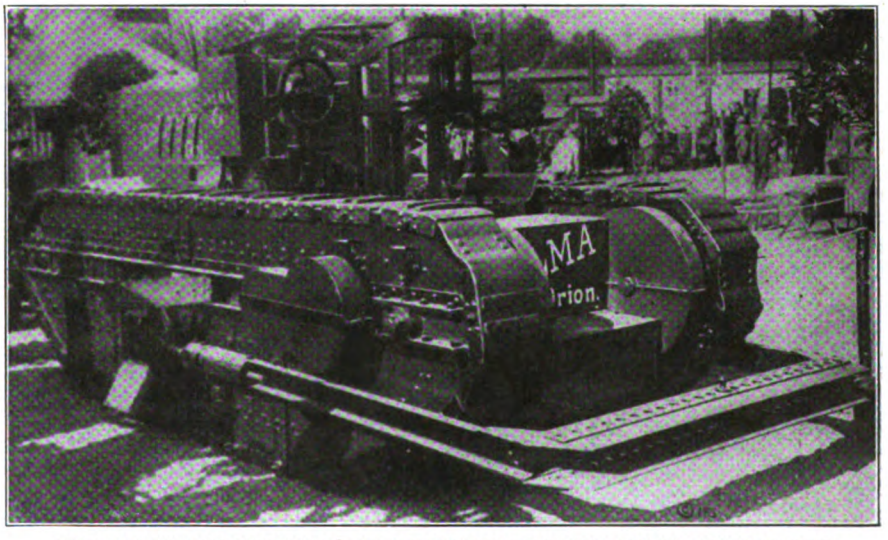
Metal Cleaning Polish—To prepare a metal polish that will form an emulsion of cream consistency, and which will not precipitate, use the ingredients listed below and in the proportion specified.

Water	10 pounds
Pine Oil	2 pounds
Sodium Olegate (Soap)	2 pounds
Silex	5 pounds

Heat the water in a large boiler, when the water is hot, but not boiling, add the sodium oleate, in small quantities at a time and continue to stir constantly while adding.

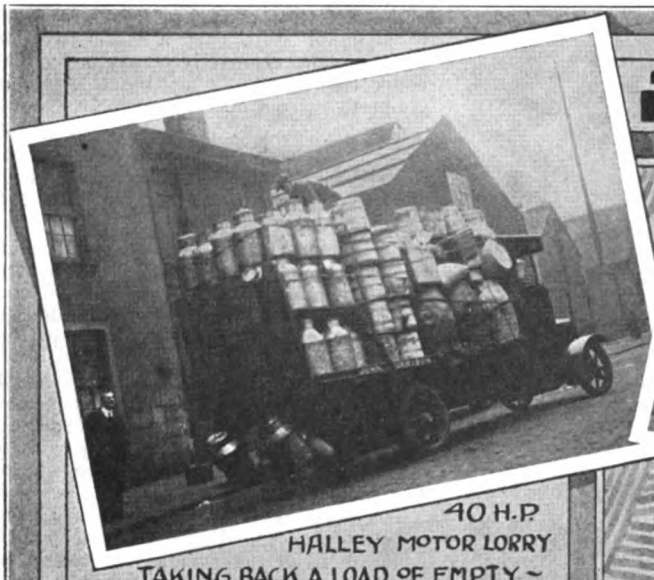
When the mixture becomes creamy or thick, add the silex in small amounts, until all of it has been placed in the mixture, constant stirring is also necessary when adding the silex to insure uniform intermixture.

The mixture should now be removed from the heat, but while still warm add the pine oil, and stir well while adding. After the oil has been added the polish is allowed to cool, and after cooling can be poured into suitable containers.



THE GERMANS MAY NOT BE "CONVERTED" BUT THEIR TANKS ARE

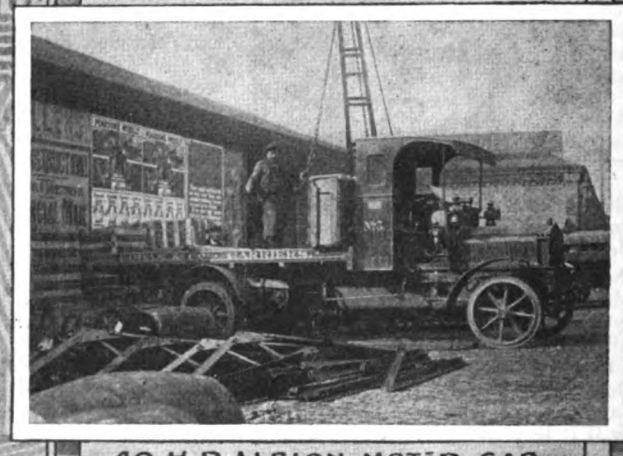
The illustration shows a corner of a Berlin exposition with a one time tank body rebuilt as an agricultural tractor. The limited size of German farms and the expense of such a machine makes their use very limited. The construction, however, is characteristically and ponderously German.



40 H.P.
HALLEY MOTOR LORRY
TAKING BACK A LOAD OF EMPTY ~
MILK CANS TO THE FARMERS DURING
THE STRIKE..

5 TON
FODEN STEAM MOTOR
LORRY 6 HORSE POWER
WITH A LOAD OF OIL FOR FUEL..

4 TON ELECTRIC MOTOR CAR
WAITING FOR A LOAD OF PETROL
AT THE DOCKS..



40 H.P. ALBION MOTOR CAR
DISCHARGING HEAVY CRATES
OF GLASS FOR
SHIPMENT..

35 H.P.
BREAD VAN
TAKING BREAD BY ROAD
DURING THE RAILWAY STRIKE..

25 H.P.
BELHAVEN TAKING
FRUIT BY ROAD DURING
THE RAILWAY STRIKE..

How Motor Trucks Helped Break the Railway Strike

JOHN Y. DUNLOP

When the British Railway workers went on strike, they figured that the Nation was at their mercy, but volunteer workers and motor truck owners proved them to be wrong—consequently the strike was of short duration. Mr. Dunlop's article tells something of how it was done.

HIGHWAY motor transportation proved itself in the war and it has proved itself triumphantly in peace by enabling us to carry on both the food and commercial transporatation of a nation with the railways in inforced idleness through a strike of its aperatives.

By means of motor transportation during the days of the strike, apart from their normal traffic, the highway carried a sufficient proportion to insure a sufficient supply of foodstuffs and other essentials while volunteer railway workers were making trial runs. The smooth working of everything hinged on the complete success of the highway transports at the instant the strike was sprung on a long suffering and strike bedeviled public. If that service had failed, many would have doubted our ability to see the things through because we would have been pinched on the instant the strike was called.

Members of the union concerned with motor driving who were contemplating sympathetic action with the railway men had immediate and ocular demonstration of the fact that there were two men or women ready to take each man's place when it came to transporting for the community. In this age of motors no man possesses any secret because he can drive a motor vehicle. Hundreds of thousands who do not earn a living at that business can drive and will always be found eager to do so in event of national necessity.

The railway strike has taught us the vital need of good roads for there is no use in having motor vehicles with the drivers and the fuel for them if the arteries of traffic are choked or of such poor construcas to speedily wear out the transporting mechanism. There were many problems in the formation of the hurriedly made schemes for the transportation of food and it was a bit lucky for the nation that the government was able to commandeer thousands of motor vehicles.

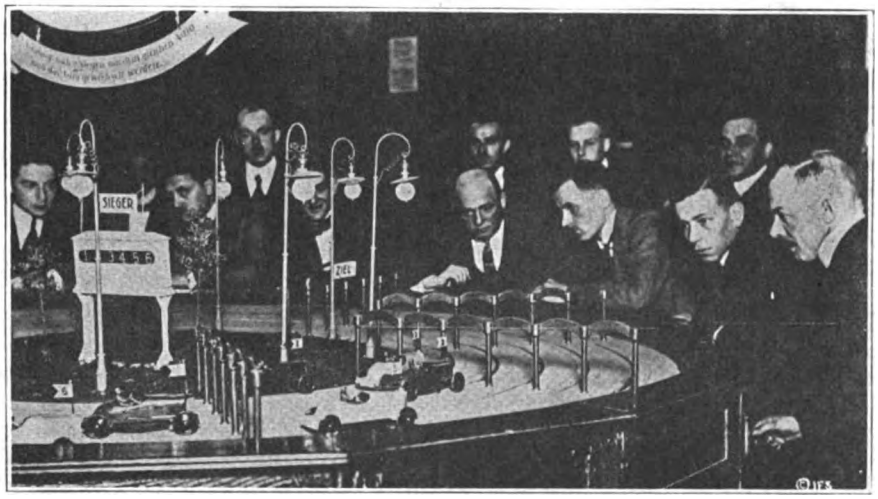
The strikers stopped work at midnight sharp on the evening set with the result that night trains which usually brought forward milk, fish, and other perishable products for the morning markets were stranded. In many cases the fish at that time had not yet reached the railway station at the port of landing and in those cases the government had a fleet of motor trucks at once at the various seaports. On the West coast these trucks were traveling as far as 100 miles for a load of fish while on the East they were working a radius of 60 miles. From these ports on the Firth of Fourth a motor truck was able to make two trips a day.

The Food Commission after the first day of the strike, was able to advise all fishermen that this class of food would only be collected from ports on the West side of the Firth so that many of the steam and motor trawlers by bringing their load of fish to the required ports were able to assist the government in bringing in a normal supply of fish to the large centers.

Another very difficult system of speedy transport was the handling of the milk supply to the city of Glasgow. During the first hours of the crisis the government commandeered 100 heavy motor vehicles to bring forward the regular supply of milk to the wholesale dairies. Usually this food was all brought by rail, the farmer delivering his milk to the station himself throughout the dairy farming sections. Thus the motor trucks had to collect from those railway stations, many of which were at least 100 miles from the city. What led to much inconvenience on the first morning of the strike was due to the farmers who learning there were to be no trains that day took their products back to the farm with the result that the motor vehicles had to do a great deal of hunting around before the were able to get full loads. In most cases the milk was brought forward to the two principal railway stations in Glasgow, which were the distributing centers from which both wholesale and retail houses received their supplies.

The scene in the morning at one of these stations was a very busy one, with motor after motor coming in with its load, while on both sides of the entrances were the smaller motors for distributing the milk throughout the city. The unloading and placing of cans on the

THE LATEST GERMAN GAMBLING GAME



The photo shows the latest game of chance being indulged in by German gamblers. It is an automatic miniature automobile race and is played by six people each time. The players pay five marks each, the winner getting 15 marks, the second five marks, and the balance of 10 marks goes to the owner. One of these games netted the owned 60,000 marks in one month. The word "sieger" means winner and the word "ziel" means end

smaller vehicles was all done by the dairyman and his assistants. At first there was considerable confusion in getting the empty milk cans returned to the farmers but this confusion was speedily adjusted.

The fruit trade was, for a short time inconvenienced and food of such a perishable character would have suffered badly without the prompt assistance of the government. Practically all of the produce from the surrounding counties was brought to market by road and reached the markets as promptly as before the strike. Each truck carried a load on every trip as the Director of Transports could always find a load of necessities for the return trip. The distribution from the markets was also undertaken by motor but as this was more of a regular trade no special arrangements were necessary.

During the short time the strike was in progress, all types and classes of vehicles were on the road and it is said, that many districts saw fleets of motor trucks for the first time.

The petrol, or gasoline driven vehicles were in greatest demand although steam driven tractors and an occasional electric truck were by no means inconspicuous.

During the strike both gasoline and traffic regulations were suspended and gasoline was released in reasonable quantities to all consumers, private and otherwise. There was a local shortage of motor fuel for a day or so but the deficiency was speedily made up.

The whole system of highway transportation of food worked with admirable precision and smoothness and I am sure that the Food Commissioner must have been very grateful for the splendid and enthusiastic manner in which the transport workers assisted him.

The Right Way to Carry Out One of the Most Important Repair Jobs on Car---Some Kinks that Save Time and Insure a Good Job

For Brakes of 10″ to 16″ in diameter, cut Lining 3/8″ longer than Brake Band.

The Ends are attached first, allowing the Lining to bulge in the center (see Figure 1). To attach the ends, mark the position of holes by piercing the lining with

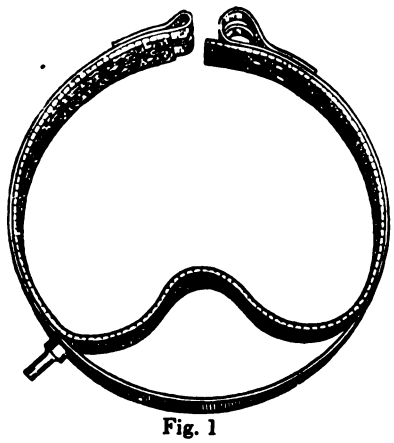


Fig. 1

an awl. Drill the four holes (two in each end of lining), the countersink the hole so that the rivet head (use solid rivet size 10/16) will be at least 1/32″ below the surface of Lining. Use tapered countersink (see Figure 2).

Then holding ends of Lining in position so that holes in lining and brake band coincide, put rivets in place, heads to be on lining side. Head over end of rivets, using anvil (See Figure 3), which is secured in vise, small end up, having head of rivet rest on anvil, heading the rivet with hammer, using hollow rivet set ,see Figure 4). After flattening Lining against band (see Figure 5) locate holes. Drill Lining and countersink as before, using tubular rivet countersink (see Figure 6). Use tubular rivets size 8/16″ and heading over with tubular rivet set, see Figure 7).

How to Line Internal Brake Bands—Cut Lining ½″ shorter than Band in order to stretch Lining tightly around band. Drill and countersink end rivet holes, then place Band flat on bench with open end away from you. Put in two

Fig. 2

Fig. 3

Fig. 4

solid rivets in **upper** rivet holes **only** at each end of band (see Figure 8). Do not have lining wrapped around band when attaching these rivets. Head over solid rivets as before, then force rest of lining around band (see Figure 9). Insert solid rivets in two remaining holes in end of band and head over. Then proceed to attach balance of lining, using tubular rivets by same method as used on external Band.

How to Reline Ford Transmission Bands.

In attaching lining using split rivets, start at one end and work toward the other end, securing one rivet at a time by forcing it through the lining with the head on the outside and coming in contact with the steel band. When split rivets are forced through band and lining, the points of rivets will protrude just enough to permit turning over with a hammer and set.

HARDENING TAPS AND DIES

When a die becomes worn or a tap will not cut, you must either grind the tool or if grinding is impossible, let down the temper and file the cutting edges sharp, after which retempering is necessary.

It is quite easy to anneal a tool so that it may be filed readily. Just heat to a dull red, bury the tool in the ashes and dirt of the forge and leave it there to cool very slowly overnight or daytime until cold enough to handle.

But when heating the tool for hardening, a good deal of the corner sharpness may be burned off during the heating operation and it is best to guard against such deterioration by protecting the tap or die as far as possible from the action of the atmosphere while the tool is hot. To prevent this, fireclay can be smeared over the sharp corners of the tool, or even better, it can be heated inside a short length of steam pipe.

TRAGIC HUMOR ABOUT THOSE CARS OF YOURS AND MINE

F. H. Sweet

"LOOK here, you," called the motorist angrily to the dealer of whom he had bought the tire, and who refused to replace it. After only 200 miles of use it had blown out from a glass cut. "You guaranteed this junk for 3,500 miles."

"I did guarantee it for 3,500 miles against defect or actual wear," replied the dealer, who had been through with it before; "but no man can guarantee that a motorist will not run over a bottle that some one has thrown in the road, or one that he has carelessly left in his back yard. The manufacturers cannot assume responsibility for things that depend upon drivers. When you or any other driver gets a tire cut, that is your ill-fortune and you should have it vulcanized at once so that water will not rot the exposed fabric and cause it to blow out, as your tire did. This will cost something, of course, but it will usually save the tire, if done promptly."

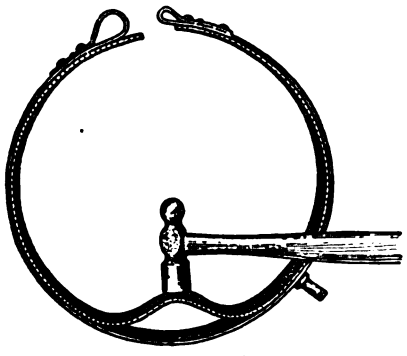


Fig. 5

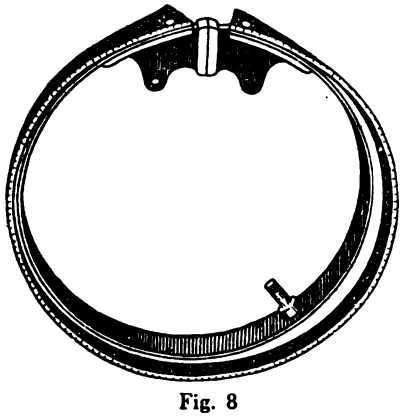


Fig. 8

The matter brought up here occurs all too often. Every one who owns a car should use his influence to secure laws (and then the enforcement of these laws), making it a crime to throw empty bottles in a public road. Then all motorists should be careful about driving in back-yards and by-roads. These are real jungles for lurking tigers and other beasts of automobile prey.

Sometimes through carelessness, or in looking for a bargain, the motorist will purchase straight side tires for use on clincher rims. In such case the side walls are almost sure to be cut or chafed and the tires ruined. If it is necessary to use a straight side tire on a clincher rim, first fit filler heads into the rim clinches.

"Eh? Car misses? Doesn't pick up?" asked the trouble man, thoughtfully and casually laying a screw-driver across the spark plug head.

"Oh, it isn't the spark plugs," laughed the owner scornfully. "I scraped the points bright and opened them a shade so as to get a good fat spark; and it didn't help things at bit. Besides, you can see for yourself what strong sparks jump off the end of that screw-driver when you hold it almost touching the cylinder head. No; it must be the carburetor; and you fellows have got to give me a new one."

"Certainly, certainly!" agreed the trouble man, with a cheerful smile. "But suppose we try the car on the road."

"All right; but wait till I get my overcoat."

Half an hour later the owner jerked out his gears, snapped off the switch and faced the trouble man.

"Say, now, what **did** you do to this car while I was getting my overcoat? I wasn't three minutes, but it runs better than it ever did."

"Why, I cleaned the spark plugs; that's all."

Now this is a true story, or, rather, a lot of true stories; for as every repair man knows, dirty or defective spark plugs are the cause of at least nine-tenths of all gasoline engine trouble.

There are four things to do in case of trouble: First, Take out the spark plugs, one at a time; connect the wire to the top, hold the side of the iron bottom of the plug against the cylinder, and crank the engine. If no spark, or only a weak or occasional spark, jumps the points, unscrew the plug in the middle; wipe and scrape clean the insulating parts. Second; See that the wire connections at the top are tight and clean. Third; If you still do not get a good spark, the insulating material is probably cracked or broken; you must put in a new plug. Fourth: If you still don't get results, the trouble is somewhere else—in the wiring or the magneto; but that won't happen once in a hundred times.

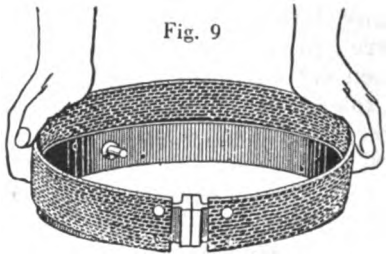


Fig. 9

If the automobile driver always knew when he was going to skid—why, he wouldn't skid. But skidding is such a sudden thing that the driver has to be mentally prepared so as to do automatically and quickly the thing which will prevent accidents.

First of all, drive **slowly** when going over a greasy or wet, slippery pavement. Be careful not to get into tight places or too close up behind another car, so that the use of the brakes or quick steering necessary, as either of these may cause skidding. As soon as you see the first sign of skidding, release the clutch immediately. If that is done promptly, the car will right itself in many cases. Apply the brakes only when the car has recovered a straight course. When you release the clutch, steer the front of the car in the same direction that the back of the car is sliding. This helps to recover a straight course and permit the application of the brakes with safety.

Fig. 6

Fig. 7

We can not afford to be so careless with our tires as we once were. For example, a friend and myself came to a newly-built section of tarred road, top-dressed with stone screenings. My friend was in a

hurry, so he drove at a good speed over this for five miles or so, with apparently no damage. But, ten miles farther on, a tire blew out; then another—another—all four within twenty miles! The fine slivers of stone worked in like so many lath nails, and his casings were practically ruined. Now, when my friend or myself hit such a road, we slow down and pull over on the dirt shoulders. At the first chance, we turn off into some byway, even though it adds many miles to a trip—and I advise you to do the same.

When ever you take a casing off, especially an old one, examine its interior surface carefully for cracked places in the fabric. If one is found, slip a blow-out patch under it when you put the tire on.

Non-skid tires, with their heavier tread, should be used on the rear wheels of all cars; the strain is far greater back there. When the casings wear thin, they can be shifted to the front wheels, or carried as extras, while new non-skids are put on the rear wheels.

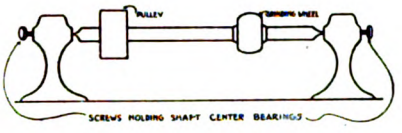
A little cut in a tire doesn't alarm us, and we let it go; but sharp sand and stone chips enlarge it, bit by bit, until—bang! If we had filled the cut, using one of the small vulcanizing outfits on the market, we would have added many hundred miles to the life of that tire.

Many inner tubings are ruined by the sudden application of the brakes after a puncture or blow-out. When this is done a heavy strain is thrown on the tire when it is in no condition to resist it, and the result is an inner tube torn beyond repair. It is always better to shut off the power and stop the car slowly.

Very often when a motor is hard to start, the trouble may be found in the commutator.

The average man will thoroughly oil the commutator if he happens to see it. If much oil is used, the contact points soon becomes gummed and the current fails to make a circuit. When the motor stands a while the oil congeals and usually a great deal of cranking has to be done before it is worn away. Especially is this true in winter.

When your tractor or automobile motor is hard to start, remove the commutator and examine it before condemning the ignition system. If the commutator is dirty, wash it thoroughly with kerosene and then brush the contact surface lightly with gasoline. When the parts are cleaned, never use more than a drop of two of oil every 200 miles you run your car.



RAZOR POLISHING MACHINE

Be a lifter. The world is made up of lifters and leaners. And while the leaners may get through the world a little easier they cannot respect themselves, and surely they are not respected by other people. The man who lifts a load is a producer of energy. The man who produces nothing is not only a leaner, but a parasite.

POLISHING RAZORS

E. M. Peterson

This article has to with polishing and finishing the completed blade which is done after it has been concaved or hollow ground.

After the final grinding the blade goes to the buffer and receives a roughing over before it receives its fine polish. A cloth wheel coated with glue and fine emery or fine emery mixed with melted tallow and applied to the wheel gives good results for this polishing but crocus seems to be superior to anything I have used for the purpose as it gives a fine silvery color to the blade.

The polishing wheel is small and is located on the end of the spindle as shown in the sketch. The spindle is mounted between centers in the same way that a piece of steel is supported between centers in a lathe and such an arrangement makes it possible to slip this wheel out and use some other polishing or grinding wheel without the necessity of several machines and in this way all sizes and shapes of wheels may be used on the same machine.

These spindles run at high speed and to do effective work should operate at from 10,000 to 12,000 r.p.m.

At the completion of the final polish the handle is put on. A small brass washer should be placed between the inside of the handle and the blade on both sides before the handle is riveted on. These small washers make the blade solid in the handle. The next and final operation is the honing and to do this properly without leaving a feather edge after it has been hon-

This dairy farmer lives 15 miles from his market and he can make the round trip in less than two hours. Still there are those feeble minded enough to want the farmer to sell his flivver and drive horses—merely to create business for the horseshoer, and of course the horseshoer would like nothing better, but our farmers, wise in their day and generation, are buying every year more passenger cars, tractors, trucks and other mechanical devices to lighten his tasks and permit him to enjoy some of the pleasures and comforts of life.

ed and stropped requires considerable skill. This is cured by drawing the edge over a stick of wood or across the finger nail of the operator and it usually comes O. K. after honing and stropping again. If the razor has come this far without reason for rejection it is cleaned thoroughly and is ready for use.

BE SURE OF YOUR PARTNERS

Many young men are entering into a partnership for the sale of automobiles or supplies, or both, who know little or nothing about the men with whom they go into partnership. They have met casually, we will say, and find themselves mutually interested in auto goods. Each has a little money, and a partnership is organized. Perhaps they know what they are doing and perhaps not. Possibly both understand the liabilities they are incurring, though it is more likely they have not given that a thought. In such a case they are not only assuming all the risks of the business, but also the unknown quantity of the other's stability.

In partnership law it is well to emphasize a serious disadvantage of one partner being liable for so many things which the other may do, such as acts of spending the firm's money, injuring its reputation, and even destroying the business without the first partner's knowledge. For this reason it is well to be careful in taking a partner or partner's making sure that they are trustworthy and responsible. In partnership no specific authority needs to be given to a partner to do the sort of things mentioned. The very fact of partnership creates the authority, because one of the fundamental principles of partnership is that every partner is the agent of all the others, and being their agent can bind them to what he does.

A recently handed down decision right on this point is both interesting and sufficiently valuable to discuss briefly here. It shows clearly how the danger mentioned may work out. Abrams & Burt, we will say, were in business as partners for the sale of automobiles and supplies. A customer of the firm, Card, owed it for an expensive machine, and not being able to pay he turned over certain securities to the firm in order to protect it until the debt was paid. The securities, incidentaly, were worth six times as much as the debt. A few weeks after this, the firm got into a tight place financially and one partner without the knowledge of the other raised some money by selling Card's securities. The proceeds were used for the benefit of the firm, but Burt was ignorant of the whole transaction. In a little while Abrams & Burt went into bankruptcy paying a small dividend, and it looked as if the securities were gone forever. But, sometime after being discharged as a bankrupt, Burt came into some money, and the owner of the securities began suit against him to recover his losses. Burt defended on two grounds: First, he was not liable because he did not know about the securities being sold by Abrams and had no part in their sale, and, second, even if he were originally liable, he was freed from liability by his discharge in bankruptcy.

He was overruled at both points. The court held that a discharge in bankruptcy was not a release from all debts, particularly those arising "for wilful and malicious injuries to the person or property of another." As for the plea that he was not liable because he was ignorant and innocent of the sale of the securities, the court said this "that partners are individually responsible for torts (wrongful acts) by a firm when acting within the general scope of its business, whether they personally participate therein or not, we regard as entirely clear. If, under the circumstances here presented, the firm inflicted a wilful and malicious injury to property, of course, plaintiff in error, Burt, incurred a liability for that character of wrong."

All cases laying down this principle lay great stress on the requirement that in order to bind an innocent and ignorant partner, the act complained of must have been done within the general scope of the business. For instance, take a partnership in business to sell automobiles. Suppose a manufacturer sends a thousand dollars' worth of supplies to the firm as agent to be sold for the manufacturer's account and proceeds remitted. The goods are sold and Austin, one of the partners, puts the money in his pocket and absconds. The other members of the firm will have to make up the loss because their partner's act was done within the scope of the partnership business. But suppose Austin had been handling the consignment business on the side. It was his own enterprise. The regular business of the firm, let us say, did not include anything like this. It was a retail business, and bought and sold in the regular retail way. In this case Austin sold the goods and departed with the money; his partners, even though he had used the firm's name in the transaction, would not be responsible in the least. The act would then not have been done by the partnership in the general scope of its business.

There are many cases where totally innocent partners have been made to pay back money which a fellow partner had raised on a note in the firm's name and put in his pocket.—F. H. Sweet.

DO YOU KNOW?

Do you know the young fellow who works for $25 a week and who is wearing a new winter suit that cost $85?

Do you know the wage earner who loafs because he is afraid if he does too much he'll "work himself out of a job"?

Do you know the housewife who is ashamed to be seen with a market basket on her arm or to carry home a brown paper bundle?

Do you know the manufacturer who, when the price of raw materials and overhead goes up 5 per cent. and the cost of labor advances an equal amount, adds twenty-five per cent. to the price of his goods?

Do you know the factory girl working for $18 a week who is buying and wearing a $350 fur coat?

Do you know the man who lets a fresh clerk sneer him into buying a $15 hat for fear he'll seem "cheap", when he can buy a satisfactory one for $7?

Do you know the investor who has traded his Liberty Bonds for a promise of a hundred per cent. profit in a stock company backed by a dishonest promoter?

Do you know the married couple who do not think enough of their children to buy War Savings Stamps for them and to teach them to save?

Do you know the shopper who says "Wrap it up", instead of "How Much?"

Do you know the person who lets the desire of the moment destroy the results of days and weeks of thrift and saving?

Do you know the man who thinks it is not necessary to save?

Do you know the man who says that the government savings securities, Liberty Bonds, War Savings Stamps and Treasury Savings Certificates are too slow or too small or too old fashioned for his investments?

IF YOU DO, YOU KNOW PRETTY WELL WHAT IS THE MATTER WITH THE UNITED STATES.

The Ford Time Gears

SINCE in a four cycle engine, each cylinder fires at every other revolution, it is necessary to run the valves and spark timing device at one half the speed of the crankshaft. This reduction in speed is accomplished through the small gear on the crankshaft meshing with one twice the diameter on the camshaft. There is no adjustment on the center distance of these gears, their location being determined by the accurately machined line bearing and the camshaft bearing holes in the cylinder block casting. The gears are carefully machined to within limits which will assemble properly between these centers.

The method used in correcting a noisy gear or a "noisy front end" as it is generally called, is to change the large time gear, selecting one which meshes properly with the small gear of the crankshaft. Us-

Fig. 1

ually one change of gears will suffice. However , it is occasionally necessary to try two or three before the proper gear is found. At times one will meet with noisy gears which are caused by a sprung camshaft, the camshaft having been sprung by some foreign substance getting between the gears, careless workmanship in changing the commutator brush, or more often in removing the gear cover without moving the fan pulley to allow sufficient clear-

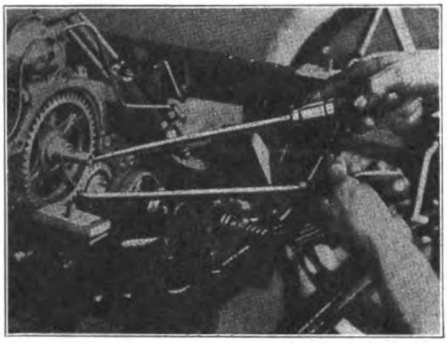


Fig. 2

ance between the camshaft and the cover.

To expose the time gear properly it is first necesary to remove the radiator. The fan adjustment screw, in the cam gear cover, is then backed out and the assembly is removed by running out the bolts which hold the bracket to the cylinder block. This bolt is locked into place with a cotter pin on the back of the time gear case. This pin must be removed before running out the bolt. When the bolt has been withdrawn the fan and bracket assembly is removed and the belt is brought forward on the starting crank.

The commutator with wires and pull rod is next removed and swung up over the back of the gear case. To remove the commutator, loosen the cap screw which holds the commutator case spring to the breather pipe and swing the spring out of the way, after which the case may be pulled forward.

To remove the fan pulley, withdraw the cotter pin from the starting pin, which extends through the crankshaft, inside the pulley. There is a large and a small hole in the pulley. Insert a drift pin through the small hole and drive the pin out as shown in Fig. 1. When the pin has been removed the pulley is brought forward by a special tool for the purpose or by forcing it first on one side and then on the the other with an ordinary bar or cold chisel. It is not necessary to remove the pulley from the shaft, simply move it far enough forward to allow the cover to be taken off with out springing the camshaft.

Next remove the commutator brush assembly. To do this run off the nuts which holds it to the shaft, remove the cap and withdraw the pin which locates the brush on the shaft. The later brushes have a groove on one side only and the later camshafts are drilled only half-way through, making it imposible to set the brush the wrong way. The earlier Ford brush had a double groove and the pin extended through the shaft. It was therefore possible to install the brush 180 degrees half of a circle) out of the way. As a new style roller may be installed on an old style camshaft, the repairman should note the position of the brush so he may replace it in its original position. It is well to put a punch mark in the end of the shaft on the side toward the roller or brush After the pin has been withdrawn the brush may be withdrawn from the shaft. Should it stick, turning it back and forth will usually break it loose. If necessary, insert a screwdriver behind the brush and force it off.

On the later Ford models a commutator shield is assembled behind the brush. When this shield has been removed run out all the cap screws in the cover and take it off by bringing it forward until it touches the pulley and then leaning it over until it clears the end of the camshaft. The gears have now been ex-

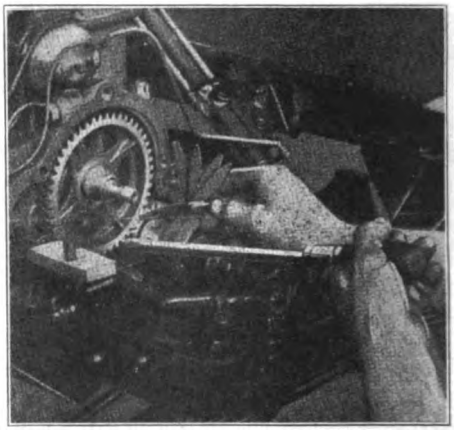


Fig. 3

posed for examination or removal.

The new gears are assembled with .005 to .005 inch "backlash" (space between teeth) while repair jobs may have as high as .006 inch. The experienced man may judge the back lash by twisting a bar between the teeth of the gears and watching the movement, as shown in Fig. 2. The accurate way of checking this is to hold the teeth to one side with a screwdriver and insert the feeler between the free sides of the teeth as

shown in Fig. 3. Try the gears at several points to find any high spots, that is, a spot where the gears mesh tighter than in the other parts of the gears If a high spot is found, mark the gear with chalk at the point where it meshes with the small gear. Remove it from the camshaft by running off the lock nut with a wrench, after which the gear may be forced off with two screw drivers as shown in Fig. 4 or it may be pulled with a gear puller as shown in Fig. 5.

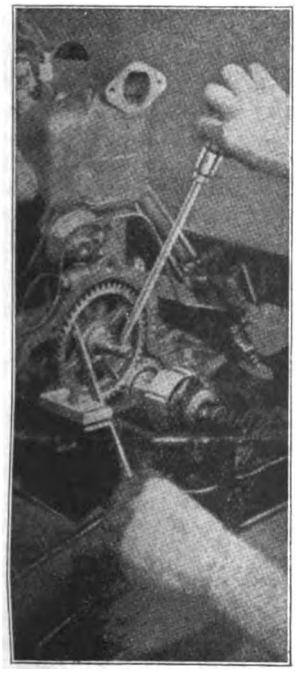


Fig. 4

When the gear has been removed it should be examined for a burr (raised spot) on the teeth. If there is a burr, remove it with a file, replace the gear in its original position and try it again. If no burr is found replace the gear in the camshaft turning it to a position opposite to the one in which it originally meshed with the small gear. Force the cam gear onto the shaft with the nut and try the play between the teeth. If the high spot still shows, the trouble is probably in a sprung camshaft. If there is plenty of play the trouble lies in the gear and will be overcome by replacing it with a new one.

THE LURE OF THE VILLAGE

(Continued from page 64)

Now, if you had this establishment in the country—some thrivin' little hamlet such as I could point out to you—your rent would be—"

"And what would I do with a garage and fillin' station in the country!" Sam puts in in a peeved way. "If I'm goin' to get my business from automobiles I gotta be where automobiles' are"

Sam never finished that sentence. At this juncture a dudeish-lookin' little runt steps in and Sam looks like the sheriff's come with the papers. Sam introduces me and I see right off that he's the agent for the landlord and he's after Sam's scalp.

He don't even take time to remark about the weather, but asks Sam right point-blank if he's prepared to pay the rent. Sam looks at me helpless-like and I just naturally have to intervene in behalf of a friend.

"Beg pardon, Mr. Thunderhead -er-Thunderberg," I say real suave, "but what rental do you extract from my friend here for these premises?"

He looks at me like it's none o' my business and snaps out, "It's been $125 a month; it'll be $150 beginning October first."

"And I suppose that you would experience no serious inconvenience should said friend decline to pay the stated sum, but should rather vacate the premises as a protest at what he might consider your extortionate demands?"

But Sam wouldn't give him a chance to reply to my interrogation. "Ha; Ha; Ha," he tries to laugh as if it was a joke. "Don't pay any attention to him, Mr. Thunderberg. The rent'll be all right. I know they're raisin' all over, and what you ask is perfectly reasonable considerin'—"

"Pardon the interruption, friend Samuel," I interrupt, "but the fact is you already owe Mr. Thundercloud-er-Thunderbag-I beg pardon, Thunderbag—"

"Thunderberg" the landman offers real icey, like he thought I was doin' it on purpose.

"Thunderberg! Thanks, Mr. Thunderbug. As I was saying, Samuel, you already owe Mr. Thunderbolt—ah—Thunderbird — a certain sum, or sums, of money, do you not? Yes, and, pray Mr. Thunderberg, what action do you contemplate taking in case my client fails of payment, and at what time do you purpose performing said action?"

"I don't know that you've got anything to do with it," the land-agent says somewhat impolite, "but I don't mind telling you that Mr. Spraks will be given notice to vacate at once if he is not prepared to pay up in full and give assurance that he will not again fall into arrears."

"I see. And what do you say to that, friend Sparks?"

"Why, that's perfectly all right, Mr. Thunderberg," Sam says hastily.. "Nothin' more than I expected. But I'll be able to settle up with you in full the first of next week. I have some money comin' in—"

"That's all right, Sambo," I cut in on him, "but I'm goin' to settle up right now with Mr. Thunderhard—er— Thunderlou — Thunderbig! and he can rent this joint for $200 next week for all we care." And I produce my roll and pay up to Monday of the followin' week for Sam.

"Sam will vacate the establishment Monday morning, sir," I go on, so you can just give him a receipt in full."

Sam tries to put in and tell the man that he has no intention of vacatin', but I cut him with a look and the fellow writes out the receipt and goes out lookin' real mad.

When he's gone Sam breaks down and almost cries. He woulda cried I'm sure if he hadn't been so busy callin' me names. I let him get it off his system and then I gently elucidate my plans and purposes.

"Now Samuel," I begin real mild, "You might stay here till judgment day and you'd still be in the same fix—always just barely pullin' through. You are located

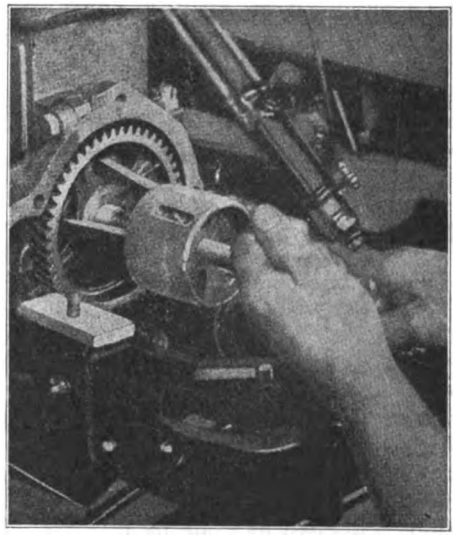


Fig. 5

where there is traffic, it is true, but of the thousand cars that pass your place every day only about five stop for gas and, say one for repairs There's too much competition. You seldom ever sell a tire or a horn or a tube of cement—the folks go to the accessories dealers. And as

for sellin' a car; you never even think of such a thing. And with it all you're payin' outrageous rent, tax, wages and livin' expenses.

"Now you're goin' to move to a certain little village I know of called Gordo. It's a thrivin' little place of about five hundred folks, nine hundred dogs and a hundred and fifty Fords. Besides there's a lot of farmers all around that've got cars and tractors, and they have the worst roads I ever saw in my life. There's not a garage nor a fillin' station within ten miles o' the place.

You will proceed to set up your establishment, sell gas, accessories, and automobiles; do light and heavy repair work, and act as superintendent of the Sunday School. Your rent will be almost nothing and your taxes less, and what labor you need can be had at not more than half what you are payin' here. When you get ready to build you a home, you will erect a nice brick structure for about five thousand instead o' buyin' a little frame bungalow here for ten thousand; and you'll have your own vegetables, fruit, eggs, milk and butter, and when you kill hogs in th fall I shall expect an invitation to eat spare-ribs and fresh sausage—"

Enough's enough. Sam didn't like the idea a little bit, but I had the advantage and used it.

And how did it all turn out? Why haven't you heard of the Spraks Auto & Garage Co. of Gordo? Most everybody has, for Sam's a mighty wellknown and prosperous man these days.

HANDLING SOFT CENTER SHARES

In dealing with soft center plowshares there are three points that the blacksmith should pay special attention to. These are heating, hammering and hardening.

Regarding heating, it is advisable that only that portion of the share which is to be hammered should be heated. This can be done by laying the share down flat with the edge over the center of the fire and filling up the underside with green coals. This keeps the greater part of the share cool, thus preserving its shape. The common mistake is to put the share in the fire in a vertical position with the edge down. The objection to placing the share thus is that the result is a heating of too much of the share. In consequence, we are apt to have warping and distortion.

Second, hammering should be done from the upper side, the bottom of the share having been laid flat on the anvil. This keeps the cut-steel of the upper surface over the soft steel in the center, thus preserving for the share a hard cutting edge. Shares receive the most wear on the underside. Pounding the share at this point exposes the soft center steel and it has a tendency to work the cutting edge out of shape. As soon as the point of the share has been hammered to the proper shape, we may weld on a piece of steel to the top of the point. But in carrying out this, we should be on our guard lest we spoil the scouring qualities by denting the share in our hammering.

One of the leading makers of soft center shares gives dull cherry red as the correct hardening heat, but we must recollect that dull cherry red varies with the vision of the individual blacksmith. One successful method of hardening the soft center share is to draw the share through the fire slowly with the cutting edge down until the edge has been heated to the proper color. Then draw the share from the fire, put the point into the ground far enough to hold up the share, and let it stay there till it cools.

THE COMPOSITION OF STEEL

Steel is principally made up of grains or crystals. If the steel contains just about 0.90 per cent. of carbon, then it will consist simply of grains or crystals of pearlite.

A grain or a crystal of pearlite is made up of alternate layers of cementite and pure iron. Cementite contains both carbon and iron.

If the steel contains more carbon than 0.90 per cent., then the grains or crystals of pearlite will be separated by films of cementite.

If the steel contains less than 0.90 per cent. of carbon, then the grains or crystals of pearlite will be separated by films of pure iron.

When steel is heated above medium cherry red, the grains or crystals grow and the steel loses strength. They may be made small again by forging or may be reduced by annealing.

To anneal steels containing 0.40 per cent. of carbon or more (medium hard and tool steels), we heat a little higher than the point where a magnet loses its grip.

To anneal steels that contain less than 0.40 per cent. of carbon (soft steels) we must heat up beyond the magnetic point—and the less carbon, the higher we must heat. The magnet loses its grip at about medium cherry red for tool steels. For softer steels it holds on for higher points.

To restore the quality of overheated steel containing more than 0.40 per cent. of carbon, heat up the steel from a comparatively cool condition—black, for instance—until it reaches the point where the magnet loses its grip and then heat a trifle higher.

THE WELDING ROD

To build up the welded section we must add material in the form of a rod or wire. The weld should be as nearly as possible the same material as the original metal so it is necessary to use care in the selection of filler rod.

The rod may have certain alloys in it to offset the action of the high heat of the torch. We may use mild steel of a very low percentage of carbon to offset as much as possible decarbonization, and as the case may be, incorporate in the rod certain agents, such as silicon for cast iron and phosphorous for copper. Hard welds in cast iron, steel welds deficient in strength or porous, copper joints brittle and aluminum goods are liable to contain a large quantity of oxide, unless the welding rod is correct. The welder cannot judge the rod by its appearance or wholly by its action under the welding flame and the purchase of the rod, so often made in a carless manner, should be one of careful choice.

We must not be guided by price quotations in the purchase of welding rods; we are not able to specify simple cast iron or steel, aluminum or copper rods, but should purchase the welding rods to weld these various metals which are specially prepared by technically trained forces understaing fully the chemical as well as the mechanical requirements.

Make an inducement in the way of discounts, or cash prices for those who do not ask for extended credit. Some shops are charging at the rate of fifty cents a month for the use of a charge account, whether it be large or small.

Queries-Answers-Notes

THIS department is the meeting place where you are free to ask for information, answer questions, discuss shop matters and business conditions and any other notes you feel would be of interest to a fellow mechanic. Make use ofthis Department as often as desired.

How to Do It.—In the October number we published a communication from a Canadian blacksmith reader who was interested in knowing how he could get into the automobile business as both he and his son were tired of shoeing horses. The Editor invited the views and suggestions of other readers on the matter and to date only one has "come across"—Bert Storey, of Michigan, who knows what he is talking about, and this is what he has to say:

"In your October number I note there is a very interesting article signed 'H. C. R., Canada'. The person writing the article states that there are about 200 cars passing his place daily and it is a very peculiar thing that he has not stopped 50 of those cars, as the business belongs to him if his building is anywhere suitable for automobile work. Don't rent your shop but flop her over. A good smith can certainly retain his old customers and it isn't necessary to let them get too far away.

"This would be my advice to the brother:—Install a free air service, get a good standard line of tires and tubes to sell, carry patches and repair inner tubes, and in this connection a small vulcanizer is a nice business getter. Buy good oils and greases, also carry spark plugs, fan belts, etc., get a good gas pump. Anyone can handle this branch of the business.

"Keep your fire and anvil and handle a few springs and also advertise your ability to weld springs or make new leaves—if the smith can change a buggy spring why not an auto as well?

"Another long feature for the smith is to buy spindle bolts, bushings, etc., for Fords, here is some easy money. Advertise and have autoists come to you to have their wheels and front axles turned up (who is more competent than a good smith to do this work?).

"If you are not competent to handle auto work yourself at once, hire a man on commission and charge the prevailing labor rate per hour for such services. If this is around 90 cents an hour, let the man keep 60 or 70 cents and you keep the 20 or 30 as the case may be. The first thing you know you will be able to do as good a job as your auto man, but if you attend to your tires, gas, oils, etc., what more do you want? I have been or am going to throw the change myself. I also handle storage batteries. At the end of the year I will write you something about my year's business."

B. J. Storey, Michigan.

FORD PISTON RINGS—Piston rings now being supplied by the Ford Motor Co. have the name "Ford" stamped on the edge of the ring, as shown in the illustration. Rings bearing this stamp should be installed on the pistons with the edge bearing the stamp toward the top.

Another Answer to H. C. R.—In the October number you ask for replies to H. C. R., of Canada, where he asks about quitting blacksmith work and taking up automobile repair work.

Canada is a long way from Kansas and what applies here might not hold good there. I will say that the journals have written a great deal on the line of advising smiths to take on auto work in connection with blacksmithing. Some places it may work out satisfactorily, but while the volume of blacksmith work may have been lessened on account of the automobile, the number of smiths has also lessened, until now most of us are past our best working days and for a man of 50 years to drop a trade he thoroughly understands and take up something he knows but little about, in my opinion, is something of a mistake. It is hard to learn an old dog new tricks.

I think the proper thing for a smith to do as he grows older is to equip himself with more labor saving machinery, keep on sale more of the articles that pertain to his line of work and handle the repairs for the machinery most in use in his neighborhood. Last year I put in an electric blower and I never knew or had an idea that it would be such a help to me.

I expect that work with H. C. R. is much the same as it is here that is, a big rush throughout the summer months and the rest of the season more or less slack, and with me I rather enjoy the slack period when it comes, and as we grow older (and we soon do after fifty), we will not want to work as hard as we did when we were younger, and for a man of fifty taking up auto work will find he has something to learn. The work isn't as light as it may seem, and is certainly not as clean as our work, and Oh, this crawling under cars. When we get to fifty we are not as limber as we were and the most of us are a little fatter. I advise Mr. H. C. R. to "ease up" on the horse shoeing and put in more labor saving machinery, and if he doesn't do it already, to take up oxy-acetylene welding—it is quite a profitable and interesting side line and I am certain he can find all the work he wants in the same line he undestands

The trouble with the most of the smiths I am acquained with is that they are not sufficiently well equipped with heavy tools and continue to do most of their work as we did years ago, that is, by hand. One man with good equipment can do as much as two men can do with poor or insufficient equipment. So, Mr. H. C. R., let up on the shoeing and go in more for handling repairs. Keep a good stock of those things you think you can sell and buy a few more machines to help you with your work. and let your boy go on with the auto work. After reading what each of us have to say, tell us your plans.

I. H. Stewart, Kansas.

Editorial Note.—This is exactly the sort of a discussion we wanted to start and the kind of "stuff" that we want to get more of the personal views of our readers. You're interested in what others think, so don't you think others will be just as much interested in what you think? Write the Editor a letter for next month's number about something connected with the business that others will find interesting.

Nebraska Blacksmiths Meet.—The 13th annual convention of the Nebraska Blacksmiths. Horseshoers and Wheelwrights Association was held in the rooms of the Fremont (Neb.) Commercial Club on October 15 and 16.

A program of addresses by members of the association and others on timely subjects to the membership was one of the interesting features of the convention. A price committee composed of Messrs. Kearney, Holdredge and Friend recommended that the association increase its prices from 10% to 20%. It was pointed out that the increase was made necessary for the reason that we are all now so familiar with, "the high cost of labor and materials." It was brought out during the discussion of this committee's report that the average wages of the blacksmith is $5 per day, some receiving as high as $7 and $7.50 for special work.

C. C. GOOD
Re-elected Secretary-Treasurer for 5th term

Inasmuch as 50% of the membership of the organization is equipped with acetylene welding apparatus, discussion of this subject was of much interest, and a welding demonstration was conducted at Peterson's blacksmith shop by a demonstrator representing a firm of torch manufacturers.

Officers elected to guide the association for the coming year are G. C. Casten, president; J. G. Savage, vice president; C. C. Good, secretary-treasurer.

Omaha lost out in favor of York as the place for the next convention, which will be held October 20 and 21, 1920.

The deliberations of the association were ended on the evening of the last day by a banquet given by the Fremont Commercial Club.

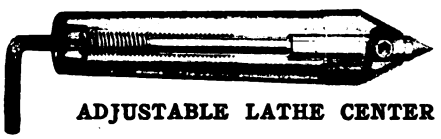
What do you like best?—"I find your paper very helpful around the shop, especially Benton's Recipes and the Shop Kinks. Give us more on auto repairing as this line of work is on the increase.

Theo. S. Ehlert, Texas.

ADJUSTABLE POINT LATHE CENTER

The accompanying illustration shows the adjustable point lathe center that has made its appearance. It is claimed that the new point will eliminate the waste of time and material caused by the necessity of frequent grinding of lather centers.

The body is made of carbonized steel, but the adjustable point is made of high speed steel containing from .18 to .19 tungsten, drawn just enough to relieve the strain of harding. All parts are interchangeable.



ADJUSTABLE LATHE CENTER

Not only does the high speed steel point give from seven to nine times more production per grind than the ordinary carbon steel point of general use, but when it does become necessary to grind the new point there is a much shorter angle to be ground, and a heavier feed can be used while grinding as the high speed steel will stand a much higher friction temperature without its temper being drawn. This makes it possible to reduce the time of the grinding process from the usual fifteen or twenty minutes to one to two minutes.

As the point is gradually worn down it is adjusted with the adjusting screw, without the necessity of shifting the tail stock, and when finally worn out, one need only replace the small center instead of scrapping the entire center.

The adjustable center can be used in either tail stock or spindle of lathe or grinder. D. G. Baird

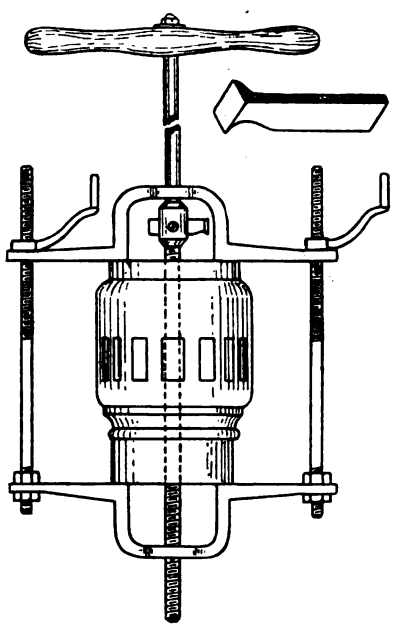
Horse Propaganda—A recent joint convention of the Wholesale Saddlery Association and the National Saddlery Manufacturers' Association decided to employ investigators and publicity men and make propaganda for the wider use of horses. Likewise, similar progaganda has been undertaken or is under discussion by other parties who would be directly benefitted by a successful campaign to have everbody use horses.

In the old days there was no necessity for horses propaganda people either used horses or walked. Today we have automobiles and horses too, and we have our choice and about 90 per cent choose the auto. Some there are who claim that the use of automobiles is merely a passing fad that will soon die out and leave us with the transportation facilities of 25 years ago and you remember what they were.

Facts and figures can and will be marshalled to show the economic value of horses. their number and all the other familiar statistics that the Census Bureau and the Agriculture Department delights to compile for us but we predict absolutely negative results from such propaganda, no mater by whom conducted. We are living in an age where something better than horses are required for our broadened activities and while such sentiments may conflict sharply the ideas of active and sincere partisans of the horse we feel that it is facts and not theories that face the honest admirer of horse flesh.

How Prices Have Riz—From a reecnt bulletin of the War Industries Board we take the following figures to show the increase in cost of many articles commonly used by the blacksmith. The first figures shows the price for the month of January 1914 and the last figure the prevailing price for the same article in December 1918. Anvils; 1914—$.09 per pound. 1918—$.20 per pond. Axes. single bit;—1914—$7.50 Doz. 1918—$14.00 doz. Calks, toe, blunt and medium; 1914—$3.90 per cwt. 1918—$6.20 cwt. Chain, trace, wagon; 1914—$32 per 100 pair. 1918—$76 per 100 pair. Files, 8 inches mill bastard;—1914—$.92 per doz. 1918—1.79 per doz. Farriers 2½ lb. turning hammers; 1914 $12.64 doz. 1918—$17.28 doz. Nails, cut 8d.; 1914 $1.65 per 100 lb. keg; 1918—$5.10 per 100 lb. keg. Nails wire 8d; 1914—$1.65 per 100 lb. keg; 1918—$3.60 per 100 lb. keg. Horse rasps 16 inch plain; 1914—$4.07 doz.; 1918—$5.80 per doz. Wood screws 1 inch. No. 10 flat head; 1914—$.09 gross 1918—$.22 per gross,. Iron spoke shaves; 1914—$1.50 doz. 1918—$1.98 dozen. Horse & mule shoes; 1914—$3.75 per 100 lb. keg; 1918—$6.25 per 100 lbs. keg. Carriage springs, black 1¼ in. and wider; 1914—$4.88 cwt.; 1918—$10. cwt. Swages, 1 in., 1914—$3.70 dozen; 1918—$7.41 dozen. Tongs, blacksmiths' 18 in; 1914—$2.98 doz. 1918—$4.65 doz; Vises, solid box 50 lb; 1914—$8.45; 1918—$9.50. Wedges, oil finish; 1914—$.03 per lb.; 1918—$.12 per lb.

Boxing Wagon Hubs.—The accompanying illustration shows a home made hub boxing apparatus. The side stays are made of round stock and go through the spokes of the wheel. The span irons, of which there are two, are made of 2" by ¾" flat stock and are held firmly in position by screwing down the lever nuts on the stay rods.



HUB BOXING MACHINE

The boring bar is ⅞" in diameter, the lower half having a thread cut on to work in the tapped hole of the lower span iron. The hole in the upper span iron is a sliding fit. The cutting tool fits into a slot cut in the swollen part of the bar and is held in place by a set-screw.—Work.

Government Escort Wagons.—The government in disposing of its surplus property has on hand several hundred escort wagons, both new and used. The new wagons are being sold at a fixed price of $75 each and the used wagons at from $50 to $75 each.

The number of wagons and their location and the officer in charge of the sale of each lot are as follows:

New—614, Jeffersonville, Zone Supply Officer, Jeffersonville, Indiana; 100, Columbus, Depot Officer. Army Reserve Depot, Columbus, Ohio; 100, Newport News, Zone Supply Officer. Newport News. Va.; 100 Camp Meade, Md., Zone Supply Officer, Coca Cola Bldgs., Baltimore, Md.; 100, New Cumberland, Supply Officer. Army Supply Base, New Cumberland, Penna.

Used—92, Fort Sam Houston, Zone Supply Officer, San Antonio, Texas; 152, Camp McArthur, Texas, Zone Supply Officer, San Antonio, Texas.; 115 Camp Gordon, Ga., Zone Supply Officer, Ponce de Leon Ave., Atlanta, Ga.; 100, Camp Sevier, S. C., Zone Suply Officer, Atlanta, Ga.; 19, Camp Joseph E. Johnson, Fla., Zone Supply Officer. Atlanta, Ga.; 191, Camp Greene, S. C., Zone Supply Officer, Atlanta, Ga.; 200, Camp Lewis, Wash., Zone Supply Officer. San Francisco, Cal.: 68, Camp Mason, San Francisco, Zone Supply Officer, San Francisco, Cal.; 91, Camp Kearney. Cal., Zone Supply Officer, San Francisco, Cal.

Automobiles in Canada.—There were registered last year (1918) in the Dominion of Canada 275,746 automobiles, which were divided as follows among the various provinces: British Columbia, 15,370; Alberta, 29,300; Saskatchewan, 50,531; Manitoba, 24,012; Ontario, 114,376; Quebec, 26,897; New Brunswick, 6,434; Nova Scotia, 8,100, and Prince Edward, 689.

IOWA SMITHS MEET FOR FIRST TIME

The blacksmiths of Northwest Iowa met in convention at Sheldon recently. They talked shop and got acquainted with one another. This is perhaps the first time that the blacksmiths of this section ever met in convention together and it was without doubt a profitable and worth while meeting.

HORSESHOERS SCARCE—BUILDS OWN SHOP

The frame work for a large blacksmith shop which O. W. Jones is erecting on his property on South Perry street, just south of the Oil Creek bridge, is completed, and the building will be enclosed and ready for use in a week or two. Mr. Jones has more than a hundred horses in use in his liveries and for teaming in the city and vicinity and his expenses for shoeing them is heavy. With the increase in the prices of shoeing made by the blacksmiths on Oct. 1, Mr. Jones decided to erect a shop and hire a blacksmith to do this and other work which he requires in his business. It is said that his horse shoeing bill for October was over $200.

I have sold my business and will quit the trade shortly. Advancing years and indifferent health makes it necessary that I should seek something more suitable. I shall be sorry to leave the trade and shall miss the ring of the anvil but I intend to keep in touch with matters of interest to the trade and will make your journal the connecting link, while I am on the surface. I can not say anything better in appreciation of your journal. Thos. Cuthbertson, N. Z.

AMERICAN BLACKSMITH AUTO & TRACTOR SHOP

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BUFFALO, N. Y., U. S. A

WILLIAM F. WENDT, *President.* | L. J. WISCHERATH, *Editor.*

Time for a Show-Down

WHAT happened to the Molly McGuires in the Pennsylvania coal fields of a generation ago—what happened to the Populist fanatics in Kansas and thereabouts? Some of them came to a well merited end on the gallows, others "got the limit" in the penitentiary—and deserved it, and informal necktie parties were held for the benefit of others.

These movements undertook to obtain their object by a reign of terror and intimidation and for a time there was an orgy of assassination, arson and general lawlessness that shocked and scandalized the whole country. The came a time when the self respected members of the affected communities got together and from that time forward things began to happen with promptness and despatch.

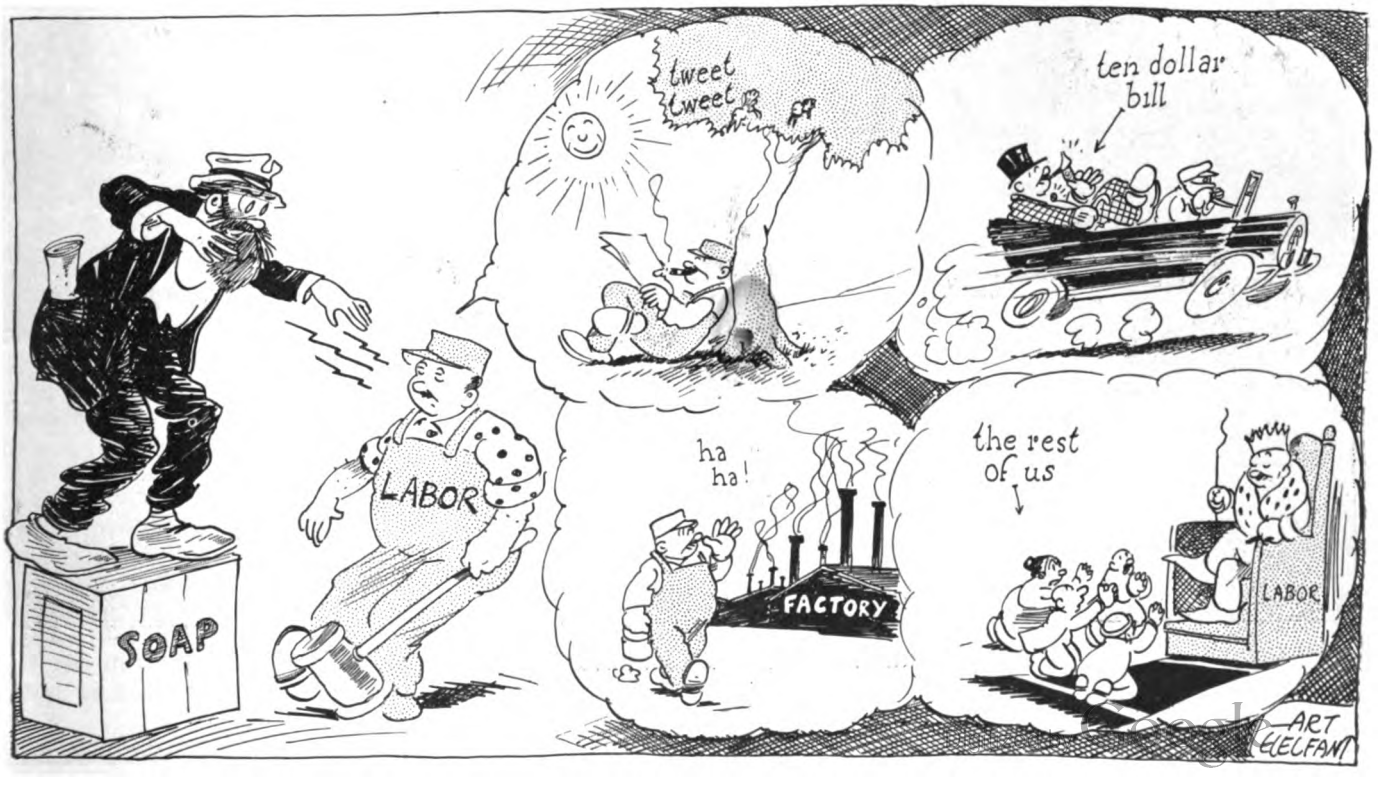
Certain elements in the country today have in effect proclaimed a revolution having for its object the overthrow of all restraints of government and religion and for turning over the instruments of production to the "downtrodden wor-r-kin' man"—just as has been done in "enlightened" Russia, which is held up to our gaze as the example of all that is good for the worker. Unfortunately there are a sufficiently large number of half-baked individuals who believe this sort of rot and are willing to act accordingly, and they're not all foreigners either—some of the finest and most rabid specimens of "radical", as they like to be called, are the product of our own country and unfortunately can't be deported to that land of workingman's bliss where the worker neither toils nor spins—unless he feels like it, and where factory whistles have long ceased to blow because the factories have ceased to operate.

The recent occurrence at Centralia, Washington, where four Great War Veterans participating in an Armistice Day parade were shot down from the housetops in cold blood clearly demonstrates that this element does not hesitate to commit murder or any other act of violence that, to their deluded minds will further the "cause" of the "worker."

Recently several hundred foreigners—both aliens and naturalized "citizens" and confessed anarchists, syndicalists, etc., have been rounded up and await deportation to Germany or Russia or from whence they came. Now that their prospects for returning to that workingman's Elysium they have been trying to tell us about are so bright, and at the government's expense to boot, they are fighting strenuously to remain here and this would seem to indicate there is something wrong somewhere. If these imported European ideas were as beautiful in application as their exponents in this country would have us believe, one would rather expect a general exodus to that Paradise where the soviets talk long and often and where every man may have his say, but then such doesn't happen to be the case and as a matter of fact his opportunities of starving to death are much better in Russia than any place else—for nobody works, but a little thing like that makes no difference to our "advanced thinkers."

The long suffering and strikes be-deviled public which is always slow to wrath and "unorganized" is, like the well known worm, beginning to turn and when he turns something is going to drop and if the political "old women" in congress who claim to represent the will of the nation don't get together pretty shortly and pass a few much needed laws for the protection of the law-abiding, God-fearing citizenry against the extortionate demands backed with thinly veiled threats of terrorism that they are continually compromising with in order to "get the labor vote", the chances look extremely bright for the resurrection of the old time Vigilantes.

The time has come when a show-down is an absolute necessity and if the political log-rollers who make Washington their headquarters don't come across with some action in the form of legislation for the effective suppression of the radicals no one will be surprised to hear of citizens taking the laws into their own hands, and while lynching can hardly be condemned in terms sufficiently strong it begins to look as though a few lynchings are needed to show our foreign and domestic agitators that if they prefer Russian ideals to ours, then Russia is the place they should be—this is the United States and the only thing that ails it is that we're so darned good natured that we'll take a lot before we begin to get mad but as a nation we're slowly beginning to get "het" up and the signs begin to look like an early open season on "radicals", with not limit on the bag and a bounty on their pelts.



"HERE'S POP'S AUTO & TRACTOR SHOP"

WE'RE not going to mention any names in this article for fear, that we'll hurt some-one's feelings and even if he isn't one of our advertisers and doesn't owe us any money on his subscription we're going to hew right to the line and make the chips fly all over the place and if we say anything, that someone might accidentally remember, as being responsible for having said, he may rest assured, that the secret of his identity will die with us.

You aren't so old, but that you can remember when, the automobile equipped with gaslights, that were supplied from a generator was considered as being about the last word. Also, you will be able to remember the first model you saw that had electric lights and self starter 'neverything—that old 1909 model was sure some boat and it was along about that time, that the makers of gas equipment of various kinds for automobiles began to lay awake nights and wonder where they were going to get off at and it affected one concern so badly, that they put out a lot of printed matter setting forth the disadvantages of the electric starting, lighting and ignition systems, that were beginning to make their appearance on the cars of the day. It is from this book that we quote the following terrifying information for avoiding an electrically lighted car as one would dodge a mad dog:—

"When a motor car maker adds 200 pounds or more of electric equipment to his car, he must allow not only for the power of which its operation robs the engine, and not only for the weight of the electrical apparatus itself but he must also strengthen his construction throughout the car proportionately.

"The frame must be heavier—must have an extra cross member in it. The springs must be stronger, the axles and bearings should be proportionately heavier, the tires should be somewhat larger, and, with a heavier car throughout, the engine should be somewhat heavier to pull the additional load."

Isn't ancient history interesting? But the worst is yet to come. The sharps of that day and date figured that electric lights on a car were good for

"About 10% to 15% more tire expense.

"More general upkeep due to weight.

"About 10% more fuel on account of increased weight.

"Another 10% to 12% more for fuel to operate the electric dynamo.

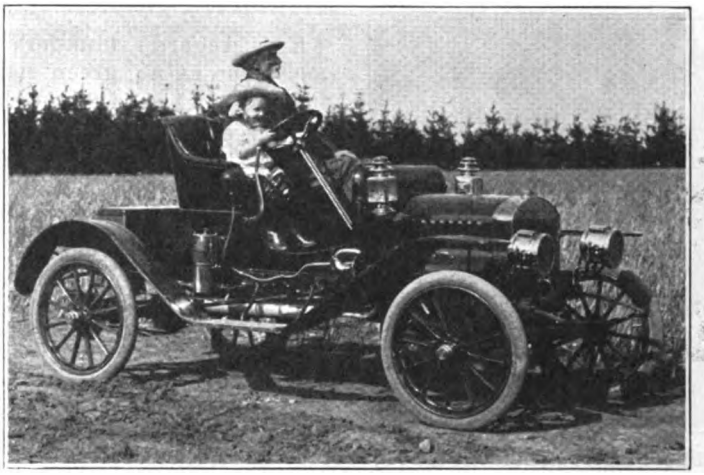
"At least $12.50 per year for battery maintenance (based on two years battery life—which is excessive—and a displacement cost of $25 which is conservative.)

"$3 to $6 per year for lamp bulbs (The S. A. E. estimates that over 2,000,000 light globes will be sold during the coming year, for not over 150,000 electrically lighted cars.

"$5 to $15 per year for electrical repairs—very conservative, but based on two years use."

There, you have it on no less authority, than the circular quoted that electric lights on an automobile immediately puts the owner in the millionaire class.

This same booklet has a deal to say about electric starters and the writer doesn't begin to get thoroughly warmed up to his subject until he comes to this part of the, then modern car's equipment and then he r'ars on his hind legs and



THE LACK OF AN ELECTRIC STARTER IN THE GOOD OLD DAYS DIDN'T HELP GRANDPA'S LUMBAGO A BIT

paws the air something after this fashion:—

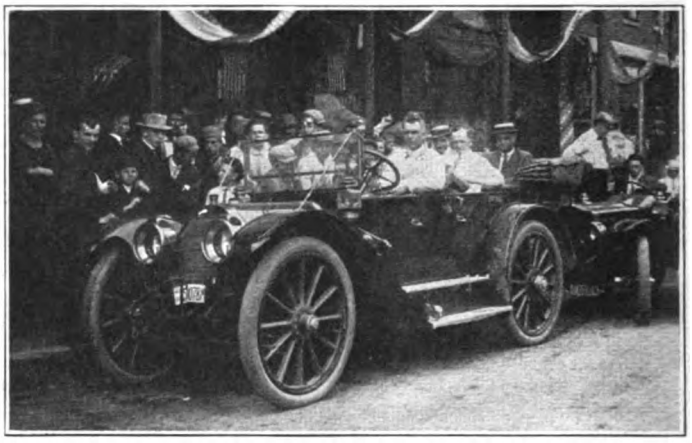
"The early self starters were of the acetylene or other ignition form. These starters had only one mission—to put an explosive charge into the cylinders of the engine, so that by touching the spark the engine could start as it does in what is commonly called 'on compression.' If the engine happened to stop on dead center with no cylinder in firing position, or if the spark plugs were dirty or the ignition weak, the starter naturally could not work....."Then came the electric starter in the light of over a year's experience, it may now be said that the electric starter was one of the most over-rated and one of the least understood devices ever applied to the automobile.... ...."From the minute the electric starter is installed in a car its efficiency begins to deteriorate. Its excessive consumption of electric current is ruinous to the battery and the troubles of the starting mechanism itself, in most cases, are too complex for the ordinary repairman even to analyze, and practically impossible for anyone but a factory expert to correct.

But the writer of this book was a bum prophet and a discredit to the profession when he claimed that; "There are today a great many automobile manufacturers who are using electric starters as standard equipment, yet who are making all possible haste in the perfection of an air starter, in the expectation that by the summer of 1914, the electric starter will not be in demand.

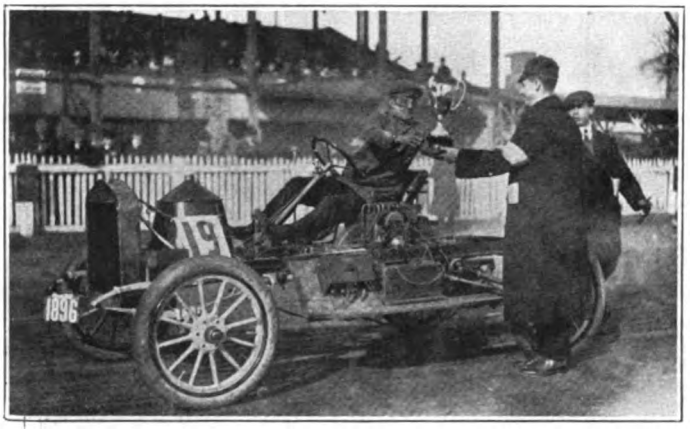
"It is no secret in automobile manufacturing circles that the air starter is superior to the electric starter in all respects. But the manufacturer who really wants to equip his car with an air starter has been confronted with the problem of educating the public in the face of what they call the 'electric craze'."

Then our amiable friend goes on at considerable length to tell us that every car should have an -tylene generator somewhere about it something after the fashion of those prudent and abstemious souls who keep a properly filled flask about the house in case of "sickness."

It is on electric starters that our friend becomes incoherent and rambles off into a mire of "testimonials" of those who have used electric lights and won't use anything else now, but acetylene lights and some others who make strange prophecies and strange statements in which they regard acetylene as a boon with he can fill his tires, run his engine and a lot of other plain and fancy tricks. Our friend winds up with a rgular 'im of 'ate on electric equipment in general and extends a tear- and sympathetic invitation to all, and sundry to write to him and tell about their trobules with electric equipment and he let it be inferred that a car using 30x3 tires ought to have 45x6's on it if it's owner had so far lost his reason, as to buy a car equipped with electric lights—great Heinz preserve us!



WERE YOU IN THE CROWD WHICH GREETED THE FIRST AUTOMOBILE THAT CAME TO TOWN?



FOR ATTAINING THE DIZZY SPEED OF 15 MILES AN HOUR, THEY WERE PRESENTED WITH A PEWTER CUP, SOMETHING AFTER THIS FASHION

There are 5351 motor vehicles in Calcutta, India, exclusive of motorcycles.

CHOOSING A FILE AND USING IT

Mark Meredith

I well remember the rages of the old workman, who gave me my first insight into lathe and vise work. I was put into the shop like any other apprentice. My father, who owned the works, had the wisdom to ordain that I should be treated like the other boys. I was treated no better. It was up to me to take care, that I was treated no worse for being the son of the big boss. So, when I committed the blunders into which any other green hand is sure to fall, I got the rough side of an honest workman's tongue and I may say, incidentally, that the education which I had been given didn't help me greatly in replying.

The Abuse Of a File—What led to these autobiographical details, which you are not called upon to condone; if they bore you; was a remark at the Club by one of my fellow-members about the wastages of files. "We always seem to be buying files", he said. "What is the trouble? Has the old-fashioned file gone out, and are the files that we get today too soft for the work?"

I told him "No." A good file, bought to-day is better than the old hand-made file, generally, and if, for a particular purpose, a hand-cut file would do better work than one with the teeth punched-up on the machine, the old-fashioned process would still be used.

What ruins files, I explained, is not use, but abuse. And that brought back the forgotten scene of my boyhood, the foot-lathe on which I was allowed, for safety, to practice; the heap of turnings, all

spiralled, like a Whitworth screw, that my mentor could make, and the scrape which fell from my unskilful hand, the tools lying about; the bad light from gas flares before electricity or even the mantled gas-flame had been invented. And I heard again the snarl of the old workman as I threw the file I had been using into a tool-box with screw-drivers and others things.

"Don't you know better than that, you booby?" he asked. "Every tooth on that file matters. You can't jar a sharp edge on a clutter o' gear like that and not break it. Next time that file goes across a bit o' work, there will be so many places where it doesn't cut. That means more time needed to finish the job.

"And look at the way you've left the teeth—all clobbered wi' bits o't'brass that you were filling yesterday. Presently you will have some of them 'pinned' and get a score over your next piece of work. Brush your files out when you're done with them. Lay each file apart wi' a bit o' cloth round it, instead o' flinging 'em a' clatter into your basket. Serve your tools right and they'll serve you right."

Favored Files—And a good workman does not use his files indiscriminately — nor choose them so, either. You can select the right cut for a given range of purposes and materials, and it is not difficult, even over a dark counter, to see or feel that the teeth shall be sharp; but it is next door to impossible to judge the temper of a file or any other tool. Therefore the careful buyer looks at the tang. If he reads on it a name, that he can trust, he knows that the performance of the file will be right. Large buyers follow the same plan. They order files, not haphazard, but by name. And this ensures satisfactory service.

A File For Every Job—Wrought iron requires special "angle" or "new cut" files. Brass also requires a special cut, Cast Iron and Steel the ordinary cut. The best service given by a perfectly new file is on broad surfaces. Narrow surfaces are best cut with a file that is still sharp, but not perfectly new. To cut edges, an old file, showing some wear, is essential: the fine points on a new file would catch too easily and very likely some of them would be torn out.

A file, that is good to begin with, and has the maker's mark on the tange is the only guarantee and test of that, should be useful to the end. To remove sand and scale from castings or forged work with a new file is wasteful and inefficient. These things are very hard: an old file, with the teeth worn down, so that they are strong because the cross-section of them is large, will clean up such work as this. A useful tip, is to use the edges of an old file where too much resistance is experienced. The chances are they will be less worn than the faces, for they are not sharpened in the same way.

How To Use A File—There is a knack, as my old master taught me, in filing. I would sweat and have aching arms without getting rid of much metal. He knew how to use his strength. "Sithee lad", he would say, "t'work's done forward. Let thy hand up as tha draws back. There's no cut then. Spare thy arms."

A slight sideway motion, changed every few strokes, makes a better cut than straight fore and aft work. The side-edges of the file get a chance then.

Files come in a variety of faces, from the rough file to the dead-smooth cut used for finishing. A file will pay for care in use as well as in keeping; but the best economy of all is in choosing the right file in the first instance, by name, not merely by price. The brand on the tang means more than mere identification of the maker. It means right steel, right workmanship and consequently right service, which is the only real economy.

The Money Value of Fair Dealing

ROBERT FALCONER

IN automobile repairing, possibly more than in anything else that people buy they look for unjust treatment. The automobile repair man has already taken the place of the plumber as the man who makes the greatest posible charges for the minimum amount of work. It is rather unfortunate that this is the case but we cannot read the papers and go to the theatre without realizing that it is so.

There is one way in which this fact works to the advantage of the man who does automobile repairing. Since so many people have apparently come to the conclusion that they are going to be overcharged the repair man who can prove to them, he is perfectly fair can win just that much more business.

In most cases the charges of unfairness that have been made against the garageman have been due to ignorance on the part of the car owner. Few car owners realize the work that may be necessary to get the offending part of the car out where it can be repaired and of

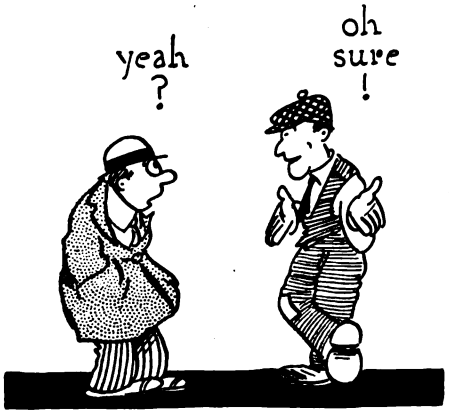
"SO MANY PEOPLE COME TO THE CONCLUSION THEY ARE GOING TO BE OVERCHARGED"

getting it back into place again. Few also realize that there may be a great deal of difference between different makes of cars and different models of the same make of car in the time required to make repairs. For example, there are very few car owners who know that in the case of certain model of a certain make of car it required a great deal more time to disassemble and assemble the rear axle than was required in the case of any of the other models.

Some repair shops have worked out a method of telling the car owner in advance just what a repair job will cost. In most cases, however, the repair man is not in a position to make accurate estimates in advance. Progress can be made along this line, however, by keeping accurate records of all repair work that is done. These records can be kept on job cards. It will not be especially expensive to keep them if the cards are made out in duplicate and one copy is filed away for future reference under the make of the car upon which the job

is done. As the cards for a certain make of car accumulate they can be subivided into different classes of jobs done.

Each of these cards should give the following information. First should me noted the symptoms of the car when it was brought in. Then should follow the amount and the kind of work done upon it. The work should be divided into the time required for each operation.



"THE ABILITY TO TALK IN AN IMPRESSIVE WAY IS ESSENTIAL"

For example, if the engine is taken down the time required to do this should be given in as complete detail as possible. The new parts and their cost should be included. As a matter of fact each card should give complete information in regard to the repair.

It will not require many cards on any particular job on any particular model of any make of car to supply enough information so that the cost of any given repair can be set before the work is done. In any case a close estimate can be made.

These cards also serve as check upon the workman in the shop. If the work is done better and quicker than the cards show it to be ordinarily done, then the man who did the job is a man whom it is well worth while keeping on the payroll. If the job takes more time and is not done as well as the cards show that previous jobs have been done, then the man who did it is the man to let go when the slack season arrives. Unless some such record as this is kept there is always a danger that the wrong man will be allowed to go. A pleasing personality, the ability to talk in an impressive way and a highly developed skill in passing the buck, may make a man appear more valuable than he really is while, a quiet, diffident, unassuming man may not show up at his true value.

A card record, therefore, of the actual work done on many similar jobs is of value in determining the real value of the workers in the shop. Of course, it is well to note upon these cards, the degree of satisfaction that the job gave the car owner. This has a very decided bearing upon the prosperity of the business. If the job resulted in satisfaction to the owner the man who did it is of more value than the man who can do the work cheaper but whose work does not give as great satisfaction. There are two things to consider. First satisfying the customer. Second, getting the work done as cheaply as possible. The cost of doing the work, however must always be subordinate to satisfying the customer.

All of this preliminary work is necessary to make sure that the customer can be impressed with the fairness of the concern. When a customer brings a car to the shop and the repair man looks it over and gives the owner a price for doing the whole job, that owner is inclined to believe that the repair man is honest and fair. If the job gives perfect satisfaction the customer has still further confidence in the repair man.

If it is not possible to give an exact price but the repair man says that it will not cost more than a certain amount and when the repair is made the resulting bill for it is below the maximum sum mentioned the car owner again has confidence in the repair man. If this job is satisfactory the confidence is enhanced.

A collection of the job cards on past jobs will give information that will make such estimates possible. In the case of a make and a model of a car upon which work is being done practically every day, it will not be long before enough data can be gathered together to make it possible to give a price on a job before it is done. Such a price, of course must be an average price. There are no two jobs that will cost exactly the same amount. One will require a little more work than another, and possibly on one a workman may have an accident of some sort that will increase the cost to a certain extent. With an average price, however, and the same price to all, there will not be a variation in the amount charged to the customers which may lead them to believe that the charges are based more upon what it is expected can be charged rather than upon the actual cost of the work done.

In the case of cars that are not worked upon to so great an extent, data, can be gathered together which will give the information required to make estimates, accurate enough to make the customer feel that the repair man is fair.

In a great many cases, the idea that he is not being treated fair, is created in the mind of the customer when he has an idea that it will cost only a certain amount to have the work done and when he receives his bill finds that it has cost several times that much. No such case can happen if enough records are kept so that the owner can be given a maximum estimate before hand and it is only through the records already suggested, supplemented by a record of all the work done on each car of the regular customers that such estimates can be given.

All of this seems like a great deal of work. It may seem like a great deal of useless work but winning the confidence of the customer is worth all of the trouble and the cost of keeping these records. The job cards themselves can be used for the job records and data from these cards can be placed upon other cards which show a repair record of each car regularly repaired in the shop.

The satisfactory service that will

"THE OWNER IS INCLINED TO BELIEVE THE REPAIRMAN IS HONEST AND FAIR"

result from such a system will result in more and more regular customers and more and more business. There is practically no community in the country in which a repair man who can win the confidence of his customers cannot build up a business that will keep his shop busy the year round.

Practically all that is necessary to build up this confidence is to do satisfactory work and to be in a position to at least give an accurate estimate of the cost of the job be-

fore work is started. The concerns that are doing this are keeping records. They have to do so because their estimates on future work are based upon the cost of doing similar work in the past.

If a garage or a repair man can win the perfect confidence of a hundred customers, it will not be long before he will have the perfect confidence of another hundred customers, be increased still further. Each car owner will advise his friends to patronize that repair shop or garage.

It always pays to advertise and the reason that the satisfied customers is the best advertisements is because that customer is a continuous advertisement. Jusa as long as he is satisfied, he is working as a salesman for the business concern that has satisfied him. He is persuading all of his friends, and his acquaintances to patronize that concern. Satisfying customers, convincing them that they will get a perfectly square deal is setting in motion an endless chain of sales effort that costs nothing, but which never fails to result in a greatly increased volume of business and constantly climbing annual profits. Of course, however, this form of advertising requires a certain amount of time to show results. Sales will not result from it immediately. It, however, does build up the business permanently and many a leading business in communities of all sizes owes its present prosperity to giving customers honest, fair and satisfactory service and in convincing the customers that this has been the case; that it is the policy of the company.

A WAGON SALE IN 1834

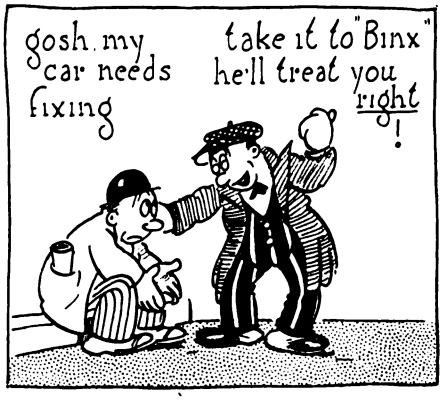
A wagon manufacturer in the United States recently ran across a bill for a wagon as made for one, John McElfresh, in 1834. The prices on this ancient invoice are:

Woodwork complete for 2-horse wagon	$25.00
190 lbs. tire at .10, 115 lbs. running gear irons at .15	36.25
37 lbs. iron on bed at .20	7.40
Boxes and painting, $5.50, boards $1.00	6.50
Breat chains	1.00
Total	$76.15

Automobiles Made this Blacksmith

ERNEST A. PHILLIPS

"HAS the automobile in any way crippled my business?" shouted W. I. Turner, owner of a Lonoke, Ark., combination garage and blacksmith shop, who formerly operated the blacksmith shop only. "Good Lord, no. To tell the truth, it has made me; and it has increased my business to such an extent that I now employ three mechanics and two helpers—whereas before I used to do all the work myself.



"AS LONG AS HE IS SATISFIED, HE'LL WORK AS A SALESMAN"

"Look inside the shop there—all five men working as fast as they can, and out here I've got three horses that need attention; you can see those four automobiles there waiting for repairs, and back there is a tractor that needs tinkering on. No siree, autos didn't hurt me a single bit. I'm glad they came when they did," he continued enthusiastically, but at the same time wondering why I should approach him with such a question.

I reminded him that he used to operate only the blacksmith shop, and asked how it came to pass he went into the garage business too. He seemed amused at this question also.

"Well, that's a funny tale. I used to toddle along with the blacksmith shop and used to make an average wage from it. One day one of the merchants saw me remodeling a grain tank, and the next day he drove a skeleton machine up and asked me if I could build a truck body on it for him.

"Business was sort of slow right then, so I took the job. Two days after it was finished another man drove up with a broken set of trucks and asked me if I could fix them together. I did. A few days later a farmer brought in his car to be painted. I did that too, and when the farmer, who had been doing business with me for years, commenced to tell me about other farmers who were buying cars and trucks, I heard old King Opportunity knocking at my door.

"By glancing ahead a few years I saw all farmers driving cars. Fine and dandy, and they'll have to be fixed just the same as horses. I thought that if I'd install a garage these same farmers who had been bringing me their plows and horses and wagons and buggies for years wouldn't desert me with their broken automobiles.

"So I acted accordingly. The wife bucked at first and was afraid I'd go broke after I told her how much machinery and equipment I'd have to buy, and how much I'd have to pay to build an addition to the old shop—but she thinks differently now," he hastened to add.

"At first I knew nothing of an automobile, so I bought all the books I saw advertised in the market and magazines and papers, but old practical experience taught me more than all the books I read. Business grew and kept growing until I was swamped with work, and many a night I worked till long after midnight. It was then that I saw possibilities of broadening out and enlarging the plant, so I hired a mechanic.

"But one wasn't enough, and I got another, and still another, until now I have three and two helpers. We're always busy. I handle all the horses and mules that come in. My helpers work on wagon beds and buggies when automobiles are slack, as they are occasionally; but not so often as one would think.

"Yes, if it hadn't of been for autos I'd still be toddling along with the old one horse shop. Step inside and look it over now," he invited; and I did. It was equipped with modern machinery in every respect, and the neatness inside the shop was a treat indeed—every-

thing in its proper place and where it could be found, or seen at a glance. The very atmosphere and appearance of his establishment smacked of system and his actions and movements plainly showed that he was well trained to make every step profitable. Waste motion was practically a minus quantity.

"Why don't you devote all your time to automobiles and drop the horses?" I asked at length.

"Oh, no, no! Horses gave me my start, and Ill ride them to my finish; bank on that. And horses are still profitable, coming right down to it. I make money on their needs every year, although not quite so much as on tractors and automobiles."

"How is your tractor trade?" I next asked.

"Well, not so much now because they are new down here, one might say, but a few come in every now and then. Next year I expect I'll have to expand again and make more room for them. Or the next year after anyway, because they're sure to make a hit on the farm."

And after a few moments spent here and there inside the shop the conversation simmered down to dollars and cents and profit and loss.

"No need of mentioning loss, 'cause it's one thing I'm off of for life," laughed Mr. Turner. "I'm all profit or nothing at all, and just to show you, will you believe that inside this little shop I seldom fall short of a two thousand dollar business per month?"

"And you used to think it a good year to do that much business when you were only blacksmithing, didn't you?" I returned, and he smiled and acknowledged the question with a nod and resumed his horseshoeing.

LEAKS IN PROFITS

Watch your expenses in the shop —look for the little leaks that cut into your profits. Little losses of a cent or two at a time grow into dollars in a surprisingly short while. Whenever expenses increase without a corresponding increase in profits, there is something wrong—something you want to know about just as quickly as you can.

You are not in business for the purpose of conducting a benevolent enterprise, so see to it that your employees are worth their hire, and the customers pay for what they get.

Necessity the Mother of Invention Brought Forth These Practical Ideas

CHAS. A. WILLEY

SIMPLE ideas for home-made tools always have an interest for most blacksmiths and repair shop man, and these kinks, were collected to pass on to you for their usefulness.

To make the bench vise more adaptable for holding small round

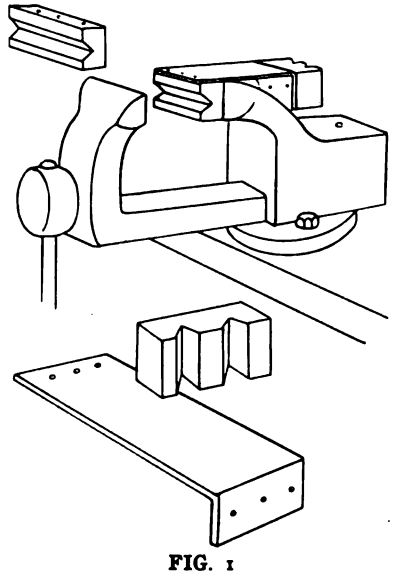


FIG. 1

stock, bolts, studs shafts, pins and pipe, one repair mechanic made from two blocks of steel and a piece of plate iron the jaw attachment shown in Fig. 1. It is simple and rests on the vise very handy. The three detail views explain how it is made and of course it must be of dimensions to suit the maker's vsie, so no measurements are given. Quite often garage men meet with the need for a special die for rechasing the threads of bolts, studs, rods, etc. and if it is possible to find a nut of the proper size and thread, it is a very simple matter to make a substitute die, as shown in Fig. 2.

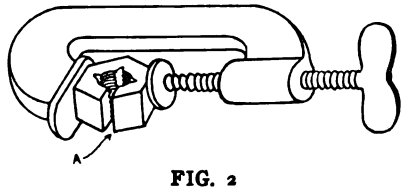


FIG. 2

The nut is split open with a hack saw on one edge at the corner of two of its faces and three slots are filed in the nut to form flutes or clearance grooves. Then the nut is hardened and it is then ready to use in a C clamp making it possible to force the cutting of light clips.

A very handy type of renewable emery cloth stick for use at the forge for polishing tempered work is shown in Fig.3. It is made of two pieces of hard wood and two common flat head stove bolts, the bolts having burrs thrown up on the edges of the screw driver slots which, make the heads hold in the wood. This burr is shown at A on the screw head and is made by filing the head away so as to make a sort of lip that digs in the wood. It can be made to stand out from the head by upsetting with a chisel. The emery cloth is cut the width of the holder or a sheet can be folded and placed on it, the method being plainly seen in the drawing.

When assembling engine valves, springs, and their retainers, a great deal of time can be saved by compressing the springs in a bench vise, as shown in Fig. 4 and tying each one, then the valve and spring and retainer can be assembled without the aid of a spring lifter and when assembled ,the string is cut and the spring released.

The attachment shown in Fig. 5

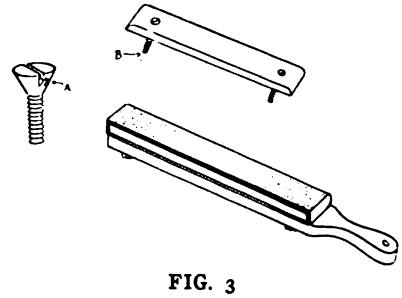


FIG. 3

is for any ordinary type of socket wrench and is a home-made affair which the writer schemed out to hold the bolt heads when tightening up flange bolts. It is very easy to make and use. Details of it are shown at A, B, C, D. The socket wrench A is of the familiar type used in all shops. The helper wrench as I call it, shown in B, is made from a regular stock wrench of forged steel, being bent at right angles on both ends, and the slot cut to fit over the socket wrench handle and a hole drilled through

it for the cotter key "C" that is used to hold it on the socket wrench. A coil spring is placed on the handle to keep the helper wrench against the flange. Of course the maker of such a wrench should remember that it is possible to use the attachment for but one size so that it is necessary to make it for the size that one meets most frequently, or else do as I have; make several attachments to cover the range of sizes. (See Fig. 5.)

Where one has much frame, fender, rod, shaft, and such sort of straightening to do, it would be worth while to make a lever wrench that is adjustable, as shown in Fig. 6. Make the tool from a good grade of steel. Old wagon or truck axle steel is very good. The sliding jaw A is held by a taper or wedge key "B" of double head type. This tool can be used as a large wrench if so desired. To be effective the lever part must be at least 3 feet. I use mine for straightening twisted connecting rods and all such work.

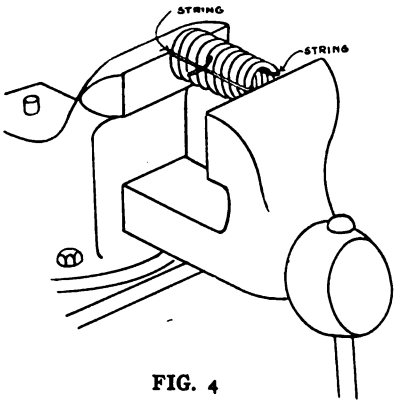


FIG. 4

The novel scheme for making a self locking cotter key shown in Fig. 7 was thought of by a mechanic in a local garage. A long cotter pin was used and one leg was cut off short and the other leg was then bent over flat so that it made a key of the sort shown. When this key is put through a hole, the end "A" springs out and locks the cotter in place. The end "B", being round and solid makes it very easy to enter the key in a hole. Another feature of this key is that it can be re-used indefinitely, for there is no bending its legs to deform it, as with the old style of cotter key.

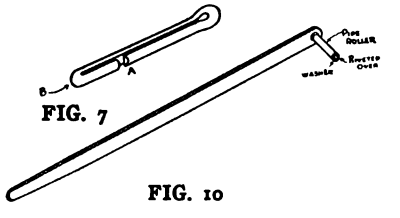


FIG. 7

FIG. 10

Figs. 8 and 9 illustrate a good scheme for using paint brushes to prevent waste of paint and to protect the brush. A wire rod is put through the center of the paint pot near the top and this riveted in place, a slot is sawed part way through into the handle on an angle, as indicated. This makes a notch to hang the brush on the wire by and it keeps it clear of the bottom of the pot so that none of the brush bristles are deformed. The wire also serves the useful duty indicated in Fig. 9, that of a place to scrape off the excess paint from the dipped brush and return it to the pail with none of the attendant waste that accompanies this operation when done over the edge or rim of the pot where part of it always runs down the outside of the pail.

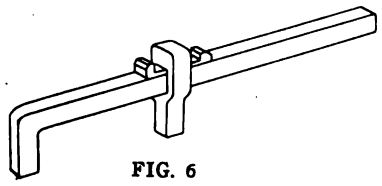


FIG. 6

Fig. 10 shows a device that is mighty handy around any shop where there are overhead belts in use. It is a belt stick for putting on belts and its usefulness lies in the roller fitted at "A" that makes it easy to put on a moving belt.

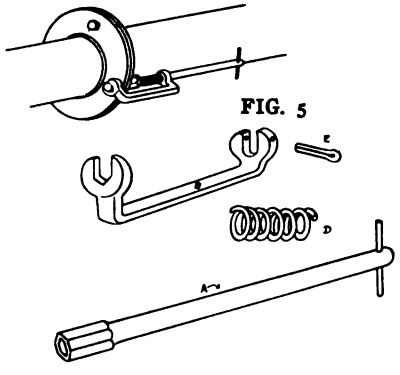


FIG. 5

WHEN KEYWAYS ARE WORN

In many tractor and separator jobs you will find that in cases a keyway is very badly worn so that the key will not fit. The fact that the keyway is made larger to fit a new key is not always advisable as this may necessitate cutting away so much metal that the shaft is seriously weakened. In such a case, if the balcksmith has a welding outfit he can make a very satisfactory job by filling in the old key slot and then cutting a new keyway to suit the original key used.

DIFFERENCE OF OPINION ON BAD CHECK LAW

Ralph H. Butz

A large number of state legislatures have placed a bad check law on their statute books within a very short time, and now the question has been raised whether a person giving a bad check in settlement of a past due account is subject to criminal action under such a law.

Where a bad check has been cashed or has been given in payment for goods purchased, and the check has not been made good within the prescribed time after notice has been served, the drawer of the check is under the terms of the law, guilty of larceny, since money or property has by this means been obtained from the seller. If satisfactory payment of the account is not made, the seller then possesses two grounds for action against the customer; a ground for civil action to obtain payment of the bill, and a ground for criminal action as a result of violation of the bad check law.

There is no difference of opinion, as far as is known, among credit men or in the legal profession as to this part of the law. But difference of opinion does exist as to the applicability of the law to cases where the check has not been given until goods have been bought and delivered and the purchase charged to the customer's account.

It is the contention of some credit men that criminal action against drawers of bad checks can only be based upon "intent to defraud" and that such intent does not exist in cases where a customer pays an old bill with a bad check. It is claimed that in such cases the seller must rely upon civil proceedings to recover money owed by the customer on account, and cannot bring criminal procedings under the law.

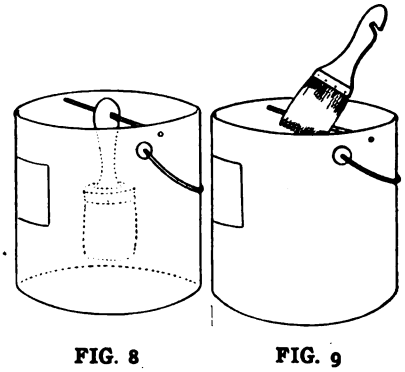


FIG. 8 FIG. 9

The provisions of all bad check laws are very similar in those states where they have been enacted. The following is the text of a model Bad Check Law recently passed in one state:

> Any person who, with intent to defraud, shall make or draw or utter or deliver any check, draft or order for the payment of money upon any bank or other depository, knowing at the time of such making, drawing, uttering or delivering that the maker or drawer has not sufficient funds in or credit with such bank; for the payment of such check, although no express representation is made in refrence thereto, shall be guilty of attempted larceny, and if money or property is obtained from another thereby is guilty of larceny and punishable accordingly.
>
> In any prosecution under this section as against the maker or drawer thereof, the making, drawing, uttering or delivering of a check, draft or order, payment of which is refused by the drawee because of lack of funds or credit, shall be prima facie evidence of intent to defraud and of knowledge of insufficient funds in or credit with such bank or other depository unless such maker or drawer shall have paid the drawee thereof the amount due thereon, together with interest and protest fees, within 10 days after receiving notice that such check, draft, or order has not been paid by the drawee.

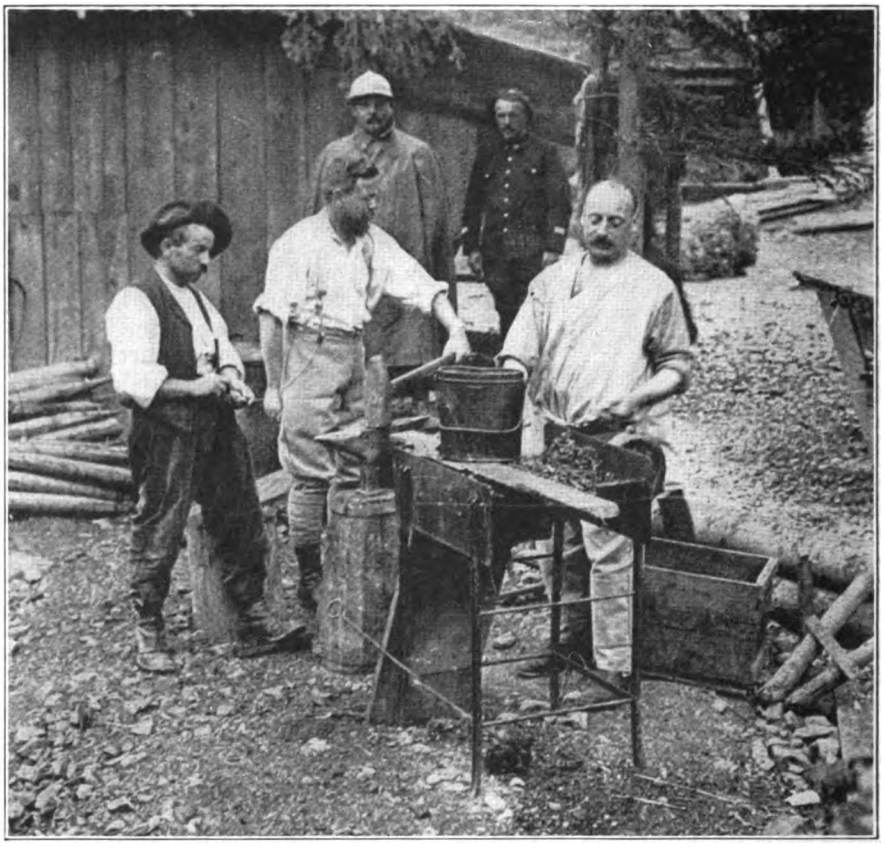
A contrary opinion is held by a well known credit man, who claims that when the customer gives a bad check in settlement of an account, he may be charged with attempted larceny. He says, "We have the making of the check and its delivery. We have the fact that the maker knew that there were insufficient funds to meet it because the making of the check and failure to pay upon due notice within the time prescribed is prima facie evidence of knowledge of insufficient funds, according to the statute. But you will also notice that the mere making of a check and failure to pay it after due notice within the time prescribed is also prima facie evidence of intent to defraud, according to the wording of this section.

Consequently in a criminal prosecution for attempted larceny, the complainant offers the check in evidence, presents his proof of service of notice and failure to pay after notice, and then rests. It sems to me there is a prima-facie case of attempted larceny made out with such proof. I do not say that the seller will get a conviction in every case, because I take it that the defense may introduce all sorts of evidence to overcome this presumption of intent to defraud or of knowledge of insufficient funds, but that is not the question.

The question is, is there a good prima-facie case of attempted larceny? It makes a big difference to the seller if he can deal with the maker of the check knowing that he has a prima-facie case against him for attempted larceny. It seems to me that while the crime of larceny is not committed by the giving of a check in payment of a past due account, yet a prime-facie case of attempted larceny could be established under such circumstances.

Back of this year are ranged a good many other years. What will you do with this one? If you do not make it better, stronger, sounder and more profitable than any which has gone before your experience does not count for as much as it should.

THIS IS THE WAY IT IS DONE IN FRANCE



This official French photograph taken at Willer Alsace shows the field equipment used by the French Army for shoeing mules during the war. It is typically French and is characteristic of the unusual mode of procedure prevailing over the entire country.

In size the anvil bears quite a contrast to the seldge. So much so in fact, that it seems almost cruel to strike such a lefenseless little object with a bludgeon the size and proportion of the one shown in the picture.

Smithing coal in France is of very inferior quality and is both expensive and difficult to obtain; at least it was during the war. The same frugal spirit which is inherent in every Frenchman is illustrated by their blacksmiths when building a fire in the forge. An adequate supply of water is kept very handy to the fire, and applied most effectively should the blaze assume the proportion of a conflagration three inches in diameter.

Our blacksmith would find a visit to one of their shops more amusing than educational and would concede on leaving, that the much vaunted American slogan "Safety First" must have originated when our foreign friends devised their shoeing stocks.

Originally designed to accommodate the wooden horse of Troy and still built with a large margin of safety when handling a locomotive; a vicious horse hasn't a chance in the world to cause any disturbance while being shod. These stocks are usually built of heavy timber with several large rollers at the top which are used after the fashion of a windlass. By means of ropes any animal is easily pulled into submission. Several feet of brush piled on the top affords protection from the weather.

Patent calks of the variety which are in general use in this country as well as manufactured shoes are an unknown quantity over there.

They still prefer to make up the shoes from bar stock. Flat shoes without calks are used almost universally. Sharpened shoes are unpopular because of the damage they cause to the roads.

TRACTOR REPAIRS WITH THE ENGINEERS.

John D. Woods

THE other day a friend in Memphis made the statement that he was going to buy a caterpillar tractor and a few log wagons for the purpose of hauling logs to sell on the river market. He asked for information about the upkeep expense on tractors in general and in particular about the necessary repairs brought about by such hard and constant operation in the woods as was the case with the Forest Engineers in France. Looking back upon the year and a half of work with the lumberjack troops, the writer is struck by the fact that really there was very little repair work done over there upon the machines we used in the woods and mill yards. While it is a fact that trucks and tractors which were used for carrying supplies in large quantities over the roads between camps and from city to troop area were subject to considerable periods spent in the shops, the real reason for this was lack of skill and care on the parts of the drivers, and excessive speed maintained over hard metalled roads. Any machine will go to pieces if it is subjected to high speed work over rough roads; not only the wearing and bearing parts break down, but frame and axle materials crystallize and snap apart.

First of all we who were responsible or log and lumber production in France picked our men from the ranks with great care, and we picked more upon general character and interest in the work than upon word-of-mouth claims as to mechanical skill. Then we tried them out upon the job, and if they made good we turned their trucks and tractors over to them to keep up, and assigned them helpers to work with them on repairs. Usually two such men would take care of a log moving tractor so well that it never went to the shop and was always on the job during the week-days.

There were two kinds of conditions under which we operated; soft ground or woods conditions, with often a few inches of snow to contend with, and highways or yard work, where the roads and paths were rockbased and surfaced with either planks or road-metal. Naturally there were two types of tractors used; caterpillars for the soft ground and wheeled vehicles for the roads, with occasionally a faster and lighter type introduced upon the roads. The Walters tractor was found quite satisfactory and valuable for road work because it did not consume so much gas as other heavier machines, it was stronger, and faster also, and had a good winch equipment.

But the caterpillars were favorites in the woods and over the bad roads. The boys could hang on four or five strong trailers, with broad tires, and then they could load on a hundred logs or ten thousand board feet of lumber, and take it away to wherever it was needed at mill or railway. And

ON THE RUINED ROADS OF FRANCE THIS WAS THE MOST POPULAR TYPE OF TRACTOR

these crews, made up of interested and intelligent men, were possessed of much pride in their machines, so that they were glad to work nights and Sundays if necessary to keep their 'hogs' going. The first rule of operation to be observed with real conscience was that of moderation. They never crowded their tractors beyond a reasonable rate of speed. And they never started off in the morning without making a thorough inspection of all working parts—at least as thorough an inspection as could be given without taking the machine apart. And lastly they were generous with oil and grease. Often the tractor man states that he is getting along well enough with his equipment except that the treads and their running wheels always are giving trouble, but on the basis of experience in France the writer usually counters with the question: "How often do you baptize these parts with good grease?" We wasted grease often, no doubt, but we did not waste tractor repair parts, and after all they were more difficult to get than lubricants. Another tenet of faith among our men was to stop the minute anything went wrong and make it right, even though the hauling stopped for an hour or two. It paid in the long run.

Of course one may say that these rules are known to all, but that under modern conditions of labor and high-speed business, one cannot observe them or make his men do so. Over in France we were not troubled with labor problems and we could have made our men do anything we though best. But actually we did not insist on these rules for running tractors. The men insisted upon them, and were not anxious to do otherwise. If one gets down to the truth he generally will find that the slap-dash methods of nowadays are due not so much to the carelessness of really good mechanics and drivers—I say really good because of course there are other varieties—as to the demand of the owners for speed and high returns on the investment. The owners should get a good man and make it worth his while to stay, and then should see that he is given a fair deal on operating the machine as it should be operated. Then repairs will not eat up profits.

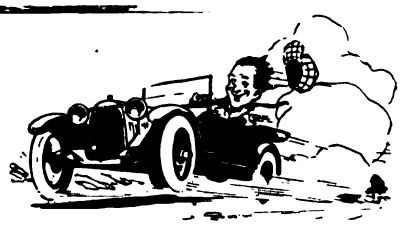
THE SPEED OF WOOD SAWS

Wood saws are generally designed to run at a certain speed which depends upon the size of the saw, the quality and temper of the material and the work to be done. For best results operators should try to maintain this speed as closely as possible. The following figures give the revolutions per minute usually recommended for wood saws of the diameters shown. One column applies to high-grade, well-tempered saws and the other to ordinary cordwood saws:

Diam.	High-grade	Cordwood
16	2500	1970
18	2250	1500
20	1950	1300
22	1750	1200
24	1600	1100
26	1500	1000
28	1400	930
30	1300	870
32	1225	820

If the speed is much lower than that given for the kind and size of saw, the work will be more difficult and more power will be required, while higher speeds will tend to cause a large amount of vibration and increase the danger of bursting.

High Spots



John Barleycorn dies hard, even when given knockout drops.

Even the man who has trouble to burn may make light of it.

Perhaps it is quite natural that a man's better half should get the best of him.

You can tell the dogwood tree by its bark, but the catnip doesn't make a sound.

We are told all things come to those who wait, but it's a long time between drinks.

With the high cost of living it is absolutely necessary for a man to get to the top.

There are sermons in stones in spite of the fact that some churches are built of wood.

To be matchless doesn't imply perfection, especially where a matchbox is concerned .

"Time was made for shaves," paraphrases the barber who is addicted to twisted quotations.

"Time is money," quoted the Wise Guy. "I dare say that is the reason so many people buy on tick," suggested the Simple Mug.

Wigg—"In spite of a rather shady past Mrs. Dashaway receives a great many gifts from the men." Wagg—"Oh, even a woman with a past isn't averse to a present."

Muggins—"I hate to play poker with Wigwag, he's so quarrelsome. He always has a chip on his shoulder." Buggins—"Yes, he doesn't seem to realize that a chip in the hand is worth two on the shoulder."

If cleanliness is really next to Godliness, the world is badly in need of a bath.

The love of money is the root of all evil. And yet we are told that love is blind.

When a married woman talks about her new suit we never know whether she is referring to clothes or divorce.

You never can tell. Many a man invests his money in experience, only to discover that it pays no dividends.

Just because a fellow talks about himself don't jump to the conclusion that he knows what is he talking about.

It's just as well to be prepared for sudden changes in the weather. The naked truth sometimes meets with a frost.

On the road to Success some men exceed the speed limit. The man who travels in a rut at any rate has time to admire the scenery.

Wigwag—"I suppose a man should think twice before marries." Henpeckke—"And even then he'll do some mighty tall thinking afterwards."

"What do you think of the actors' strike?" asked the dramatic critic. "Oh, many a fellow plays the fool who isn't much of an actor," replied the theatrical manager.

For one man willing to take his medicine there are a hundred trying to establish an alibi.

You never can tell. Many a fellow is fond of lady fingers who never asks for a girl's hand.

There isn't as much room at the top as there used to be, even for the froth on a glass of beer.

It requires a keen sense of humor for a man to laugh in his sleeve when he knocks his funny bone.

It's just as well to begin right, but even a story with a happy ending may wind up in the wastebasket.

The people who look before they leap are not the ones who jump from the frying pan into the fire.

True sportsmanship—Failure offering its congratulations to Success.

Is it possible to be perfectly square and and still be known as a many sided man?

Styles certainly do change. The glass of fashion used to hold champagne.

The people who are most eager to keep mony in circulation are those who haven't any.

No, Maude, dear; a girl isn't necessarily a jewel just because she is set in her ways.

There are no short cuts to fame, in spite of which most of us have our shortcomings.

It's just as well to buy a return ticket. Many a man goes to law who never gets back.

When poverty comes in at the door love calls up the hangar and orders around the airplane.

When a detective follows the fashions, of course the fashions don't know they are being followed.

There's no reason why any man should be out of work. Even idle curiosity gets mighty busy at times.

.."Marriage is lottery," quoted the Wise Guy. "Then alimony must be a sort of gambling debt," suggested the Simple Mug.

Love laughs at locksmiths, but poverty still continues to come in at the door.

Even after she has been that way for a year a woman can't realize that she is fat.

Your wife may have her faults. But if is wasn't for her you would make a fool of yourself oftener than you do.

A single man can be o fool and not know it. But it is different with a married man.

The o. f. man who used to pick tomatoes now has a son who tries to pick winners.

We'll admit that we are no better than other folks. But we believe that if we owned a white horse we would send him to the laundry once in a while.

A poor workman blames his tools, even when he tries to work on our sympathies.

Strangely enough, the more a man is on his uppers the farther he is from the top.

You never can tell. Many a fellow with a pull never succeeds in getting in his push.

The chornic borrower divides his time between breaking old friends and making new ones.

Just because a man is buried in thought don't jump to the conclusion that he is a dead one.

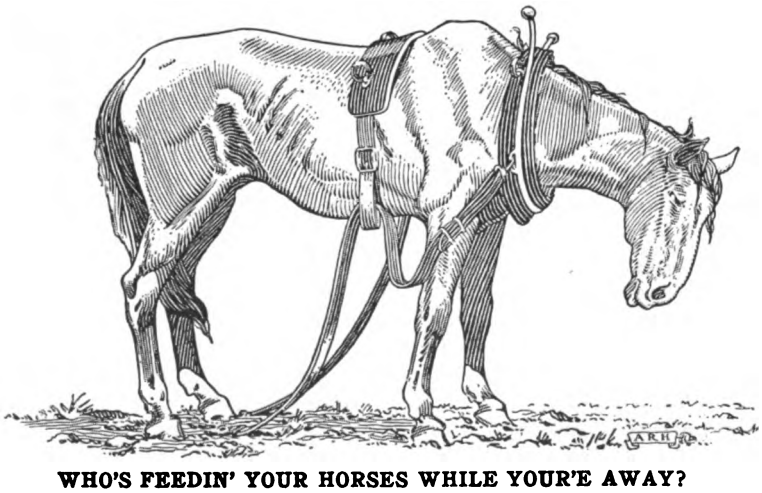
Nell—"I wish I could feel sure of never being disappointed in love." Belle—"That's easy. Marry for money."

The girl who marries a man because he has no bad habits will lead a happy, though mighty monotonous life.

Muggins—"A woman always gains her point." Buggins—"Huh! Did you ever watch one trying to sharpen a pencil?"

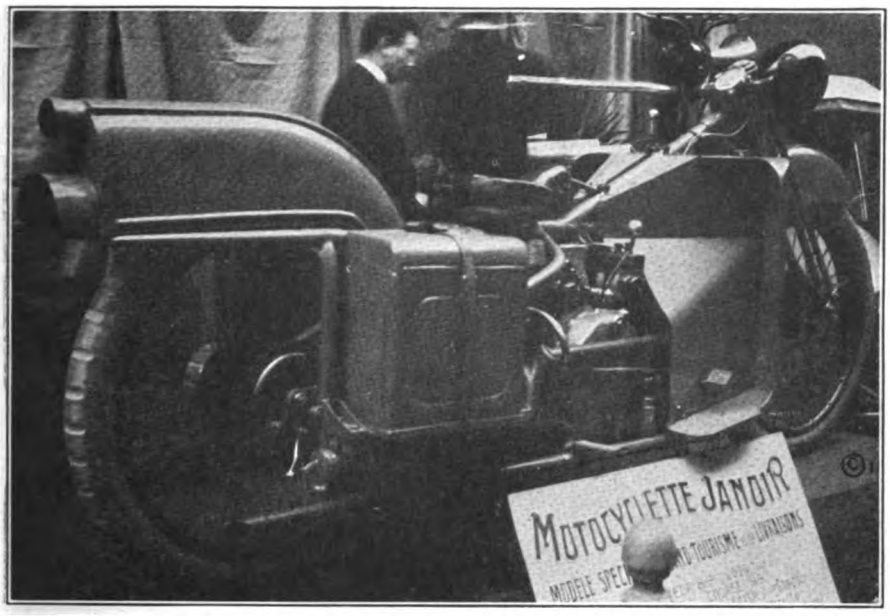
THE WORST HOTEL

Irvin S. Cobb says in the **Saturday Evening Post**, "The worst hotel for its size in this country or any other is one that overlooks the railroad yards in a smallish city on the edge of the Allegheny coal fields not very far from Pittsburgh. It has hot and running cockroaches on every floor and all night switch engine service. It is also haunted. The ghost of a red cabbage which was tragically boiled to death some 35 years ago, about the time the present carpets in the guest rooms were last cleaned, stalks throughs the corridors in the still watches of the night and sniffs at the keyholes.



WHO'S FEEDIN' YOUR HORSES WHILE YOUR'E AWAY?
WHO'S GIVIN' 'EM WATER—WHO'S GIVIN' EM HAY?

THE FRENCH IDEA OF A MOTORCYCLE



THE FIRST PARIS AUTO SHOW SINCE 1913 SAW THIS 400 POUND MOTORCYCLE SELLING AT 4,000 FRANCS, WHICH AT THE PRE-WAR RATE OF EXCHANGE IS ABOUT $800.

Benton's Recipes

Soldering Acid and Solders.—I have seen a number of different formulas for soldering acids and have had occasion to try several of them with more or less satisfaction. Among all the different ones which I have tried, I know of but one, however, that actually can be said to fill all requirements. As the formula for this acid is not generally known it may be valuable to our readers to add same to their collection. The acid is composed of: Solution chloride zinc, 1 ounce; glycerine, 1 ounce; alcohol, 7 ounces.

As far as the solder itself is concerned, one can, of course, make compositions of tin and lead in almost any proportions to fill the requirements in general. The melting point of these different compositions will vary greatly, however, according to the proportions of above metals in same, and, of course, this is an important factor in many instances, especially when wanting to solder metals which have a low melting temperature, in which case the solder ought to be a composition which itself will melt at a very low temperature. If bismuth is added to the composition the melting temperature will almost invariably be lowered. I have on hand a fairly complete table of compositions for solder giving their respective melting temperatures and the metals from which they are best adapted.

Tin.	Lead.	Bismuth.	Melting Temperature Degrees Fahr.
15.5	32.0	52.5.	205
20.0	26.0	54.0	214
20.6	26.8	52.6	217
21.4	27.8	50.8	225
24.8	22.1	53.1	237
20.0	20.0	60.0	250
15.0	25.0	60.0	257
63.2	36.8		361
60.0	40.0		372
70.0	30.0		381
50.0	50.0		415
34.0	66.0		446
30.0	70.0		495

A.

Belt Glue Formula—A glue for belts may be prepared as follows: Soak 50 parts of gelatin in water, pour off the excess fluid and heat on the water bath. Stir well and add first by weight, five parts glycerine, 10 parts turpentine, five parts linseed oil varnish and thin with water as required. The ends of the belt to be glued are cut obliquely, the leather warmed and the hot glue applied.

Polishing Wood—A very nice polish on wood is obtained by using the following mixture: ½ pint of alcohol, ¼ ounce of shellac, and ¼ ounce of resin. Dissolve the shellac and resin in the alchol; then add ½ pint of linsed oil, and shake the whole mixture. Apply with a sponge, brush or flannel Rub the wood thoroughly after the application

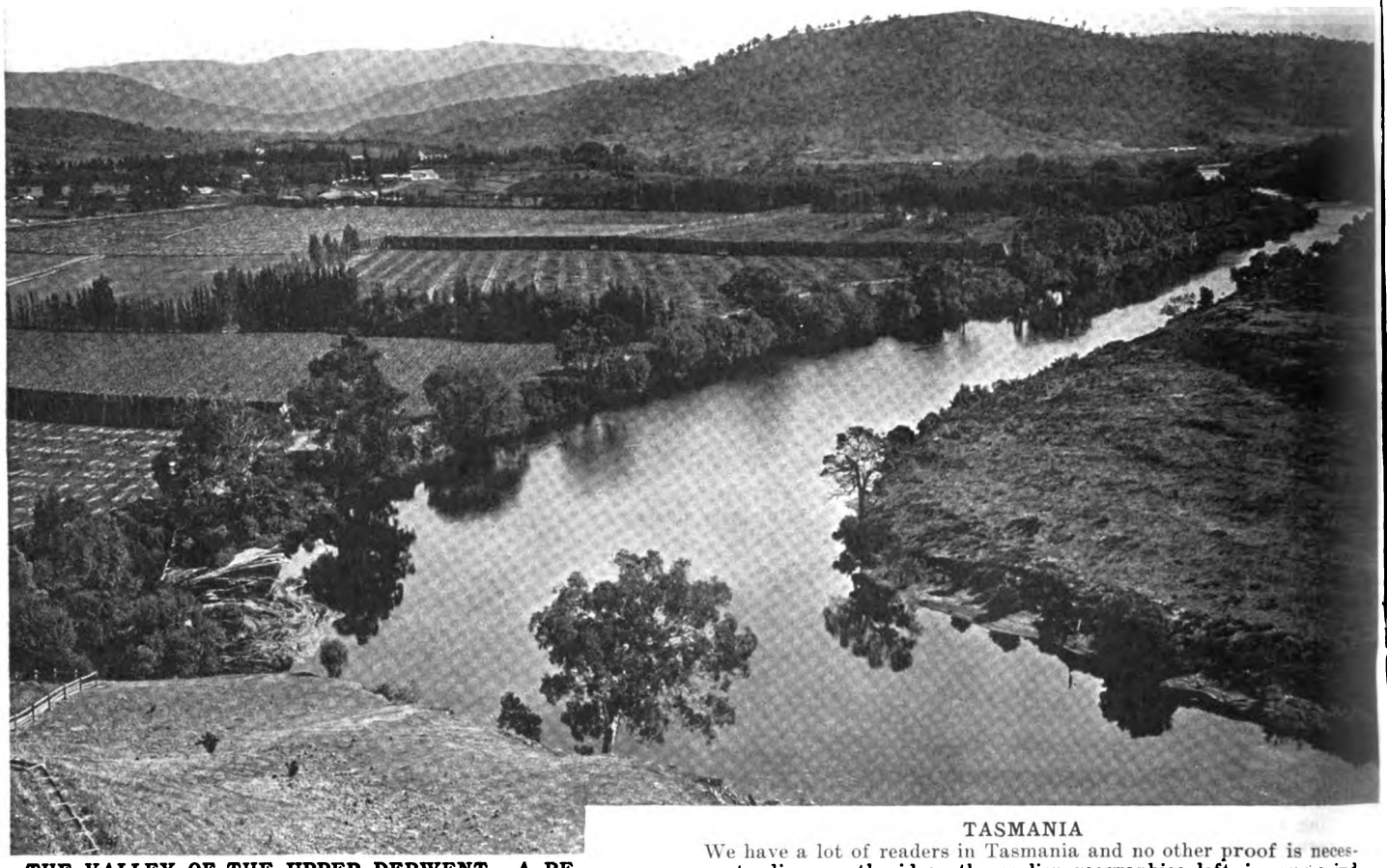
Hardening Formula for Cutting Tools—To make a hardening solution for metal cutting tools mix saltpeter, 2 ounces; salamoniac, 2 ounces; alum, 2 ounces; salt, 1½ pound; and soft water, 3 gallons. Keep the solution in a stone jar for it will eat a wooden tub and rust an iron pot. Do not draw the temper but only warm the tools enough to relieve the hardening strains. It is also well to rinse the tools well in water, for if this is not done, the solution will rust them.

To Case Harden Cast Iron—I have successfully case hardened cast iron, using the following receipt; pulverize and mix together equal weights of saltpetre, prussiate of potash and ½ ounce sal-ammoniac. Heat the cast iron pieces till red hot, roll them in the powder, and then plunge them into the liquid.

Turning Copper—Those who have had to turn copper in the lathe have generally wished that they had let someone else do the work and that they stood by and jeered when it was being performed, or else criticised it after it was done. Soap and water do not help; turpentine is a delusion and a snare; but milk does the trick "with neatness and dispatch."

THE RED BUG GIRLS BRING HOME THE BACON

With this little wagon and a suit-case strapped on behind a week-end can be very pleasantly spent especially if within a couple of hours from "duck-country." These two outdoor girls decided on a little hunt, packed a grip, hopped into their car and were off. After locating a good rendezvous they spent the day bringing down the birds and when the day's sport wos over they collected their game strung it on the improvised rack above the car climbed into their seats and sped back to Boston from the "happy hunting grounds". These girls think duck-shooting on a week-end "la Red Bug" is the finest sport in the world.

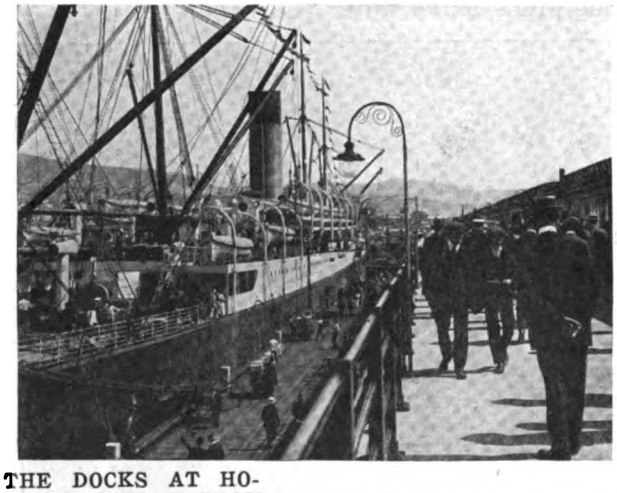


THE VALLEY OF THE UPPER DERWENT. A REGION FAMOUS FOR ITS FRUITS

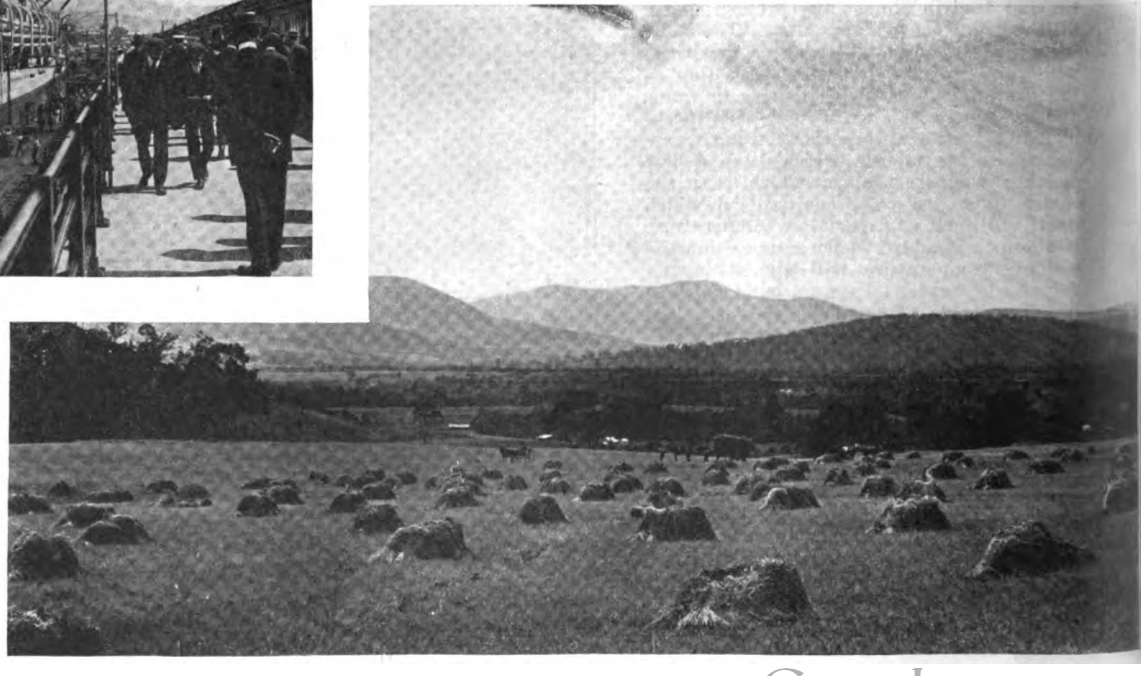
TASMANIA

We have a lot of readers in Tasmania and no other proof is necessary to disprove the ideas the earlier geographies left in our mind about Tasmania which was a country populated by a peculiarly ferocious savage and an equally queer assortment of animal life.

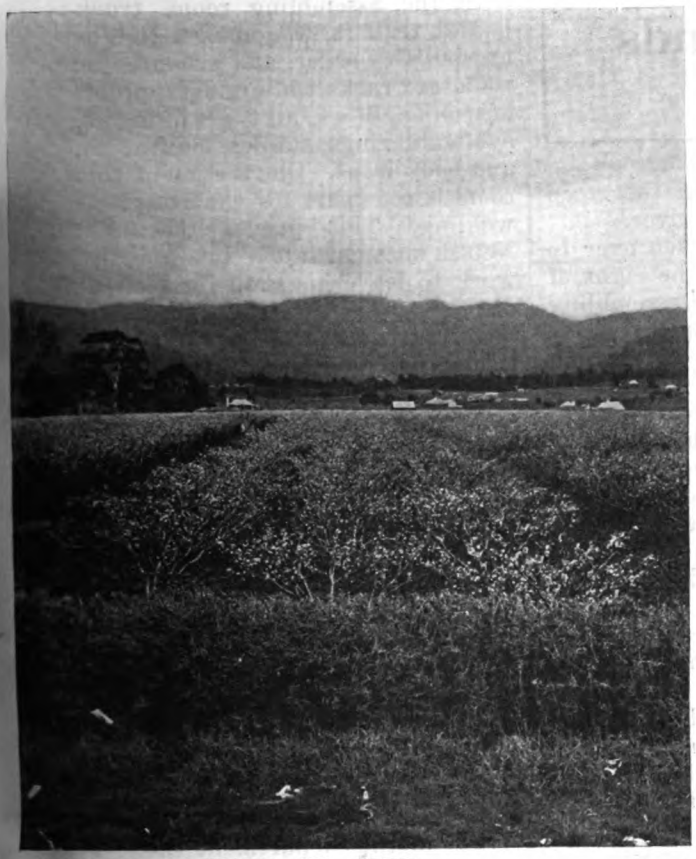
Tasmania, as the pictures show is an agricultural country, and as such is enjoying exceeding prosperity these days. However, as in Australia, New Zealand and other parts of the same group the repairmen are having a difficult time to obtain supplies. Your Antipodean while a British subject has a lively interest in anything American and his methods and ideas are far more progressive and up to date than a lot of us imagine.



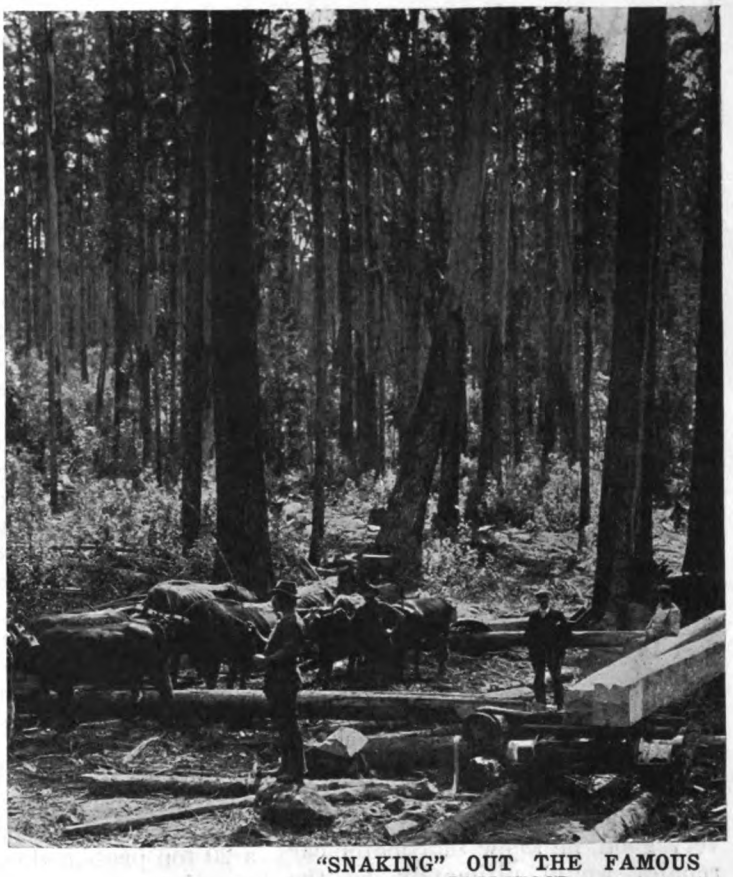
THE DOCKS AT HOBART—THE ESPLANADE ADJOINS



HARVEST TIME IN THE UPPER DERWENT

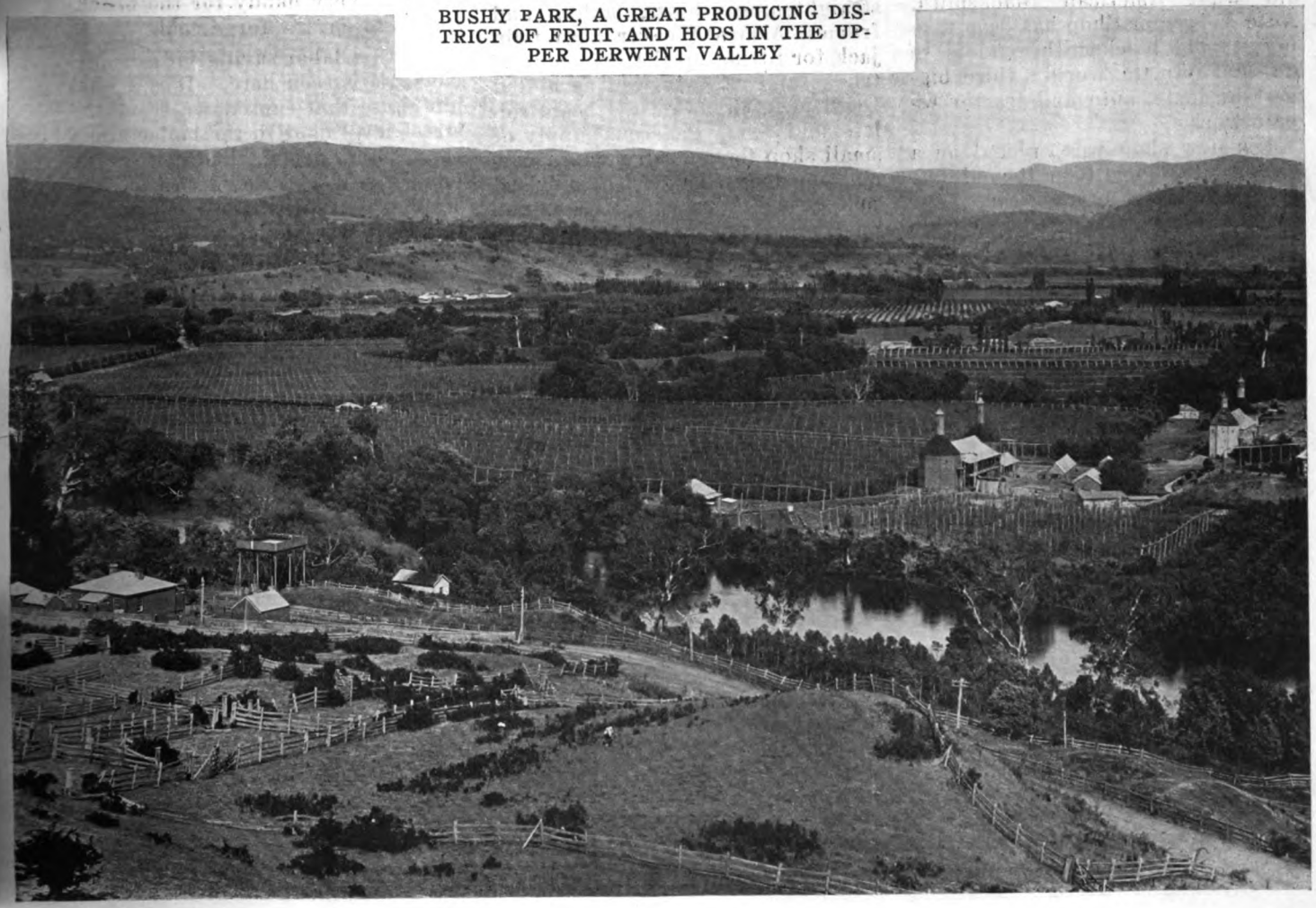


APRICOT ORCHARD IN GLENARCHY ABOUT FIVE MILES FROM HOBART



"SNAKING" OUT THE FAMOUS GUM-WOOD

BUSHY PARK, A GREAT PRODUCING DISTRICT OF FRUIT AND HOPS IN THE UPPER DERWENT VALLEY



Another Blacksmith Expands His Business

IF you were to ask Mr. H. E. Netsch, of Manchster, N. H., today to what particular thing he attributes his success in business, he would most likely reply: "To my decision to vacate the old horse-shoeing and repairing shop and build a modern building designed to care for both the old horse shoeing, wagon body work, and the real business for all live blacksmiths of today—automobile passenger car, and motor truck repairing."

The old shop shown in the illustration is typical of the village blacksmith shops throughout the country, but like many others, it was the means that led up to the present up-to-the-minute repair shop. In the old shop Mr. Netsch worked hard or many years, shoed horses, built truck and wagon bodies, and did general blacksmithing. But while his business was very good, he knew that motor car repairs would ultimately be the more profitable business, and he did what American Blacksmith, Auto & Tractor Shop has been urging its old blacksmith readers to do—got into the world's third biggest business, auto and tractor repair work.

His new shop was erected on a vacant lot 600 feet from the old one. It was designed and contracted for by himself. Mr. Netsch is a wide awake business man, and personally saw to every detail in the work of construction. The shop has three stories, though the illustration shows but one. This is due to the location of the shop on the steep bank of the Piscataqua river.

The street floor is given over to the office, which is at the right of the entrance, the garage, assembling room, and blacksmith shop, where horse-shoeing is still carried on. This department, as will be seen in the illustration, has a separate entrance that permits horses to be handled with no interference whatever with the motor car department. The floor under the street level is equipped as a woodworking shop. The lower floor is used as the boiler room.

It is at once apparent to the visitor in Mr. Netsch's establishment, that he is a firm believer in modern automotive shop equipment and that the shop is well equipped to handle all phases of the present automobile field work.

In the garage repair department a 20 ton press makes short work of pressing on or off crank shaft fly wheels, bushings, gears, etc., straightening shafts, axles, and frames. Also a Weaver auto twin jack for lifting up the rear ends of trucks and cars, as well as a Red Devil jack, chain hoist, I beam rollers, and a very generous supply of small shop tools a sall modern garage shops must have, such as wheel pullers valve grinders, vises, and portable electric tools. Two garage repair men are kept busy in this department. Mr. Netsch also has a complete equipment for battery charging and repairing and the handling of electric repairs.

In the assembling room, truck bodies, trailers, wagons and sleighs are built to order, and around this room are racks containing supplies of iron bar stock, all types of hooks, eye bolts, rings, staples, malleables, and body irons. One section of this room is set apart for the acetylene welding. This proves that Mr. Netsch does not intend to allow any work to leave his shop for lack of equipment, as readers know that many automobile owners will take their repairs where they know they can get acetylene welding done.

The blacksmithing department is well equipped with two forges, threading machine, tire upsetter, shears, and punch, tire bender, emery wheels, oil tempering tank, bench vises, anvils, calking vises, and drilling machines both portable and stationary, also a complete line of all sizes and shapes of iron and steel bars, carriage, machine and tire bolts, and the usual stock of horse shoes, calks, etc., for shoeing.

Each forge is equipped with an electric blower, as befits a modern blacksmith shop. Between the forges in this department there is located a bin for the forge coal, which saves steps and time and makes it very handy for the blacksmiths to get the forge coal.

Another labor saving idea of Mr. Netsch's is seen here. It is a coal bin chute that runs down from the street level floor to the boiler room three floors below, thus saving the handling of coal down two flights. Two blacksmiths are continually employed in this department. The heating of the garage is by steam from a Gurney boiler in the basement.

The woodworking department does not lack for equipment, having

MR. NETSCH'S PRESENT SHOP. A MODERN BUILDING WHICH SERVES BOTH THE MOTOR AND THE HORSE

a board planer, buzz planer, band saw, splitting or circular saw, spoke pointer, spoke tenoning machine, hub borer, and a saw filing machine. The shop has ample space and convenience for handling all lumber, shafts, spokes, and rims, making it very attractive to the wood worker. One wood worker is employed there steadily.

Two electric motors supply the power for operating the various shop machinery, one 7½ horse power and one 2½.

One outstanding feature of Mr. Netsch's place of business is the volume of space given to windows. There are 26 steel sash windows, each 10 feet 7½ inches, by 7 feet 8⅜ inches. These make the inside of the shop department as light as outdoors. Mr. Netsch designed the building, and he well knew how the lack of light made the old shop a hard place to work in and saw to it that the new shop was as near daylight as he could make it. For night work he has 35 high candlepower electric lights well distributed about the building.

Mr. Netsch carries a stock of Ford parts as well as tires, tubes, oil and gas.

He believes in local newspaper advertising and uses a display cut of his shop. He is well posted today in his business and is a good example of the up-to-the-minute wide awake motor repair shop man, and an example for those blacksmiths who have not yet seen the light to look up to and follow.

USED 216 TYPES OF AUTOS

During the recent war emergency, 216 different types of passenger cars and trucks were represented in the 150,000 machines purchased by the United States war department, according to the annual report of Brigadier General Charles B. Drake chief of the motor transport corps.

Strive to make every day of the New Year a little more joyous for yourself and your associates than any year which has gone before. Seek their co-operation; give praise for work well done; be willing to do as you would be done by; and, when you make a mistake, don't gloom and mourn over it, but make up your mind instead, not to make that mistake again.

Welding Auto Springs

DAVID BAXTER

A detailed instruction for welding auto springs by the oxyacetylene process. With valuable hints and suggestions to be followed when welding spring steel.

THE good old-fashioned blacksmith can weld auto and truck springs; some of the smithys can produce splendid results; but there are several objections to their method when compared with the modern torch process. One of which is the fact, that the leaf of the broken spring is from a half to an inch and a half shorter after it has been welded by the forge and anvil process. Another is that it takes longer for the average blacksmith to weld a spring than it does a torch welder under ordinary circumstances. A third objection is that it is harder, hotter work to weld a spring by the old method. And where the breaks occurs at the hole, which it usually does, the forge welder is forced to destroy the hole so that it must be drilled, while a fairl yexperienced torch welder may make a weld on both sides of the hole without effecting it.

It might be going too far to say that the torch method of welding auto springs is the best, because there probably are many torch operators who cannot make first class welds on auto springs. But in view of the arguments given above, it will pay any blacksmith to at least investigate the oxyacetylene process.

There may be several methods now in use for welding flat springs by this process, some may be better, and some may be worse than the one described in this discussion, however, this one is being employed with good results in at least one welding shop, for which reason it is no doubt, safe to follow. Like everything else, however, allowance should be made for difference in ability, shop conditions, materials, etc. Also there are many different shapes and sizes of springs; and there may be a difference in the metal of many of them. But this method is giving good satisfaction on all classes of flat springs. So, if the various steps in the process are followed carefully the average welder should have no trouble in welding broken springs.

First the welder should bevel both the broken ends of the leaf. A handy way to do this is to grind them on an emery wheel, cutting the spring metal away until the

MR. NESCH'S ORIGINAL BLACKSMITH SHOP

beveling will form a V-shaped groove when the broken ends of the leaf are placed together. This groove should be about twice as wide at the top as it is deep. Or, as wide at the top as twice the thickness of the leaf. More important still the grooving should all be done on one side of the spring; namely, the inner side, or the inner side of the curve. The groove should extend the full depth of the metal. In other words the spring leaf should be grooved on the inside only with the sides of the V sloping gradually to the bottom. To groove them on the outside puts the weakest part in positions of the greatest strain when the spring is placed back in service. While to grove both the inner and outer sides only makes more trouble and doesn't improve the weld. See Fig. 1 which shows the groove cut or ground in a common flat spring leaf.

When this grooving has been properly executed the next thing is to set it up for welding. This is easily accomplished upon an ordinary weld-table, or it may be done upon the floor, or any convenient place. The leaf is arranged with the groove side upward, in approimate alignament with its original state. To obtain this alignment, fit the broken pieces to the outside curve of an unbroken spring. Hold them firmly together while the ends are blocked up with any convenient object such as a couple of fire brick or a pair of V-blocks.

Before aligning the broken leaf, however, a strip of asbestos paper should be arranged so it will be directly under the groove when the spring is placed upon the table. This asbestos acts both as an insulator and a reflector. It prevents a loss of heat, through conduction due to the poor conductivity of the asbestos, and to the reflecting power of it. The heat is held and thrown back to the weld thus permitting more rapid fusion. The asbestos also protects the objects beneath the weld from the heat of the welding flame.

Besides the grooving Fig. 1 also shows the aligning arrangement; it shows a spring leaf ready to weld, the asbestos and blocking in place after the unbroken leaf has been removed.

Before proceeding to a description of the actual welding it is well to discuss the welding flame to be employed, for the benefit of the beginner, and as a reiterated caution to the more experienced operator.

The flame to be used on spring welding must be strictly neutral: exactly half oxygen and half acetylene. It should be thus at the beginning, during the process, and at the end. A constant watch should be kept over the flame to see that it doesn't vary. A flame that carries an excess of either element is probably the cause of more failures in spring welding than any other thing. If the flame has an excess of oxygen the filler metal and the spring metal will be oxidized or burned. The amount of oxidization depending upon the excess. Also depending somewhat upon the manner of manipulating the torch. When a spring weld is being oxidized from either cause some of the oxide or burned metal frequently remains in the weld to weaken the bond. Oxidation makes itself apparent during welding by the burning sparks that fly out as the flame is applied; if carried to extremes all of the metal in the weld will fly out, thus making welding impossible. When the sparks of oxidation commence to fly in increasing numbers it is a pretty good indication that the flame is gaining in oxygen, or else it is being incorrectly handled. On heavy steel welding this doesn't do so much harm because the operator has a chance to correct his torch and scrape out the burned spot before proceeding with the welding. But when welding auto springs if a considerable section of the groove is burned it often means that the whole procedure must be gone over again on account of the comparatively small size of the weld; it is sometimes necessary to cut a new groove an re-arrange the spring for welding.

From the foregoing it will be seen that it is best to test the flame at frequent intervals in case any doubts exists as to the proportion of oxygen in the flame.

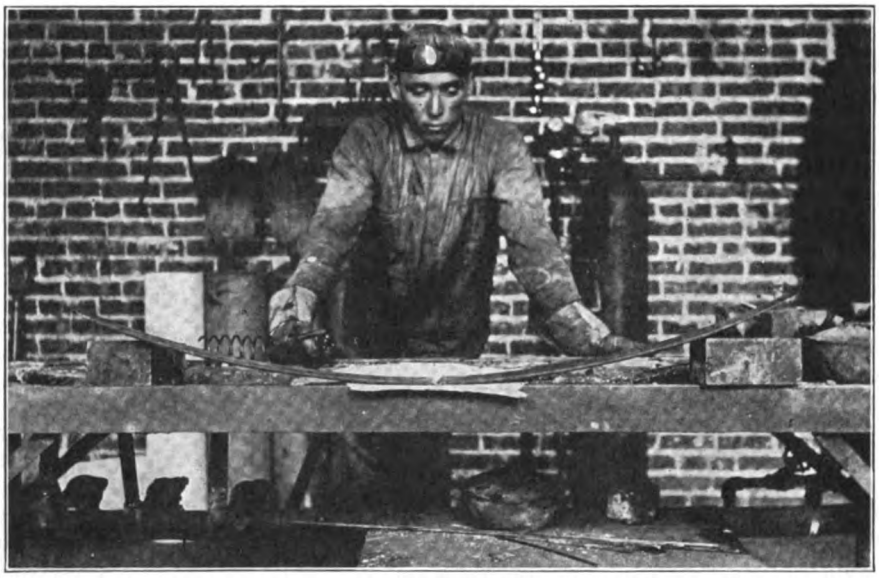


FIG. 1—SHOWING THE ALIGNMENT OF THE BROKEN LEAF

For the welding flame to carry more than half acetylene is also a bad practice, because this gas being rich in carbon is liable to carbonize the weld. In non-scientific terms this means that the carbon of the flame is liable to be absorbed by the melting weld thereby causing it to became hard and brittle. An excess of acetylene also causes the weld to be porous. Therefore it is plain that neither element should be in excess of the other if the operator hopes to produce a good spring weld.

Of course there are other things that cause a weld to become oxidized or carbonized but these need be mentioned but briefly, viz.: the oxygen of the air attacks the molten weld the moment it comes in contact with it; therefore it is best not to use a flame too large for the work since it exposes a larger amount of molten surface to the effect of the oxygen. Then a too large flame causes difficulty in controling the molten weld; and, it also tends to force oxygen into the weld.

The operator may carbonize the weld by carelessness even though he welds with a strictly neutral

flame if he shuts off the flame for a moment, then relights it on the molten weld, probably permitting a pure acetylene flame to play over the surface for a second, while he adjusts the oxygen. This bit of

FIG. 3. THE CORRECT WAY TO HOLD THE LEAF FOR GRINDING THE WELD

thoughtlessness may inject a quantity of carbon into the weld, which will be impossible to get rid of entirely. It is always safer to light the flame any where but on a steel weld.

Now in connection with these short instructions concerning the welding flame it may be well to caution the novice about the size of tip to use for welding springs. Too large a tip produces a flame that is injurious to the weld in the manner described above, while too small a tip gives a flame which will not furnish heat fast enough to fuse the metals and still furnish a surplus to be carried away by conduction and radiation. In other words the metal adjoining or surrounding the weld will absorb the heat of the flame so rapidly that not enough remains to properly fuse the weld. And so much heat is radiated from the weld that it lowers the melting power of a small torch tip. Therefor the choice of a proper size tip is an important factor in welding springs.

It is difficult to state the proper size tip; since the outlet of the tips vary with different makes of torches. So we must look to the manufacturer to supply a table governing the size of tip to use on different thickness of springs; the operator may be guided to a large extent by the tables, but he must exercise his own judgment, also.

Keeping these essentials well in mind the operator may proceed with the welding. First apply the flame to one end of the groove and melt a bit of the bottom together. At the same time a filler rod of correct dimension is brought to a melting state by holding it in the flame close to the weld. The flame is kept moving around over the weld and end of the filler. When the bottom of the groove is melted, the molten filler is added to it. Care being taken to see that the sides of the groove as well as the bottom are in a molten state, when the filler is added. Do not insert cold filler into the weld, but melt it in. Melt in enough to fill the groove unless the spring is a heavy one, in which event it will be necessary to make several layers along the groove in order to fill it. When the first bit of the groove is fused full, move onward and melt another bit of the bottom. Filling this full in the same manner, being careful to melt it into the first section as well as the bottom and sides of the groove. Then add a third section and so on until the entire groove is fielled. The flame and filler should be kept in motion constantly working in harmony while filling the groove. The idea being to make the sring and filler one single mass when the weld is complete. A slight surplus of filler is added to the top of the the welded metal; carefully melting it into the spring along the edges of the groove by playing the flame over the joint. A slight surplus is also added to the ends of the weld to make certain there are no unconnected spots.

The foregoing instruction applies to welds where there are no bolt holes or where it is not desired to save them. Where the break is located through a hole, it is necessary only to divide the weld into two parts and start on each side of the hole welding outward to the end of each groove. Care having been taken not to cut the groove through to the hole; this thin section may be melted together with the flame before adding the filler. If the welder is careful he will not need to fill or drill the hole.

If the spring is much thicker than the one illustrated in the accompanying photos, it will be necessary to weld back and forth along the groove two or more times in order to fill it. Each layer must be thoroughly melted and mixed with the top of the preceding one and also with the remainder of the sloping sides of the groove. Each succeeding layer will be wider so it will be more essential to keep the flame in motion to prevent destroying the life of the steel. The filler will also have to be melted in larger quantities for the same reason; it should be given a constant twisting motion, to help knit the weld and to prevent burning.

The choice of filler rod is a very important consideration when welding springs. Of course there is an absolutely correct size but the operator can get good results if he closely approximates this. However he should not attempt to use a filler rod smaller than three sixteenths of an inch in diamter, unless the spring is very thin or broken close to a thin end. The illustrated spring was welded with a three sixteenths rod.

The operator can purchase filler rods made expressly for spring welding but it is unnecesary unless he has a large number to weld. In fact he is running chances when he buys filler for this purpose unless he knows the manufacturer is responsible.

A good filler rod is readily made of any coil steel springs. These

FIG. 2—METHOD OF MAKING RODS OUT OF COIL SPRINGS

springs are no doubt better, when purchased new because there is no coating of corroding rust or dirt. Old springs, obtained at a junk yard will serve the purpose admirably. The average blacksmith usually has several of them lying around.

The old coil spring is converted into a straight filler rod quite easily. It is necessary only to grip one end of it in a vise, then

heat a curve or coil at a time and pull it straight. It need not be absolutely straight either, just fairly so. The curving is heated only enough to allow the straightening to be done. The heating, also loosens the rust or enamel which should be scraped off before melting the rod. No flux is required in connection with these rods; in fact no fluxing is done when welding flat springs.

Reverting again to the spring illustrated in the cuts: the next step in the process is to see that the lower side of the spring is properly connected. The spring should be permitted to cool enough so that there will be no danger of bending, when turning it over to examine the under side. If upon examination it is found that there are unconnected spots in the center with the curve upward, the leaf should be blocked to prevent sagging, while the operator re-melts the defects and knits them together with filler metal. This is accomplished by applying the neutral flame, until the defect and the end of the filler rod flow together.

When at last the weld, which should have been completed as rapidly as possible, is finished it is allowed to cool naturally, until almost cold before proceeding to the next part of the work. This does not mean, that it is essential to have the leaf warm for it may be allowed to get absolutely cold if desirable. However, when the weld has cooled to nearly its normal temperature, it is then taken to the emery wheel, where it is ground flat and smooth, grinding the weld down level. This grinding is an important part in the art of spring welding. The writer is not prepared at this time to say, whether or not there are any scientific reasons for grinding the spring in the way given in the following; but it seems reasonable to suppose, that the action of the emery wheel should have some effect upon the structure of the steel. Anyhow it is said to be better to grind the weld lengthwise of the spring, or in the manner illustrated in Fig. 3. The action of the revolving emery wheel is said to influence the grains of the steel in such a way as to make the joint stronger. It seems to be a fact, that the spring is weaker when ground sidewise.

The weld should be ground smooth with no hollow spots since the hollow places tend to concentrate or localize the bending point and thus weaken the weld.

After grinding; the leaf is once more wedged up like when preparing for the weld, to prevent sagging. When this is done the welding flame is again applied. Only this time the flame is swung around in a circle over the finished weld about an inch and a half above the spring and on each side of the weld. The heat is spread around slowly and evenly, until a circle about three inches in diameter reaches a cherry red heat. In other words, a section of the spring leaf about three inches long, including the weld is heated to cherry red. As soon as this is done the flame is removed and the spring permitted to cool of its own accord. When it is cold enough to handle, it is ready for service on the car.

In event of lack of table room the spring may be set to one side to cool. This can be done immediately if it is placed on edge. The reheating is for the purpose of softening any hard spots, that might have been produced in the weld. It is a sort of tempering or restoring process. The operator should be careful not to raise the heat too high, just a dull red in daylight.

Heavier springs than the one shown may be treated the same except, that the heat takes longer to show, if it is brought up evenly.

Fitting Ford Piston Pins and Bushings

THE piston pin when properly fitted will wear very slowly, but when carelessly fitted will wear the bushing in a very short time, causing a noisy motor and excessive wear on the crankshaft bearing.

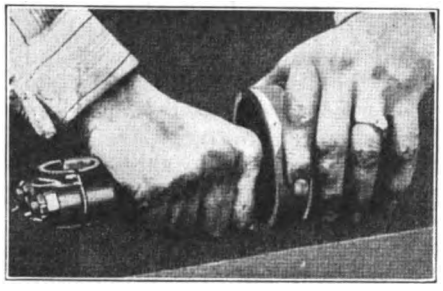


FIG. 1

To check the play between the piston pin and the piston bushing, hold the piston with piston pin perpendicular to the bench with the left hand, as shown in figure 1, while with the right hand, the connecting rod is forced up and down in such a way as to cause the pin to be forced against one side of the bushing and then the other.

If there is any play a new pin should be fitted and if necessary, the piston bushings should be replaced.

The pin is removed by turning out the connecting rod clamp screw after which, the pin may be pushed out. Every repair shop doing Ford repair work should be equipped with a piston clamp as shown in figure 2. Such a clamp eliminates, to a large extent the possibilities of springing the piston or rod in any of the operations which may be performed on the assembly.

If no clamp is available, the piston may be held by means of a rod through the pin, while loosening or tightening the rod. See figure 3. The practice of holding the rod in a vise, as shown in figure 4, invariably results in a twisted rod and a scored cylinder.

The piston pins are fitted into the bushing by a selective fit. A pin is tried in the bushing. If it turns freely, another pin is selected until one is found, which requires a fair amount of effort to force it in and turn it. Since the piston pin is harder than the bushing, it is usually necessary to renew the bushing to insure a properly fitted pin.

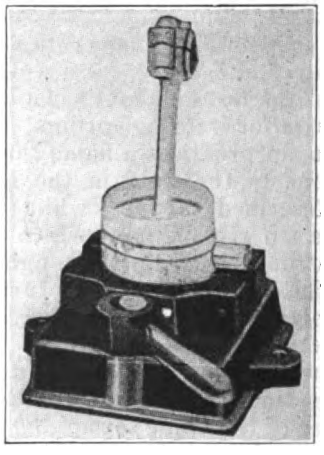


FIG. 2

The bushings should be removed on an arbor press. Care should be exercised, that the piston is not

distorted. Driving the bushing out with a hammer invariably throws the piston out of round. The arbor press should be provided with a fixture for holding the piston, as

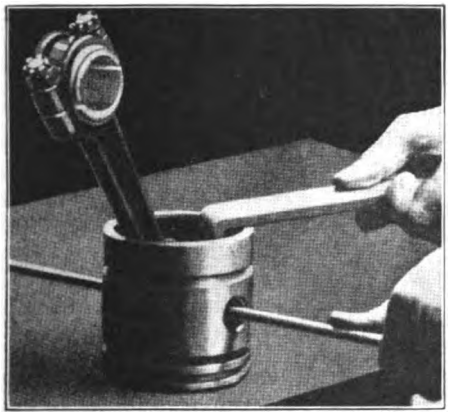


FIG. 3

shown in figure 5. The driver should be provided with a pilot, which will line it up with the bushing.

The bushing is removed through the inside of the piston, it is then turned over and the other bushing forced out in the same manner. When pressing in the new bushings, it is important to have them line up properly with the hole in the pistons, as a cocked bushing requires considerably more pressure to force it in, throwing the piston out of round.

The bushing should be pressed in until 1/16 of an inch of the bushing shows on the inside of the piston or until it is 1/32 of an inch below the outside diameter of the piston. When the bushings are in place, they should be reamed with a standard Ford pilot reamer. An ordinary reamer can not be used: first, because it would be difficult to obtain one of proper size, and secondly, it would not ream the two bushings so that they would align properly.

To hold a short stud while threading the end sometimes troubles the mechanic. A stud box is useful to hold the stud, also to drive it into position. But as an off-hand kink the writer learned a new one the other day. Simply hacksaw a nut lengthwise across the centre of one of the flats through to the thread. This gives the nut a spring hold. Run the stud into the nut, place the nut in the vise and you have a perfect hold for the stud without injuring the thread.

A Step Forward in Farm Machinery

AN invention that may easily prove to be one of the greatest forward steps in agricultural machinery within the last century, is the bucket plow, which has been invented by William Watson of Portland, Oregon. While Mr. Watson has not yet authorized the manufacture of this bucket plow, the demonstrations that have been made by him with his own models prove beyond a doubt that the invention is practicable and will probably replace the older methods used in tilling the soil.

The Watson plow is so different from anything heretofore used in farming as to defy description except by extended reference. To approach near to its appearance, imagine a platform seven feet by twenty mounted on wheels. Imagine, then, a cylinder six feet long, with buckets its whole length, made of steel and shaped like those of a steam ditch-digger or of an elevator, the cylinder turning in an opposite direction from that of the wheels of a river steamer in a forward movement. The buckets thus scoop up the soil, carry it over the top, throw it against a battery of metal fingers, the process breaking up the ground into small particles, the larger ones falling to the bottom, the fine earth being deposited on top. Thus, the bucket plow dispenses with the disc, because it pulverizes the ground as it plows, and does away with the harrow for the same reason.

FIG. 4

The buckets can be instantly set to plow at any depth desired up to sixten inches, and a simple attachment sows the grain, if it be desired that this be done at the time of plowing while the ground is mellow, moist and fresh, or this may may be deferred and done at another time. The plow is driven by an engine stationed on the platform, and will plow, pulverize, harrow and sow a strip six feet wide at a speed equal to or greater than that of a tractor.

An attachment susceptible of connection in a few minutes will cut and thresh a swath of grain anywhere from six to sixteen feet wide—even twenty-four feet, if wanted. In fields where farmers head their grain it will clip off the head and thresh it, cut the stalk off at the ground, likewise in the middle, as may be desired, by the application of one or two extra cutting blade attachments, thus leaving the straw evenly distributed over the ground to be plowed under for fertilizing purposes.

It will mow a sixteen to twenty-four-foot swath of hay, leaving it on the ground to be sun cured, as is done by the present style of mowers, or will carry the hay to a windrow to be air-dried. By adding another attachment the machine will gather up these windrows, deposit the hay on a rack located on the deck of the machine and convey it to the barn loft or stacking ground, disposing of it there. It will perform all the functions of a truck, or of a wagon, will operate a woodsaw, pump water, fill silos, etc., according to the inventor's claims.

According to Mr. Watson, the bucket plow will displace all other farm appliances, at a cost less than half of that now necessary to equip the agriculturist, and production will be more prolific because the soil will be aerated, giving the seed a chance to propagate, as science

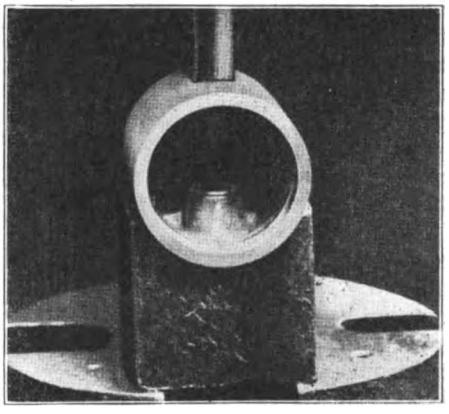


FIG. 5

has declared it must be at its best. Again, the cost of operating a farm will be greatly reduced, as one man, except in harvest, can do all the cultivation of the average farm or ranch. Ralph H. Butz.

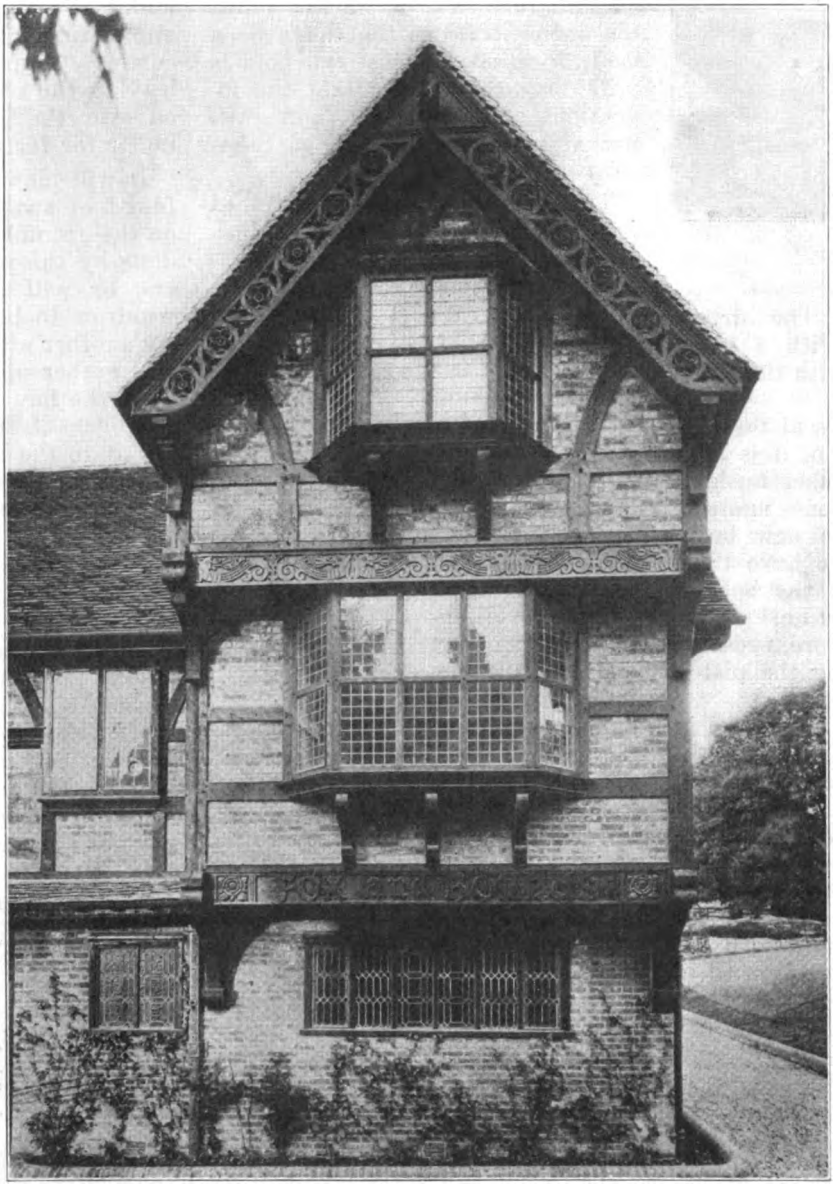
Touring in England—The Wayside Inn

SUMMER holidays are always such an acceptable part of our life that it is very difficult to come to think that people could ever-do-away without emigrating to coast or country without developing a wandering spirit for fresh scenes and charms of the road. Even in our youngest days, trips to the seaside or to the country were always looked forward to as an annual event.

We have changed all that now and even in our schools children have their organized camps, and our knowledge of coaching days and coaching ways are things of actual experience and the Greenman, the White Hart and the Fox and Hounds of coaching days have all come back to us in fact. A holiday on the road with the car has every day fresh charms and brings in a great sense of freedom from the turmoils of business life. The first experience of such a holiday is full of thrills; there is the uncertainty of the night's resting and tomorrow's program.

An acquaintance of mine who has motored all over England and Scotland advised me when on our first motor excursion to have no anxiety with regard to rooms and food, but as he expressed it always put up at the village inn "where charges will be moderate and comfort assured."

At a village not many miles outside London we found a little thatched building called the Green Dragon but decided that it looked altogether too much like a hut for us so when we asked a kindly shopkeeper to recommend a hotel he pointed out an imposing building "The Red Lion". As we were just in the smallest part and did not carry much of our worldy gear with us we remarked that we wanted a quiet place where cloth did not matter and pointed to the Green Dragon. He smiled and said "The Green Dragon, Why it is the classiest place in the country side. You have to dress for dinner there." The thatched roof and the rough appearance had belied its splendor, it merely played at ruralness.



AN ENGLISH HOSTLRY
A CLOSE VIEW SHOWS EVEN THE EXTERIOR OF THE BUILDING TO BE MOST PLEASING

The next inn left a very different impression it was a hostel of the old English coaching days. A nive size of an inn just set on the road amidst woodland surroundings, the front of which was panelled in brick and the interior of the rooms panelled in wood.

This inn in Crawley, Hampshire, which is shown in the illustrations, was in every sense a friendly inn where we regreted we were just for one night only.

For it called us to wait on its hospitalities and the peace of the wide moor beyond and the gurgling streams and to be free from tiredness begotten by the happy toils of the road.

Further over the country we called for lunch at a village hut, but as the landlady explained, it was the washing day, a meal was impossible, but we could have drinks. It was evidently a tavern only as a meeting place for the local worthies.

Coming back we passed through the English lake district which seemed planned for tours in spite of the hilly roads.

The traveler can find resting places in every village. Even in the most unlikely places we found enticing notices inviting to tea and lunch and often al fresco meals. Cottages, like amateur inns in catering for weary passengers at tables spread in sunny gardens so we come to remember many villages by the fare they provided. In many of these villages the inns are really hotels, too big and formal for friendliness, the landlords, instead of the rubicund, beaming host of tradition is a businesslike, town bred manager. In such places we followed the advice

a Highland landlady once gave us in our early motoring days. She evidently thought she had gauged the depth (or the shallowness) of our purse and warned us in kindly fashion when we reached a certain town not to go near the hotel for it was just for high gentry and the bakers shop would supply our needs quite well.

Of course half the charm when motoring comes from the hunger and fatigue of the open air; a good tiredness that soon gives place to sheer contentment when we enter an inn beside the road and find there for the night a friendly welcome and a resting place.

HANDLING AUTOMOBILE SPRINGS

Authorities on spring production state that it is not advisable to reset spring leafs of any kind by hammering them, hot or cold, or by running the leaf through a tire bender. The method suggested is to heat the steel to about 1900 deg. F., reforming the leaf to a predetermined form and immediately dipping the leaf in a bath of tempering oil. It is usual to sprinkle a little water on the hot plate before dipping it into the oil bath. The plate is then very brittle and must be drawn carefully. The matter of drawing depends a great deal on the degree of heat before quenching, but at 1900 degrees quenched in a moderately cool bath it is usual to draw until there is just the slightest suspicion of a dull red glow or about 700 degrees.

In most cases there is a little fitting necessary after the plate is drawn and allowed to cool slowly. This is done by a hammering process on a regular spring fitter's block or anvil, but the amount of such hammering compared with what is necessary to completely change the set of the spring is negligble and not particularly harmful to the spring. It is merely necessary so that a snug fit between all plates is obtained.

Swaging Wood Bits

The woodworker will notice that boring bits after having been used for a time seem to bore smaller holes. The bits may also stick in the wood and jam. This is due to the fact that the lips of the bit wear smaller in diameter than the body of the bit, says a writer in "Wood Turning."

With some kinds of bits, it is possible to swage the cutting lip so that it will cut large enough to clear the body of the bit. This is true of most single lip bits and some of the double lip ones. It depends upon whether or not there is metal enough in the lips, or back of them, to permit swaging to be done, for it surely is true that you cannot swage the bit which has no thickness of metal to permit swaging. Some "twist drill bits" can be swaged, provided they are not tempered too hard. Twist drills may be readily swaged after the temper is removed by heating, but they will have to be tempered again after the swaging is completed.

To swage a single lip bit file or grind a nearly round hole in a bit of metal—usually shaped to be screwed into a vise when used—the size of the hole being such that the bit to be swaged will lie easily in the hole or groove without pinching the lip. The object of the metal piece is to support the bit under the blows of the hammer during swaging. If placed upon a flat surface, the bit would be damaged. This demands the circle, nearly fitting the shape of the bit, preventing damage to that side of the bit.

To do the swaging, a punch of exactly the right shape must be prepared to fit into the angle between lip and body of the bit so that hammering the punch will stretch the metal and enlarge the lip diameter of the bit. Usually, a small, cold chisel is the very shape of tool required, all that is necessary being to grind off the end of the chisel and bevel or round it just enough to fit into the angle mentioned above, so that hammer blows upon the end of the tool, will stretch the portion of the bit between the punch and the solid metal below, against which the bit lies in its groove as described.

To determine if a bit or a drill is soft enough that it may be swaged without breaking, try a file upon that portion of the bit which is to be swaged an usually, if it can be filed, it can be swaged without breaking. But, if the bit shows to be very hard under the file, then the swaging must be done carefully, with very many light blows, or the bit may break under the strain of heavy blows.

In the manner above described, the cutting lip of a bit may be swaged large enough that it will cut a hole larger than the body of bit.

FOX AND HOUNS. A TYPICAL WAYSIDE INN AT HAMPSHIRE ENGLAND

A time saver in putting a bolt through the rear spring on a Ford car is to cut a hole about ¾ in. in diameter directly over bolt head. The broken one can be forced up and out and new one put in its place without taking the spring out from under car. In cutting hole above bolt leave about ¼ in. stock to act as hinge. After new bolt has ben installed, then bend it back to its original position, clean drops of solder on, making a neat finish.

DETECTING A SPRUNG CRANK SHAFT

"LISTEN to the motor you overhauled for me last week." "The same vicious old knock back again," unpleasantly announced the man, who had just driven into the garage. The repair man frowned. The disappointment was apparent to both. The former figuring in all probability, that he had been victimized by incompetent mechanics, while the later was perplexed; when a job which he thought had been thoroughly done less than a week before, came back pounding as badly if not worse than it did before it had been overhauled.

The main bearings were loose when the car came in the first time. The case was diagnosed as such and an examination had borne out the theory, when the motor was pulled down.

The bearings had been most carefully fitted. He had done the work himself. There was not apparent reason why the job should have gone wrong.

"I don't know how to explain it to you," "Leave the car and we'll make it right" said the garage man.

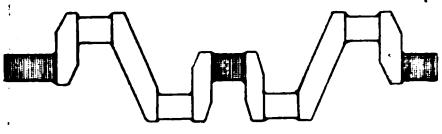


FIG. 1

The idea of laying up the car again for another week, after a sojourn of ten days less than a week before, didn't appeal very pleasantly to the owner. He needed it. "If I get this mess straightened out never again in here for me" he thought. And Mr. garage man wasn't very highly elated at the prospect of having to do the work over again and especially when he wasn't going to be paid for it.

The motor was pulled down. Sure enough the bearings were loose, particularly the center main. What caused it? There seemed to have been plenty of oil. To those, who have had this experience, the answer is simple but puzzling to the man, who is encountering the trouble for the first time.

The crank shaft was sprung. On every motor overhaul job, it is just as important to determine whether or not the crank shaft it straight, as it is to put piston ring on the pistons. No matter how carefully the bearings have ben scraped, fitted and adjusted, they will not remain so, unless the shaft which they are supporting is true.

A sprung shaft is constantly subjecting the bearings to an unnatural strain. The bearings are trying t bend the shaft back to some semblance of alignment at every revolution. For a while they are sucessful but eventually they are bound to loosen up. The bearings become loose. A knock develops. The shaft working up and down and pounds out more of the bearing metal. Things become rapidly worse. If conditions are not remedied the crank shaft is most liable to become crystalized, causing it to break and possibly the crank case with it.

One large manufacturer on production work has established a limit of .006" (six thousandths inch) for a shaft to run out at the center main bearing. That is, a shaft turned between centers with an indicator applied to the center main bearing, would be considered straight enough for use if it ran out not in excess of .006".

Such equipment is not available in the smaller garages, in fact it is not to be found in many of the larger ones. A method that answers the purpose equally as well, but which takes a little more time and may be performed with less liability of a mistake is as follows.

The main or line bearing of the crank shaft are blued lightly with prussian blue and the shaft is carefully laid on the upper halves of the bearings in the crank case. The shaft is turned over several times and then removed. Where ever the blue appears on the bearing is the place where the shaft touches. If spots appear on the front and rear bearing but not on the center bearing it is obvious, that the center bearing is low. The front and rear bearing should be scraped until a bearing surface appears on all three bearings at each application of the shaft. In this manner the upper bearing halves can be lined up.

If any degree of service is to be expected it is equally important to have the bearings properly lined up, as it is to have a straight shaft.

The scraping operation must be conducted carefully. If an excess of bearing metal is removed, the distance between the crank shaft and the cam shaft will we lessened, resulting in timing gears, which bottom.

With the upper halves of the bearings lined up, it is possible to determine whether the crank shaft is straight. Clean the shaft and bearings thoroughly, preferably with gasoline. Blue the shaft lightly and lay it on the bearings, turning it over several times without using any effort to press it on to the bearings. If the entire surface of all the line bearings on the shaft show evidence of having touched the bearings in the case, it is safe to assume, that the shaft is straight. In other words, the blue has been marked or rubbed away, entirely around all of the bearings on the shaft through their contact with the bearings in the case. See Fig. 1.

A sprung shaft is easily recognized by the marks left in the blue, marks that run only part way around the shaft and terminate as a rule at a line running parallel to the axis of the shaft, indicate a shaft that is either sprung or that has bearings which are out of round. In nearly every case it is the former.

In bad cases, it will be observed, that at a certain point the shaft can be rocked perceptibly on the center

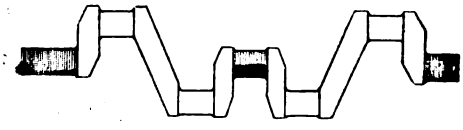


FIG 2

bearing. Evidence such as have been enumerated, usually occur at the center main bearing although there are exceptions. Crank shafts with any number of bearings may be treated in the above manner.

Straightening sprung shafts has not been attended with any permanent degree of success. In the first place it is difficult to true up a shaft and secondly, when to all outward appearances the shaft has been straightened, it is very apt to spring back when subjected to such strains as it will meet in service.

Regrinding the bearings of a sprung shaft is the most satisfactory way of correcting the evil. It is a job which few garages or machine shops are equipped to handle and since it necessitates the use of all new bearings of smaller inside diameter, it is less expensive to install a new shaft, particularly in the smaller cars of four cylinder design.

Queries-Answers-Notes

THIS department is the meeting place where you are free to ask for information, answer questions, discuss shop matters and business conditions and any other notes you feel would be of interest to a fellow mechanic. Make use ofthis Department as often as desired.

Suggestions for Free Air Service.—I am a very poor hand to write letters but as I am a reader of your valued paper and would like a little information and do not agree with it in regards to furnishing free air.

I am going to give you my experiences. I have done a little touring, and the most disappointing thing I have found was the air supply. Every other one is out of order, and no gauge to tell how much air you are gettting. Now, why should we expect a man to invest a couple of hundred dollars and keep an outfit in order to furnish gasoline which is pumped into my car for the profit of one and a half cents a gallon, or about eight cents a customer. In one garage I found a sign "Air air Five Cents a Tire". This looked good, for we got air with service and a guage and felt we could expect same although the price was small, but enough to keep the outfit in good condition and pay the interest on the money invested, which I think we should have reason to expect. This to my mind is a good business proposition.

But what I would like to know is if any of your readers could tell me how to convert a single cylinder Cadillac engine into an air compressor, and about how fast should the shaft run to produce fifteen feet of air a minute?

In replying to the above, our knowledge of the early single cylinder is rather limited. We have no specifications at hand. That type of motor, we believe, developed ten H. P., in which event the bore must have been approximately 5 inches. Since we have been unable to determine whether the intake valve was mechanically operated or was of the automatic type, which was very popular in that period, we would suggest the following:

First, it will be necessary to remove either the valve push rod or the cam which operates it in order that the exhaust valve will remain closed. Care should be exercised to see that the valve seats properly. An air leak will result in loss of pressure. Should the intake valve be of the automatic type, matters will be greatly simplified, as it can be used without alteration for the intake valve of the compressor. A suitable check valve installed in the spark hole will act as the outlet valve.

If the intake valve should be of the mechanically operated type, it will be necessary to remove the intake valve, plugging the intake valve guide in a suitable manner to render it air tight, and then attach an inlet check valve where the intake manifold was originally fastened.

It may become necessary to raise the compression, which can be accomplished by fastening pieces of sheet metal to the piston head in order to reduce the compression space. The best results can be accomplished with leakproof piston rings fitted to the piston. These rings should conform to the cylinder wall within .002".

Assuming the bore to be 5" and the stroke the same length, between 275 and 300 R. P. M. will deliver approximately 15 cubic feet of air per minute.

Prices in Iowa.—Seeing your request, and also Mr. Tye's of Canada, for prices, I will do my best to give you copy from my list. These I have worked out since February. I have been in the service of Uncle Sam for some time, but now I am back with the wife and kiddies, and am not sorry I enlisted. I have worked in nearly all the big towns in Iowa, Illinois, Nebraska, Indiana, Ohio, Wisconsin, Michigan, Minnesota, North Dakota, and Montana. As well as on railroad construction work all through the Canadian Northwest. I have also taken two hitches in the woods. I floated around, not because I liked it, but to learn. When I went to work for a guy and he couldn't show any more goods than I did, I just rolled up my apron, put it in my trunk, grabbed a rattler and fanned the breeze to the next burg. I didn't miss any meals, but I postponed a lot of them, it was the next thing to army life; but I learned a little in every burg I was in. If you can use the price list, I'll cut the chow.

Horseshoeing—New, common 0-5, set of four $2.50, each $.65; 6-7. $3.00 per set, $.80 each; 8, $3.50 per set, $1.00 each; Steel plug sharp, $7.00 per set, $2.00 each; Resetting common shoes. $1.60 set, $.45 each; Neverslips, new, $5.00 set, $1.35 each; Neverslips reset,, $1.60 set. $.45 each; Calks, $.08 each; Bar shoes, 0-5, $1.25 each; 6-7, $1.50 each; 8, $1.75; Resetting bar shoes, $1.15 each; Hand turned shoes, any size or style, $3.75 to $15.00; Stallion shoes, new, $1.35; Stallion shoes, reset, $1.35; leather pads and packing, $.40; Rubber pads, $1.75; Trimming feet, $.15 each; Outlaw horses extra. $5.00.

Plow Work—Pointing and sharpening, $1.50; Pointing and sharpening lister. $.75; Sharpening plow, $.75; Sharpening discs, $4.00 to $5.00; New lays, 12 in.. $5.50; 14 in. to 16 in., $6.00; 18 in., $6.75; Pointing and sharpening cultivator shovels, $2.50; New beam, one horse, $3.50; two horse, $4.50; three horse, $5.75; Setting beams, $2.00; Plow handles, straight, $1.50; bent, $2.10; round, $.50; Plow land side, bent, $2.50; Side iron, $1.75; New plow cross clevis, $1.75; Plow single tree, $.75; Sharpening harrow teeth, $.06; Removing and replacing teeth, $.06; Sharpening seeder teeth. $.25; Sharpening drill shoes, $.35; Sharpening road graders, $6.00 to $10.00; Sharpening stock cutter blades, $1.00.

Wagon Iron Work—Front bolster irons, $2.00; Hind bolster irons, $2.00; New bloster end irons, $1.40; New bolster stake iron, $1.00; I Pair bolster plates, $2.50; Tires set, $3.50 per set, $1.00 each; 2¼ in. tires set and bolted, $14.50. per set; $1.00 each, 2¼ in tines set and pinned, $3.75 per set, $1.00 each; 2 in. tires set, $4.00 per set, each $1.00; 4 in. tires set, $4.00 per set, each $2.00; New tires, ¾ in. x 3 in. $28.00 set, $8.50 each; New tires, ½ in. to ⅝ in. x 1¾ in., $18.00 per set, $5.00 each; New rub irons put on. $.75; New hound iron brace, $1.00; New hind hound plate, $1.50; New truing rod, $.75; New truing plate, $.50; New wagon wrench, $.85; New hub bands, $.50; New king bolt, $1.00; New box strap put on, $.50.

Wagon Wood Work—Bolsters front or hind, $4.00; Bolster stakes front or hind, $.75; Rims 1¼ in. tread, $12.00 per set; Rims 2½ in x 2 in.. $14.00.

Buggy Iron Work—Two new 1 in axles complete, put on. $12.00; 1 axle, $7.00; Tires set and bolted, $4.50 per set, $2.00 each; New tires ¼ in. to ⅞ in., $10.00 per set, $2.75 each; Spring welding, $1.25; Irons on old shaft, $.75; Irons welded on old shafts. $.75; Iron poles replaced. $1.00; Iron pole circle replaced, $.75; Iron pole brace welded, $.90; Axle clips. new. $.40; Truck felloes, 2½ in. or 3 in. $1.75; 3½ in. or 4 in.. $2.50; Wagon felloes, $.75, per set, $12.00; Single spokes. $.50; Spokes whole wheel, $.40.

Tongues—Wagon tongues, oak or ash, with old irons. $5.50; Plow tongues, oak or ash, $4.50; Harvester tongues. $6.75; Tongue hounds, per pair $3.00. each, $1.75; Front hounds, per pair, $4.00. each. $2.25; Hind hounds, per pair $4.00. each $2.25; Bent hounds. $5.75; Maple axles, 3½ in. x 4½ in., $5.50; Hickory, $6.50; Hickory axles, 4 in x 5 in.. $7.25; Sand boards. $3.00.

Miscellaneous—Wheels cut down. $15.00

SUCCESS SECRETS

ONST there was a man that you couldn't tell nothin'. He was so wise that he knew it ALL. So he insured his property for about half what it was worth. He was always Talkin' an Explainin' that he could afford to carry part of the risk himself, an' he was fond of sayin' that if his property wasn't insured too High, it wouldn't be so likely to get so hot that it would burn.

Well, time rolled on, an' it rolled some more, an' War broke out in Europe, an' America got tangled up in the fight. Friend Wife tried to talk to him about his insurance, but the Man with the Big head chuckled her under the chin an' said:

"Play in the garden with your Posies an' don't bother with what You don't know nothin' about."

One night the fire broke loose an' licked up the block which contained the business of the ole Man. He was fit to be tied. When he collected his insurance, it was Like a cherry pit in an empty coal hod.

An' Friend Wife comforted him by snappin': "That's because you knew is all an' Wouldn't insure on present values. Half of that would have built a block half as big! Now all you've got is enough for a peanut Stand!"

per set; Truck dump bodies, $135.00 to $175.00; Light delivery bodies, $15.00 to $100.00; Cars cut over into light deliveries with bodies. $100.00 to $275.00; Car frames patched, $12.00 to $75.00; Trailers built to order, with rubber tires, $75.00 to $150.00; Fords overhauled. material plus time at $1.00 per hour; Gas engines overhauled and painted, $1.15 per hour.

Carl C. Schmidt, Iowa.

SOUTH QUEENSLAND PRICE LIST

Following is a recent price list issued by the Master Coachbuilders and Wheelwrights' Association of South Burnett, Queensland:

Axles—H.P.			
1 inch per pair	£3	10	0
1⅛ inch per pair	3	12	6
1¼ inch per pair	4	0	0
1⅜ inch per pair	4	10	0
1½ inch per pair	5	0	0
Axles—C.N.			
1⅝	1	10	0
1¾	6	0	0
2	6	12	6
Axles—Dray			
2	5	12	6
2¼	6	5	0
2½	6	15	0
Long Distance Axles, 20/-extra.			
Axle Set			
Sulky	0	10	0
Buggy	0	12	6
Spring Cart or Dray	0	12	6
Bullock Waggon	1	5	0
Axle Boxes—H.P.			
1 inch	0	10	0
1⅛	0	11	0
1¼	0	12	6
Brakes			
Axle Beds for Sulky	0	15	0
Steel Waggon	6	0	0
Sulky complete	3	0	0
Ruggy Reach Brake	5	0	0
Buggy Body Brake	:	10	0
Spring Cart Brake	3	15	0
Tip Dray Brake	3	10	0
Brands			
Per Set of 3	1	7	6
Single or Numerals	0	9	6
Dash Boards			
Pine	0	7	6
Circular	0	15	0
Silky Oak	z0	18	6
Dash Irons			
Per pair	0	7	6
Poles			
Buggy, hickory, complete	5	10	0
Straight Hardwood	4	5	0
German Waggon	0	15	0
Bullock Front	1	10	0
Bullock Centre	2	0	0
Painting			
Sulkies	5	0	0
Spring Carts	4	10	0
Buggies	7	10	0
Buckboards	6	0	0
(All Red Colours, add 10/-.)			
Seats			
American Spindle Seats, each	3	0	0
Panel Seats	2	7	6
Baby Seat	1	5	0
If supplied with New Sulky, each	1	0	0
High Seat Backs, pine, each	1	0	0
Springs			
All Springs add to cost price	1	10	0
Spring Leaves			
Sulky Main Leaf	0	15	0
1½	0	17	6
2nd Leaves	0	12	6
All others	0	7	6
Swing Bars			
2-Horse Set, link and hinge	2	0	0
2-Horse Set, with eyebolts	1	5	0
2-Horse Set, cap or bar band	1	15	0
(Advantage extra.)			
Double Bar only	0	15	0
Single Bar only	0	12	6
3-Horse only	1	5	0
Extra Heavy	1	7	6
4-Horse Bar	1	12	6
5-Horse Bar	1	17	6
Buggy or Sulky Bar	0	10	0
Main Buggy Pole Bar	0	12	6
Shafts			
Spring Cart per pair	1	5	0
Spring Cart long	1	10	0
Tip Dray Shaft and Bars only	2	2	6
Single Shaft	0	15	0
Baker's Cart Shaft	1	2	6
Sulky Shaft each	1	10	0

Harvey Hausman Enlarges His Blacksmith Business.—Harvey F. Hausman, who has conducted a horseshoeing business here for quite a number of years, has added general blacksmithing to his line. He is prepared to replace broken automobile parts of all kinds, having just installed a drop forge, a finishing machine and a large drill press, which equipment will be enlarged as the business expands.

"Mr. Hausman has secured the services of John Canavan, who will have charge of the new department. He is an experienced man along these lines and automobilists requiring services of this kind will find their wants attended to in the same high class manner in which Mr. Hausman acquired an enviable reputation in horseshoeing, which will be contined in connection with the new departure."

Editorial Note.—The above is reprinted from a newspaper clipping and shows that the horseshoer can cater to the automobilist as well as the horseowner, and to illustrate the fact that blacksmithing and auto repairing are intimately related we quote from another clipping which tells us that—"Leslie Minor has purchased the garage at Santa Rosa. Minor expects to do blacksmithing also in connection with the garage work."

"Price Fixing" Associations would do well to invest.gate the potentialities of "getting in wrong" before they agree on any program of price fixing, as witness the following, which is taken from a Michigan newspaper:

"As a result of testimony given before Prosecutor Lucas in the county's investigation into high prices, the Houghton County Blacksmiths' association may be ordered to dissolve on the ground that it is a price-fixing body.

"The only witness was Isaac Frederickson, a member of the firm of Frederickson & Son, blacksmiths of Pine street, Red Jacket. Frederickson testified that at a meeting of the association held in the Red Jacket town hall a few weeks ago, a schedule of prices was agreed upon and that the new prices would go into effect as soon as the lists are received from the printers. The new prices on horseshoes were fixed at $1, the witness said, and the prices for new material were fixed at from 30 to 50 per cent. in advance of former prices.

"Witnesses summoned to appear include Paul Exley, of Hancock, president of the association, and Henry Hobba, of Houghton, secretary.

"The scope of the hearing may be indicated by the fact that the next witnesses will be shoemakers and cobblers who have been advancing their prices of late. The new prices appear to be so remarkably uniform that the officers express the belief that an agreement exists. This would be a violation of the state laws subject to a fine or jail sentence.

"Retail grocers and meat dealers will be called during the next week, probably beginning Monday."

WIPING A LEAD JOINT—Where it is impossible or inadvisable to join two pieces of lead, copper or brass pipe by other means, a wiped joint usually meets all requirements.

The pipes are "scarfed" to fit, as shown, either by scraping or filing. The next operation is to expand the female end of the pipe, and this is done by driving a wooden expander into the pipe, using light strokes. The expansion should be merely sufficient to insure a good fit.

The work should be firmly held together and supported in a vise or by bricks, as shown in the illustration. Strips of paper are pasted to the pipe at the point where the edges of the joint are to be. Before going further it should be said that the surfaces to be joined should be filed or scraped bright. An appplication of soldering paste is applied to the spaces between the paper strips and everything is ready for making the joint.

The wiping operation is done with a pad composed of three or four thicknesses of felt or canvas. This pad should be greased with tallow and thoroughly worked in.

Holding the pad underneath the pipe, the melted solder is poured over the joint from a ladle, and by proper manipulation of the pad the joint is formed and the paper strips removed. The paper strips are not necessary, but they make the ends of the joint clean and sharp without scraping when the job is completed.

Helpful Criticism.—As you know, I have been a constant reader of your paper for many years now, and have derived no small benefit from it in matters pertaining to the trade. But there is one subject on which you often have a line from different subscribers and that is the repairing and tempering of automobile springs.

Now, I must tell you right here, that I have more than a passing acquaintance with springs and spring making, as 35 years ago when an apprentice in coachsmithing in the town of Greytown, N. Z., in a shop known as the American Coach Factory, started some ten years before by an American, North, I think his name was, my first job was striking for a spring

smith, a Sheffield man, who was making long grass-hopper pattern springs for a pagnal cart of English type, and the steel was 1¾" by 5-16", and he used to rate me soundily if we did not get an end tapered and rounded in one heat. 'Twas all sledge, no rollers, and the striker boy had to keep moving some. It is a far cry back to that time, but I have been constantly at the anvil ever since—all coach and motor work— and have repaired, set up and re-tempered many old springs, and have made many new ones since then, and at no time in that long week have I been so busy with spring work as at present. Bad roads, worse drivers and frosty mornings, accompanied by a loaded motor car, have a lot to do with this state of affairs of which I make no complaint, for it brings much grist to th mill, otherwise, mali, or Jimmy O'Goblins.

Now I must take issue with you and say that I have thought your contributions on spring repairing and welding all piffle, and of no practical use to any learner. With the exception of an article from Jenkins, of the Jenkins Vulcan Spring Co., and he treats on the matter more from a spring maker's point of view than from that of the small repairman, to whom I presume most of your articles are intended. Your own suggestion as to putting them through a tire bender is no worse than many of your contributors' notes, so take heart. I am forced to think that your real spring smiths have not written. Their hand's do get pretty stiff and they do not all have the advantage of a dinky type-writer girl to help them along.

I wish to contradict one of Mr. Jenkins' statements (although I was thinking of placing an order with his firm for some stock springs and spring steel bars), where he says it is absolutely impracticable and inadvisable to attempt to reset springs. Now, this statement is incorrect and misleading to smiths who are looking to learn something about spring setting, although the remainder of the article is of value as far as it goes.

Now, Mr. Editor, what I wish to suggest is this, that you get up a competition on an essay on spring making and repairing, to be treated on from the jobbing smithy point of view—it's the small jobber and public generally we want to help—smiths only eligible for competition. Give a suitable prize for the winner, not enough for him to retire on, but sufficient to make it worth while.

Spring repairing is learned by hard and long experience and there are a lot of guys at the game who would be the better for a few lessons. I've had lots of so-called motor mechanics tell me they knew all there is to know about spring work, and the less they know the more confidently they claim it. Otherwise I have no complaint.

E. H. Humphries, South Africa.

Editor's Note.—We'll agree to all that Mr. Humphries had to say on the spring business, and the only reason we haven't heretofore published more on the subject is because we have not been able to come into contact with anyone who could furnish us with anything about springs.

Contests of any kind are generally unsatisfactory and it has never been the policy of this paper to have anything to do with them, but anyone who has any knowledge of spring work or work of any other character that would be of interest to our readers will be amply paid for their contributions at any time they see fit to send them in. If there are any of our readers qualified to furnish us with material on this or other subjects, or can refer us to someone who is able to do so, for their interest in our behalf prompt and substantial appreciation will be forthcoming.

PRICES IN NEW ZEALAND

Sulky Shaft pair	2	10	0
Sulky, cradle, pair	5	0	0
Buggy, per pair, complete	4	5	0
Buggy, single	1	7	6
German Waggon, pair complete	4	10	0
Ironwork for under carriage extra.			
Shears			
Lay and Steel	0	6	6
Steel Point and Dress	0	3	0
Dress only ordinary	0	1	6
Dress only, large	0	2	0
Spud			
Bars, lay and steel	0	6	0
Steel only	0	3	0
Cutting Stock Hoops			
German Waggon, each	0	1	6
Spring Dray, each	0	1	6
Single Hoops	0	2	0
Drays, each	0	2	0
Patent Mail, each	0	2	6
Bullock Waggon, per pair	0	8	0
Bullock Waggon, single one	0	5	0
Seat Screws			
Each	0	17	6
Complete with Slides	1	15	0
Shaft Leathers			
Per Set of 4 Pieces (Kip)	0	16	0
Trace Leathers extra	0	5	0
Points only	0	10	0
Breechings only	0	5	0
Shaft Clips			
Main Clup, sulky, each	0	3	6
Axle Clips	0	2	0
Spring Scrolls, each	0	10	0
Spring D. Shackles	0	2	0
Steps			
At rate per pound	0	2	0
Setting Steps, each	0	2	6
Shaft Tips			
Japan	0	1	6
Plated	0	2	6
Staples			
Black	0	1	6
Plated	0	2	0
Stops			
Black	0	1	6
Plated	0	2	6
Top and Bottom Plates			
Each	0	2	0
Tyre Cutting			
Sulkies, and up to 1¾ in., pair	0	17	6
2 to 2¼	1	0	0
2 to 2¼, per set	1	15	0
2½	1	5	0
3	1	10	0
4, each	1	5	0
5, each	1	10	0
Trimmings			
Sulky Sets Cushion Springs			
Cushion Plain, each			
Squab, each			
Falls, each			
	Add 22 6 per set above cost.		
Muck Guards, pair	£1	0	0
Back Apron, each	1	0	0
Timber			
Per foot	0	0	6
Time			
Woodman per hour	0	3	0
Smith and Striker	0	5	6
Wheels			
2-in. Tyre, H.W.	10	0	0
1¾ Tyre, H.W.	9	10	0
Sarven, 1⅜	9	10	0
Sarven, 1¼	9	0	0
Sarven, 1⅛	8	10	0
If colonial hardwood, 20/-less in light wheels only.			
Wheel Repairs			
Spokes, each	0	3	6
Full Sets	0	3	0
Felloes, up to 2½ in., each	0	4	0
Hickory Rims, per wheel	1	15	0
H. W. Rims	1	10	0
Wheel Rivets, each	0	0	6
Washers			
Sulky Washers, per sulky	0	2	0
Mail Patent Large Sole Leather, pair	0	10	0
Nut and Collar Washers, each	0	1	0
Wing Boards			
Pine, each	0	7	0
Silky Oak	0	12	6
Double Bent	0	15	0
Hame Hooks			
Per pair	O	6	0
Wing Irons			
Per pair	0	10	0
Cock Eyes, each	0	1	0
Whiffle Hooks, each	0	2	6
Weld Mower Blades			
Each	0	5	0
Wedges			
Per Point	0	0	0
(If heads to be dressed, according to time).			
Shoeing			
Draught Stallions, set	0	15	0
Draught Stallions, pair	0	7	6
Draught Stallions, removes	0	10	0
Draught Stallions, removes, pair	0	5	0
Draught Horses, set	0	9	0
Draught Horses, remove set	0	5	0
Medium Draught, set	0	8	6
Medium Draught, pair	0	4	6
Medium Draught, removes, set	0	4	6
Medium Draft, removes. pair	0	2	6
Ordinary and Ponies, set	0	7	6
Ordinary and Ponies, pair	0	4	0
Ordinary and Ponies, removes	0	4	0
All Slippers 6d. on remove price.			
Caulks, add extra	0	1	0
Trotting Shoes, special, set	0	10	0
Race Plates	0	15	0
Race Tips	0	10	6
Putting on Tips or Plates, per set	0	4	0
Extra Fitting Plates or Tips	0	2	0
Blood Stallions, in season, set	0	10	0

SELLING TRACTORS

Farm auctions are held in the Fall and in the Spring, and it would be to the advantage of every tractor or farm machinery salesman and dealer to "stand in" with the auctioneers.

Keep posted and have a tractor on hand to demonstrate for an hour at noon. The crowd is always there at noon, because there is generally a free lunch.

The auctioneer will announce your demonstration in his advertisements. He wants a crowd, and the tractor helps get it. The auctioneer will also give you "favorable mention" in his talks.

On the face of it, such an event gives you two live prospects.

The farmer who has sold his farm is going to or has purchased another farm, and the farmer who bought the farm on which the auction is held needs new tools.

WANTED AND FOR SALE

Want and For Sale advertisements, situations and help wanted, five cents a word. Send cash with order. No charge less than fifty cents. The small cost of these advertisements prevents our investigating and guaranteeing them. WE WILL NOT knowingly accept any but reliable ones.

FOR SALE:—Automobile. Marine and stationary engines 1 to 100 H. P. Best makes, good condition, very low prices. State your power needs. We take engines in trade. What have you? Magnetos, coils, carburetors, mechanical oilers, water pumps, etc. Also car parts of every nature sacrifice prices. Write about your requirements.
BADGER MOTOR COMPANY, Milwaukee, Wis.

BLACKSMITHS LISTEN: Save time and money by doing your own auto and tractor blacksmithing with Toy's modern methods doing hard jobs easy. Forging and making solid welds, hardening and tempering to a standard, with colored tempering charts. All for one dollar. Samples free. **W. M. TOY, Sidney, Ohio.**

FOR SALE—Old reliable, well established Blacksmith & Wagon shop, Implement business in prosperous farming country, shop equipped with power machinery, prices are right, employment for 3 men year round.
EDW. J. SCHRADER, Campbell Hill, Ill.

WRITE for new price list on Circular style Cutter Heads for wood frame Jointers 5-in to 12 in. Combined outfits Jointers and rounding heads and saw arbors. Prices from $20.00 to $50.00.
W. L. SHERWOOD, Kirksville, Mo.

FOR SALE—No. 4 W. W. punch with 8 punches, 7 dies, practically new $39.00. Little Wonder disc sharpener with coulter attachment. $18.00.
STUEKERJUERGEN BROTHERS.

BLACKSMITH shop wanted.. Send description.
C. C. SHEPARD, Minneapolis, Minn.

A LOT of chain hoists one lot of twist drills. One No. 5 Edwards Shears one of small pipe fittings, 2 Ratchet drills, lot of Pipe wrenches. **A. J. FERRELL, 437 Van Street. Barberton, Ohio.**

WANTED Fifty pound power hammer. Must be in good working condition. Write
FARBER & WESTON, Reedsburg, Wis.

When you write to advertisers in reference to anything advertised here, please mention The American Blacksmith.

AMERICAN BLACKSMITH AUTO & TRACTOR SHOP

VOLUME 19 FEBRUARY, 1920 NUMBER 5

BUFFALO, N. Y., U. S. A

WILLIAM F. WENDT, *President.* L. J. WISCHERATH, *Editor.*

SUBSCRIPTION PRICE:

For $1.00 per year, payable in advance, The American Blacksmith, Auto & Tractor Shop will be sent, postage prepaid to any postoffice in the United States. To Canada, $1.25; to other countries, 6 shillings. Reduced rates to clubs of five or more on application.

Remittances may be made by money order, express order or checks payable to the American Blacksmith Company. We will also accept uncancelled postage stamps or currency, but for safety these should be sent by registered mail.

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Mexico and Intervention

Possibly before these lines are printed the United States will have gathered it's army and sent it across the border to put an end to almost a decade of continuous disturbance—God knows we don't want to do it but the patience of our Uncle Samuel with Mexico has been sadly frazzled by the conducts of our Mexican neighbors on the other side of the Rio Grande. The only reason we can see that intervention has been so long delayed is, because we are seeking to create a feeling of confidence in us among the other South American countries who, in the past, despite our profession of friendship, have regarded our motives with considerable distrust.

Certain it is that this country has had provocation on several occasions that would have been the signal for occupation by any other country than the United States and it certainly cannot be said that we have not been lenient and unduly insistent in our demands toward Mexico but it seems that Mexico has consistently endeavored to gratuitously insult this country and its citizens whenever the opportunity has presented itself.

The arrest and detention of one of our consular agents on the charge that he paid $150,000 to have himself kidnapped is only one of a long line of similar affronts and just as long as we stand for that sort of treatment intervention is staved off—and there will be no peace for Mexico or for this country either.

Mexico, has a surplus supply of politicians and others "too proud to work", who would be politicians.

Intervention in Mexico would cost this country millions of dollars and many lives to successfully accomplish but it would be worth the sacrifice, if for nothing further than our national self respect.

The organized opposition would be speedily overcome but it is probable that a more or less unorganized resistance would have to be fought and overcome just as it was during the Phillipine insurrection shortly after our occupation of those islands. It took time but it was accomplished and today the United States has no firmer friends than these same insurrectos and Emilio Aguinaldo, their former chief would be the first man to take up arms against anyone he thought would undertake to restore the islands to their former condition.

Mexico suffers also from the animosities engendered by race hatred—that is, between the so-called "Spanish" and the "Indians." The Mexican government has never been able to crush the Indian spirit and it is a matter of fact that the Indian regards himself as superior to the Mexican and to tell the truth, he is.

The present head of things in Mexico—Don Venustiano Carranza also, "First Chief" as he has vainly styled himself is one of those unfortunate individuals whose bump of conceit is abnormally developed and is a man who delights to pose and threaten and yipe around generally at the skirts of everybody for fear he will not be noticed. The "First Chief" as some of his friends designate him, evidently considers he has the world by the tail and is intent on pulling it hard enough to hear it yowl but he doesn't consider that the critter might turn on him some day. Carranza has powerful enemies at home and it is only through the mistaken recognition of this country that he has been able to hold his grip, as long as he has on the presidential chair.

The only other alternative that suggests itself to us, aside from armed intervention would be to furnish arms and ammunition to everybody in Mexico that wanted them—and as the ownership of a gun and a handful of cartridges if the height of Mexican ambition, everybody would want one and then let them go to it, but as we see it armed intervention and military occupation of the country under a provisional government would be the best thing for both Mexicans and Americans. What Mexico needs is peace and then education and left to their own devices. Mexicans are utterly incapable of producing anything more that general chaos. One of these days we'll have to offend a few of our sensitive near-Spanish "amigos".

We are all too familiar with what temporary American authority has done in Cuba and in the Philippines and the Canal Zone to deny that the same could not be done with Mexico as well—America wishes Mexico well and does not want to bother with her internal affairs, we covet none of her territory as our own and should the time come when intervention is forced upon us it will be because there is no other way out—the question is, "How long can we avoid intervention?"

TWENTY YEARS OF THE AUTOMOBILE

So many great inventions have changed modern life in the past few decades that the name of any one of them might fittingly be applied to describe the period. But what better term than "Motor Age" can be used to distinguish the first part of the twentieth century.

Only twenty years have elapsed since the first automobile show was held in New York city. In that time the passenger car has passed from luxury to necessity. Not only in America, but in every part of the civilized world as well, the auto has worked its influence on modern economic and social life.

And great as has been the part played by the passenger car it has been in no way more important than that of the tractor and the truck. How could America have answered the appeal for food for the Allied armies in 1917 and 1918 had it not been for motor-driven plows and farm implements to cultivate and harvest the millions of acres planted to crops in those years of the war?

The auto has changed rural life as greatly as it has urban life. In fact, in some ways motor vehicles have been a greater boon to country than city dwellers. Good roads have been built in answer to the auto's call and the isolated farm is now practically a thing of the past. Markets have been brought to the farmer's door.

Twenty years ago only the far visioned could glimpe how the auto would develop. What will be its development in the next two decades? The question is probably as difficult to answer as it was in 1900.

"WHERE EVERY PROSPECT PLEASES"

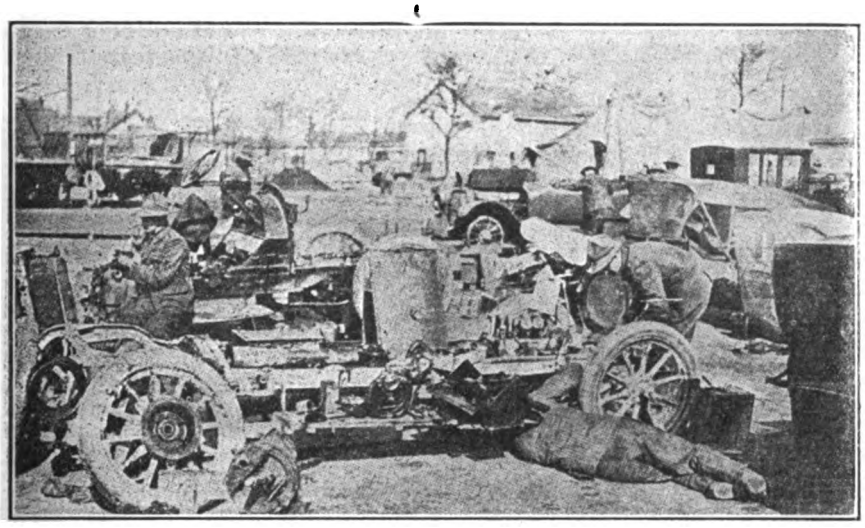
REPAIRING WITH THE A. E. F.

IS it not proposed at this late date to enter into that oft rehearsed discussion, "Who won the War?" While different factions at home are still engaged in a desultory argument, as to whether the Bolivian Navy or the American Library Association were the contributing factors, it would seem the height of impropriety, to attempt wresting from Sir Douglas Haige, the wreath of laurels with which he proposes to crown Britannia; or worse still to say anything, which would detract from the glorious accomplishments of our own doughboys.

It is intended to outline only briefly some of the achievements, accomplished under most trying conditions, by the repair units of the Motor Transport Corps, and which made possible the maintenance of adequate transportation facilities for the American Expeditionary Force.

In the great contest with time and space which America faced when she entered the War, tonnage was one of the most critical needs. One solution of the tonnage question was to get the maximum use and wear out of material shipped to France. To make everything go the limit was simply another way of saying, repair and salvage.

This necessity was realized almost immediately, and one of the first calls from the Commander in Chief in France, was for units of skilled mechanics. This resulted in the formation of three organizations later known as, 301, 302 and 303 Repair Units Motor Transport Corps, which were the first mechanical units to go overseas. Being organizations designed and equipped for base shop work, they were eventually consolidated as Motor Transport Reconstruction Park, 772, located at Verneuil, France.



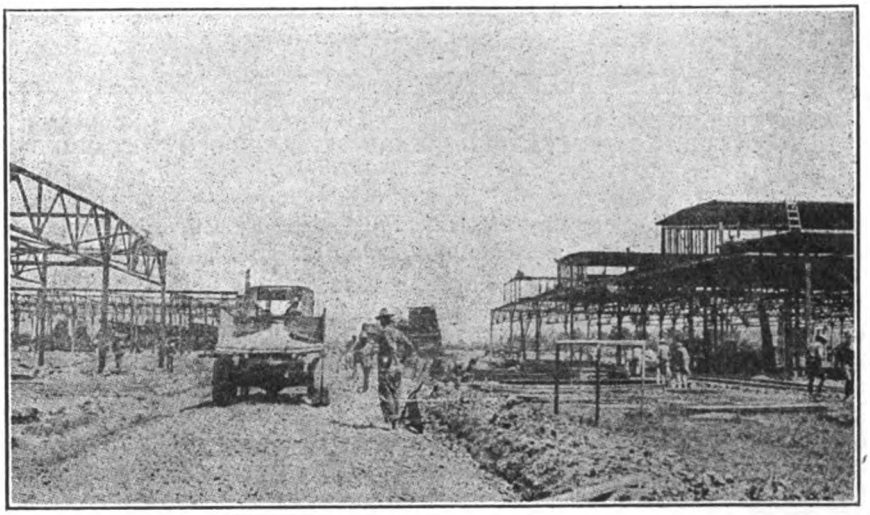
REPAIRING CARS IN THE OPEN WHILE THE SHOPS WERE IN COURSE OF CONSTRUCTION

The trip abroad was without mishap. Unit 301 the first to sail landed at St. Nazaire where it remained about a month doing such work as stevedoring, excavating, building and repairing, which the first comers of the A. E. F. found in variety and plenty. The other Units followed shortly after, by way of England where their experiences were not unsimiliar.

The three outfits met at Nevers, where a typical French Caserne was selected for the temporary shops. Work began in the fore part of February, 1918, six weeks after the detachment left America. Only stables and the open air were available for shops. While machinery, tools and supplies had to be located "Somewhere in France" and then shipped to Nevers. The stables were utilized to the last stall and despite the inclement weather, work was done in the open until lumber became available to erect canvas roofed shelters. In order that the heavy trucks would not sink into the ground, the entire yards had to be macadamized.

In spite of these obstacles work progressed most favorably and in less than a month a shop was in operation, which represented in miniature, nearly every department which was later operated on a larger scale at Verneuil.

A visit to this improvised shop, when it was in operation, would bring a comment, as to it's completeness from even a visitor with no knowledge of mechanics. In a five minute's walk one could pass from a group of men placing bodies on a line of chassis and another group painting the trucks so completed, to other groups rebuilding and overhauling motors and transmissions. One could visit a blacksmith shop, machine shop, sheet metal



ERECTING THE STRUCTURAL STEEL FOR THE MACHINE SHOP AND THE MAIN SUPPLY DEPOT

and welding shop, to a carpenter, wheelwright and trimming shop. An electrical repair shop, a tire repair department, an acetylene gas generation plant as well as a department for drawing plans and making blue prints were some of the sub-divisions of this novel plant.

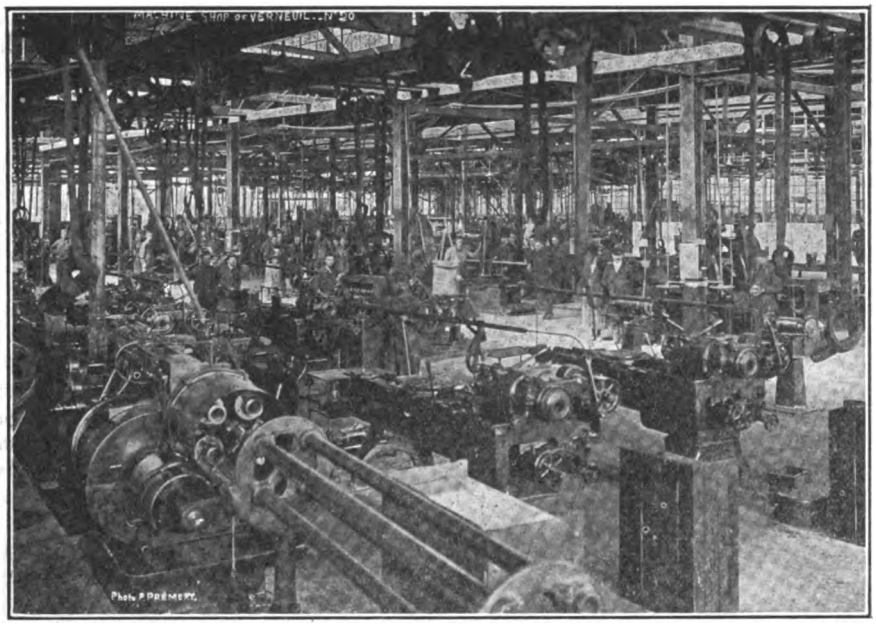
During it's stay in Nevers, this organization was the only repair outfit of importance in the A. E. F. Consequently vehicles came there from every part of France for repairs, overhauling and reconstruction. Day and night shifts were kept working in an effort to turn out the work in order to keep as many trucks on the road as possible.

Besides repairing cars trucks and tractors, which were arriving in increasing numbers every day and in every imaginable condition, some of the special achievements are worthy of mention. On one occasion the Signal Corps was in urgent need of telegraph pole cross arms. They appealed to this shop for relief. Within forty-eight hours, eight thousand arms converted out of undressed lumber were on their way. A whole fleet of five ton trucks were idle because a certain steering arm unobtainable in France had not been shipped from America. In less than a week, these shops turned out over five hundred arms which immediately released that number of trucks for the Front.

Now we come to the part of the story, which relates how a thousand acre field, partly swamp, was quickly transformed into a modern automobile factory employing over six thousand men. It reads like a tale from some industrial Arabian Night's Entertainment. But there is a decided difference. The nights that witnessed this marvelous evolution, instead of being filled with music and magic, were packed with work and worry.

The original plans called for the erection of these shops by the Engineers. When spring arrived and work on this mammoth undertaking should have started, there were no men available in the Engineer Corps who could be spared to do the work. Consequently these same units buckled down to the task of doing the work themselves.

To the last detail the plant was built by the personnel of this organization. The supervision was entirely in it's hands from the making of the first blue print in the Engineering Department to the insertion of the last pane of glass in a window sash. Every bit of labor from the digging of ditches to the skilled structural steel work was furnished by men of the organization, with the exception of about two thousand German prisoners who were employed when the work was nearly completed. This was made possible only by reason of the unusual versatility of the organization. Engineers and high grade mechanics were found in sufficient numbers to organize a force which erected the building about as rapidly and as efficiently as a crew of men from the building trade would have done the work.



A PORTION OF THE MACHINE SHOP WHEN COMPLETED. THE GRIDLEY AUTOMATICS IN THE FORE GROUND ARE EVIDENCE OF IT'S COMPLETENESS

Early in April, 1918, the first band of two hundred men were sent to the site of the new plant which was then a wilderness. On the day of their arrival they began to lay the railroad tracks in order that material might be brought in with a minimum of effort. Approximately five miles of track with nineteen switches was laid.

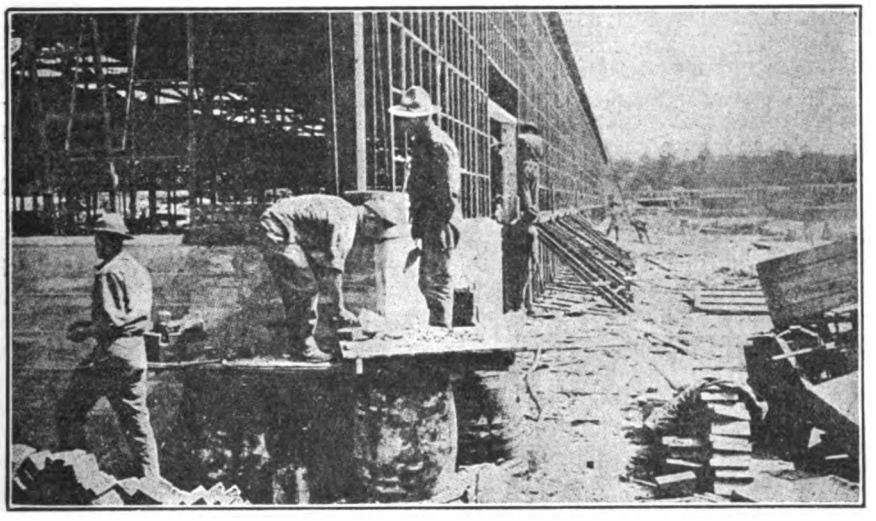
When the work of putting up the fabricated building began some grave difficulties were encountered. There were no construction tools in the possession of the organization with the exception of two winches and some surveying instruments. Even the special tools which had been provided for use in erecting one type of building had been lost somewhere between the United States and their destination. These difficulties were overcome in the shops at Nevers, which let it not be forgotten were in operation all the time the permanent shops were in course of construction. They forged wrenches, built derricks, and manufactured anything that was needed. It was a striking example of their ability to meet the needs of any emergency.

Another major obstacle was that the trusses of structural steel to be used in the erection of these buildings, had become badly bent and twisted due to careless handling on their trip from the United States. This rather serious difficulty was overcome by organizing a gang of iron workers, who placed the bent trusses on a bed of solid steel formed by laying road rails side by side. The trusses were then heated with oxyacetylene torches and pounded straight with sledge-hammers.

The whole period of construction called for tremendous labor. Handling the material all by hand was a Herculean task. Hundreds of car loads of material were arriving. Canal boats loaded with brick and sand all had to be unloaded with wheel barrows. Steel trusses fifty feet long and weighing thirty-six hundred pounds had to be carried by hand for over two hundred yards through mud that was knee deep. In addition to this work thousands of cases of spare parts intended for the Supply Depot had to be unloaded and stacked.

Nothing was allowed to delay the work. The fabricated buildings went up rapidly. The structural iron work, roofing, painting, glaz-

ing and laying the cement floors and walls all proceeded in an orderly and energetic manner. In July a little more than three months after the first detachment had begun work, construction was far enough advanced so that the remainder of the outfit still at Nevers could be brought to Verneuil and begin operation there.



A CLOSE UP OF THE BLACKSMITH SHOP WHEN NEARLY COMPLETED GIVES SOME IDEA OF IT'S SIZE

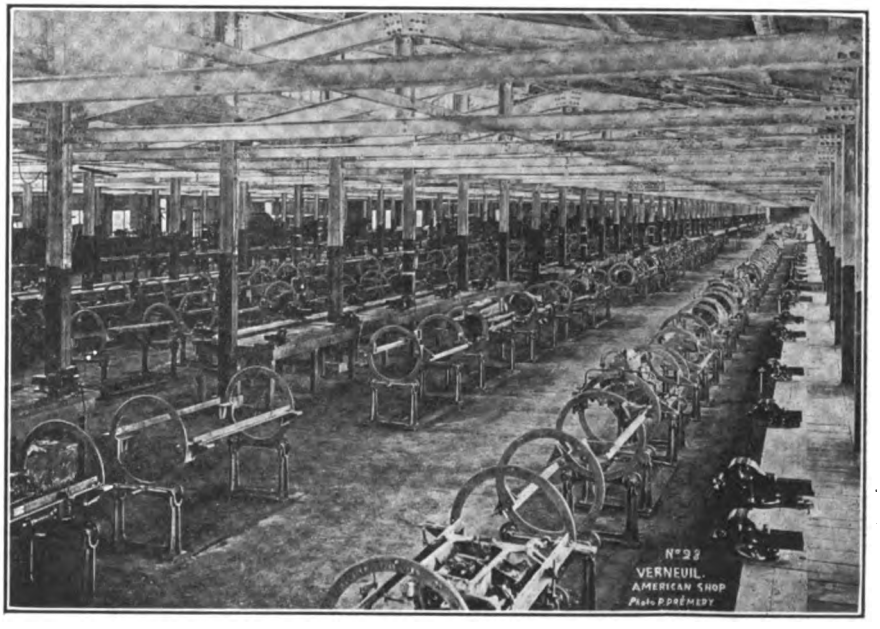
The erection of quarters for the men was left until last. For many months they lived in tents, ate in the open and suffered not a few privations. After the shops were finally completed, 188 standard troop barracks were erected to which were eventually added bath houses and mess halls.

A power house equipped with a 200 H. P. Diesel oil burning engine and 20, 25 K. W. direct connected gas engines, which burned approximately 2500 gallons of gasoline daily, supplied power to the shops and barracks and also, operated a complete water works.

Some idea of the magnitude of the undertaking necessary to keep Uncle Sam's fleet of trucks in repair may be gained from the accompanying list which gives the floor space of the various buildings, erected in such an incredible short space of time.

	Square feet floor space
Truck Overhaul Building	146,000
Main Supply Depot	120,000
Two Machine Shops	52,000
Blacksmith Shop	30,000
Sheet Metal and Welding Shop	22,000
Salvage Plant	20,300
Wheelwright Shop	20,000
Carpenter Shop	20,000
Two Q. M. Warehouses	19,600
Administration Building	14,000
Trimming Shop	14,000
Paint Shop	12,600
Gas Plant	12,500
Tire Shop	11,200
Water Distillery	1,500
Brass Foundry	1,400
Total	517,100

The same spirit of indomitable endeavor that planted bridges, reared docks and made cities of supply grow out of swamps has found incarnation in this dynamic cross section of Detroit, which builds automobiles from raw material to the finished vehicle on wheels ready for peaceful performance or combat work. It was at this base hospital for the 50,000 odd motor vehicles used in France, that the real casualties of the motor trucks were treated. Something of how it was done will be told in a later issue.



THE ENGINE REPAIR DEPARTMENT WHERE TWO HUNDRED MEN WERE EMPLOYED ON MOTOR WORK ALONE

SUCCESS SECRETS

ONST there was a man who was left a very fine going business by his Dad. He made up his Mind to show the old fogies a Round town how a live business ought to be run. So he fired awl the help who weren't good lookers an' who didn't hand him a bokay once in a While.

Say, his business force would have won first prize in a beauTy an' Politeness contest. They were 2 sweet for anything, but somehow business fell off, for a lot of them didn't know the business they were Engaged in, an' some didn't care a hang, an' quite a few were so busy primping an' exchanging Yarns and compliments with Each other and would-be customers that overLooked the trifling matter of selling Goods, Service and Satisfaction.

The way the cash receipts an' profits dropped made a hole in the ground almost big enough to Bury the institootion.

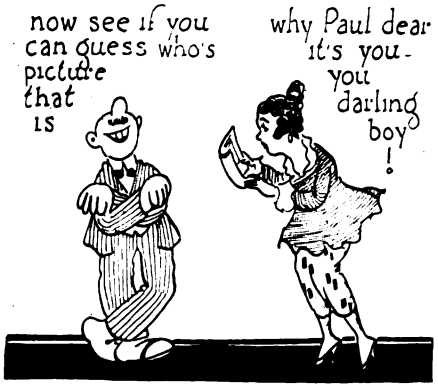
Then our Young friend who wasn't a slouch by Any means, woke up an' held a sesshun with his self which lasted from sunset to Sunrise. And this is what he discovered—"That good lookers are awl right an' personal charm an asset, but UNLESS these are backed up by **sterling qualities of character, sound business judgment, accurate information and real interest**, that awl the rest is as sounding brass and tinkling cymbals."

So next morning he began to weed out those who were mere mantel ornaments an' a lot of the rest of 'em woke up an' found that "Handsome is what handsome does." Today the young Man who inherited the Going business has pulled out of the hole and is prosperous and happy, just because he learned to Discriminate between false gold an' the 14 karat stuff.

Aim at Something Definite

ROBERT FALCONER

WHEN a man goes fishing, if he really intends to catch some fish, he takes with him the tackle and the bait needed to catch a certain kind of fish. Unless he has a definite aim, unless he is



going to try to catch a certain kind of fish, the chances are that he will not catch any fish at all. Unless he makes definite preparations, he will not have the bait and the equipment that are needd for catching the fish he finds at the place where he fishes.

When a man goes hunting he carries the kind of fire arm and the kind of ammunition that is needed for a certain kind of game. He starts out with a definite aim in view. If he is hunting bear he goes prepared for bear. If he is hunting partridges he goes prepared for partridges. Being prepared in this way, aiming at something definite, his chances are very greatly increased of bringing home some game.

Unless he does have some definite aim, the results are far too likely to be like those of a dog who had a very keen sense of smell. This dog started off one morning on a rabbit trail, but, after following it for some time, he found the trail of a fox. Away he went on this new trail until it was crossed by the trail of a deer, which the dog immediately took up. He followed the trail of the deer until he found another trail and so he went from one trail to another until night found him many miles from home but without having accomplished anything definite.

It is exactly the same way in business. When a business man aims at something definite he succeeds. When he does not aim at something definite, he may eventually find himself a long way from where he started but with nothing to show for all the efforts that he has expended. Men who are making the greatest successes in business to-day are not in business solely to make money. They are in business to meet a need that they have experienced themselves or which they have discovered exists.

A man entered the automobile accessory business because he had experienced a good deal of difficulty in securing the automobile parts and accessories that he needed for his own car. He entered it, not so much with the idea of making a lot of money, as of rendering the service to car owners that his own experience had shown him was desired and would be appreciated. That man succeeded in business. He made money because he rendered a real service. He made it because

he was aiming at something definite.

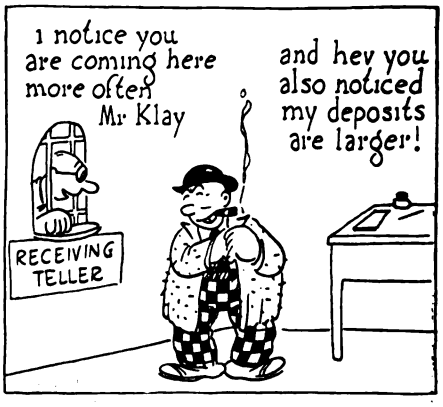
A young druggist had reached a point where he must do something very definite or go out of business. He took inventory of his business, of his employees and of himself. The result of this inventory indicated that the best service that he could render was the compounding of prescriptions. He knew that prescriptions alone would not keep his store running but he did know that a first class prescription store would fill a real need in his community. Accordingly he remodeled his store in such a way as to emphasize the prescription department of the business. He aimed at the definite goal of giving the very best prescription service in the city.

From the day that this man made that decision he succeeded. Where a vacillating policy threatened to drive him into bankruptcy, aiming at something definite carried him to prosperity.

A salesman working on a commission basis had never earned more than $200 in any single month. In fact $200 was all he needed to meet his expenses and he could see little reason why he should strive to earn more. A series of prizes were offered by an organization in that industry to the salesmen making the best records during a certain month. This contest was open to salesmen from all parts of the country.

This salesman's sales manager promised him, that if he won a prize he would have his picture and an account of himself in the official organ of the organization offering the prizes. From that time on the salesman was aiming at something definite. He wanted his picture in that paper. He worked harder than he had ever worked before and he won a prize. He had his picture in the paper and incidentally he earned in commissions $495 for the month. Aiming at something definite resulted in larger earnings for him than he had ever received before.

It does not make so much difference what it is, that is being aimed at as it does that the man is aiming at something definite. This something may be very important or it may be important only to the man himself. The mere fact that he is aiming at something definite keeps him on a course that will accomplish results. It prevents his



drifting. It greatly increases his interest in that which he is doing. It makes his efforts seem worth while. It stimulates him to efforts far greater than he would put

Welding a Cast Iron Cylinder

By DAVID BAXTER

A Detailed Instruction for Repairing an Automobile Cylinder Block by the Oxyacetylene Process and some Valuable Suggestions for Welding Cast Iron

THE broken cylinder casting illustrated in Fig. 1 looks at first sight like an impossible job. In fact, to a beginner in the art of torch welding it may seem almost impossible. The part which forms the upper section of the crank case is broken into several irregular pieces, which makes it look worse than it really is. It looks as though the welder would not be able to get the pieces back in place. The mechanic who possesses a limited amount of ingenuity will find it is a simple matter to devise ways and means of inserting the broken pieces.

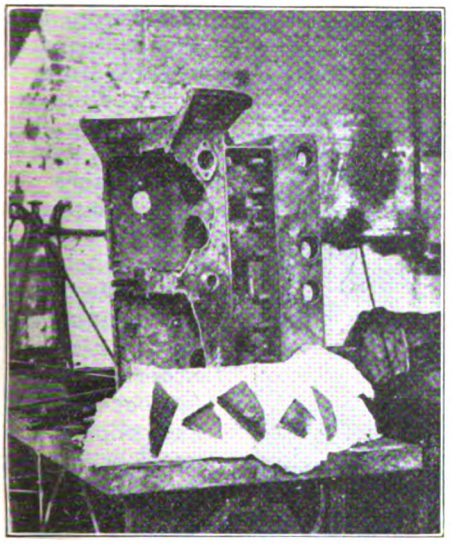


FIG. 1. SHOWING THE LOCATION AND EXTENT OF THE FRACTURE

In spite of its awkward appearance the job is in reality, quite easy to handle. Let us see how to repair a casting like this. In doing so let us separate the process into several parts in order to make the explanations clearer. Taking the casting as it appeared in Fig. 1 and following it through the process of repairing a step at a time. In doing this we must take it for granted that the reader understands the fundamentals of oxy - acetylene welding; such as how to operate the generator, gauges, torch and etc. Together with welding terms, such as preheating, re-heating, expanding, and so forth.

Preparing the Job—The first step in the welding process is to get the casting ready for welding by preheating, since it must be preheated before starting to fuse the metal. This preparation is half the battle when welding cast iron. The careful welder always prepares cast iron parts in a manner, similar to the description given in the following article. First, take the pieces to an emery wheel and grind off all the broken edges until they are wedge shape. The grinding being done all on the side that forms the outside of the casting. In other words the broken edge is beveled until it slopes gradually from the outside to the inner side of the casting. This metal is cut back from the break a distance equal to a little more than the thickness of the metal at the break. The edge is all ground off except very small portions at intervals of approximately, three inches along the fracture. These small projections are to serve as guides when fitting the broken parts together and to locate their exact position on the casting.

When all of the broken parts have been beveled the next operation is to bevel the line of fracture on the main casting. The most of this work can be done with a hammer and cold chisel. Care being taken not to damage the casting by heavy hammering, or a heavy file can be used to advantage with no danger of enlarging the break. The metal is cut away to a degree corresponding to the angle cut on the broken pieces. That is, the beveled edges of the casting and those of the pieces will form a wide V shaped groove when fitted together. Small projections are left at the bottom of the bevel on the casting like those on the pieces, to serve as guides. These projections should be very small, only enough of the bottom is left to show the lines of the fracture. They are easily melted out when welding.

During the beveling process a strip of metal about an inch wide along the entire break is cleaned of all rust and dirt. The bare metal is exposed along the entire broken edge by grinding or scraping. This cleaning is for the purpose of removing any surface impurities or foreign substance which might have an adverse effect upon the weld when the metal was melted. If the surface dirt is not all re-

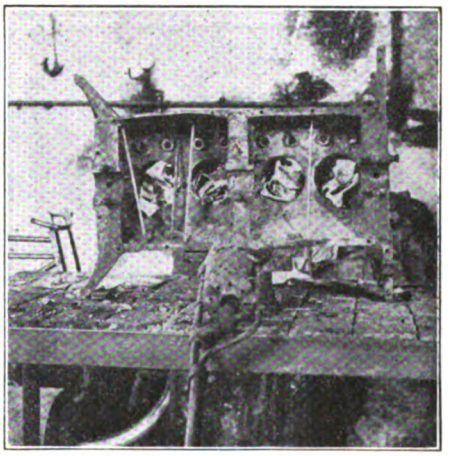


FIG. 2. SHOWING THE FILLER RODS BRACING THE BROKEN PARTS

forth if he was not aiming at this definite goal.

Trying to do business without a definite aim is a good deal like trying to play football without goals or base ball without bases. The very things that lend excitement that lend real interest have been eliminated. The definite goal in business may be anything. But a supreme desire to make money brings the poorest results. It is better to desire to excel in some kind of service. Excellence creates demand and if any man devotes his energies for a long enough time in an attempt to excel in any one phase of his business, he is bound to attract attention sooner or later to the service he is rendering.

It always pays to aim at something definite. It gives something to steer towards. It is as great an aid to the business man in holding to a course that leads on to success as is the north star to the sailor in holding his course to the port for which, he has set sail.

moved it may cause gas bubbles in the weld which form pinholes.

Tacking—After the entire fracture has been cleaned and beveled the next step is to spot weld or tack the broken pieces together. This is much easier than to weld them in place in the casting, one at a time. Also, it does away with most of the danger of distortion. Where the pieces are inserted one at a time and welded, it often occurs that the last one will not fit as it should. Of course it may be ground and made to fit on a job like this one, but on more important work it is often next to impossible to make the last piece fit. So the simplest way is to tack the pieces together and then insert them as one piece. Some operators go a step further and weld all of the pieces solid before inserting them, but this is not always to be recommended for several reasons. It more than likely will not fit, and it probably will be warped out of shape, due to expansion. Then it necessitates the double work of preheating that part separately from the main casting. This is needless when the whole thing can be heated at one time just as easily.

The spot welding is accomplished by holding the point of the welding flame close to the bottom of the groove until a very small portion of each edge flows together. The spots are located at intervals of several inches along the groove.

Before doing this the pieces are fitted together properly according to the guiding projections.

The pieces should first be placed flat upon a leveling plate and wedged up with nails or bits of filler wire until the patch is properly shaped; this is easily ascertained with the eye or with strips of straight iron. When the pieces are set at correct angles the tacking is rapidly done. A sheet of asbestos paper placed beneath the broken parts assists in the alignment, due to its rough surface preventing the pieces from sliding around.

Setting Up The Job—When the broken pieces have been properly aligned and tacked the next step is to fit the patch in place in the casting, spot weld it there, and set the job up ready for heating. To accomplish this first cut some pieces of filler rods to act as braces with which to hold up the spot welded portion while it is being tacked to the casting.

The casting is placed on one side with the break upward. A brick-top welding table is no doubt the proper place to set up the job; however, we may do it on the floor or in a special preheater. The center and corners are blocked up so that no considerable portion of the casting is suspended. This is to insure against a warped casting due to any tendency it may have to sag when the job gets hot. The casting thus arranged permits a free circulation of the preheating fire.

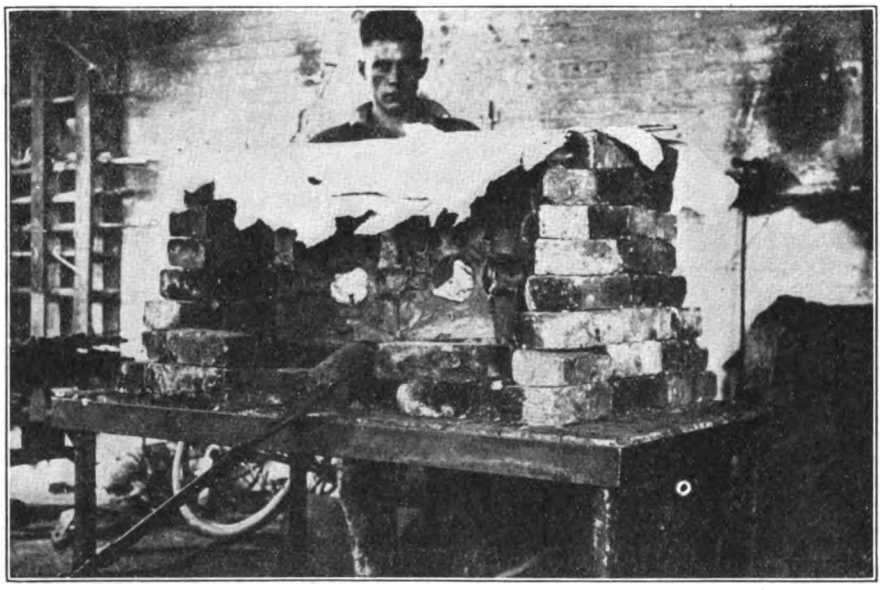


FIG. 3. THE PREHEATNG ARRANGEMENT

Before inserting the patch, with its attendant braces the bore of the cylinders are stuffed with scrap asbestos paper to prevent the preheating flame from coming in direct contact with their surface. If the bore is attacked by the flame and is overheated the job may be ruined. Before tacking the patch in place it is braced as shown in Fig. 2 of the illustrations. The patch is correctly fitted and braced with pieces of filler rod or other handy metal rods. Then the point of the flame is brought down into the groove in several places to melt and flow together a small portion of it at each place, the same as was done when spot welding the broken pieces. No flux is used to make the spot welds since they are to be remelted when the main weld is made. The idea is to melt only enough to hold the patch in place.

Fig. 2—also shows the position of the oil burner used for preheating the job. The position of it is such that the flame will spread to each side of the center bearing in a slightly upward direction. Thus tending to heat the heavier metal around the bearings and at the corner of the case where the patch joins it. A small portion of the flame may shoot beneath the opposite side of the case thus relieving any strain of expansion or contraction. But let us take up this cause and effects in its proper place, under the heading of preheating.

The Preheater—With this job as with other more or less complicated work the casting should be heated, before applying the torch, in order to regulate or control expansion and contraction; to prevent heavy and light sections from expanding or contracting unevenly, thereby causing cracks or inner strains. This is an important consideration on any cylinder jobs, but with this particular casting it requires more than ordinary care as to details.

After spot welding the patch, which may be done while the job is cold or at least only a preliminary warming need be given, the filler rod braces are removed, or they may be left in place if the welder thinks they are needed to insure against a collapse of the patch.

Then a pyramid shaped wall of dry fire brick is built at each end of the job, across the top of which is placed some iron bars for the purpose of suspending the asbestos covering placed over the whole arrangement. Fig. 3 shows the preheating devices ready for the balance of the asbestos covering. This picture indicates the size and location of the brick walls, also the method of suspending the asbestos

covering, and the location of the oil preheater. The job has been arranged upon a common brick-top welding table. This arrangement is better than to weld the casting upon the floor since the welding is not so arduous.

The brick walls and the abestos cover present a loss of heat thereby conserving the fuel. They also save welding gas because the job will heat faster and remain hot longer during the welding. It is easier to weld a hot piece of work than a cold one because the metal will melt quicker due to the fact that the heat is not drawn away from the weld by a cold casting, through conduction. The oven like structure prevents the heat from being radiated rapidly, thus allowing the job to cool slowly after welding, which is important, when welding cast iron.

Preheating—After the preheating furnace is all ready the oil burner is lighted and placed as previously stated. The pressure is turned on slowly at first to prevent sudden expansion. After burning slowly a few minutes the pressure is increased until the flame fills the interior of the furnace. The preheater is then allowed to burn for perhaps forty-five minutes. During which time a close watch is kept on the casting to see that it does not overheat, but principally to determine the exact time to commence welding operations. The job is permitted to heat until it is a dull red, particularly the section comprising the crank case part of the casting. Some welders run the heat up to bright red stage. This is risky, however, because it is then nearing the point where distortion occurs. If the casting is heated very bright and kept there for a considerable time the metal will be robbed of its good qualities. And if long continued will turn to something resembling burned stove grate—brittle and lifeless.

The proper heat can be ascertained by looking beneath the asbestos cover at several different places. The darkened interior of the oven causes the redness to show plainly. If one section seems to be heating while the other is at a standstill some little change in position of the casting or oil burner is needed. This should be done to equalize the expansion. For instance, if one end of the job seems to be heating faster than the other the oil heater should be shifted to throw more heat toward the cooler end. Do not uncover the casting in an effort to retard the heating of any part; rather work to increase the heat of the cooler parts.

When the job is dull red we are ready to start welding. But before doing so let us refer again to Fig. 3 to be certain there is no misunderstanding. Before lighting the oil burner several sheets of asbestos paper are placed at each side of the oven, joining the asbestos already in place, as shown.

Flame, Filler and Flux—Before proceeding to the actual fusion of the weld, it is well to select the proper flux, filler, and torch. There are several patent fluxes now on the market. These are manufactured expressely to assist the fusion of cast iron. They are intended to clean the molten metal of dross by dissolution, or by floating it to the surface of the weld. They are also intended to make the metal more fluid thus preventing gases from being trapped, which causes pin holes and hard spots in the weld. The flux is usually in powder form and is applied as the weld progresses.

The filler metal is usually selected according to the kind of metal upon which it is to be used. If the metal is soft cast iron and requires drilling or machining the filler must be soft gray cast iron having about the proper proportion of silicon. The proper sized rod is important in making a good weld. The rod should be neither too small, nor too large. The diameter is governed by the thickness of the metal to be welded. But there are limitations to this, and some personal judgment is needed. The cylinder casting in this description doesn't need to have a particularly soft weld nor one free from hard spots, since but very little of it has to be machined. Only where the fracture extends to the flange, it has to be dressed and this may be ground smooth in event the weld should be hard. Therefore it is not necessary to be so careful about selecting a filler rod. But we must select one of proper diameter. The metal in the casting is approximately three-sixteenths of an inch thick, except at the flanges. This will serve as a guide in selecting the filler. A good way to do this is to make a mental estimate of whether or not the filler lying horizontally would fill the groove to overflowing, and how much of it

BUTCHER SHOP ON WHEELS SAVES RENT AND SERVES HOUSEWIFE

One enterprising butcher of Long Island hit upon an ingenious scheme to reduce the cost of living and rentals and at the same time to expand his trade. The tremendous rise in shop and store rents caused him to purchase a large motor truck and fit it out as a traveling butcher shop. The front end of the truck is fitted with an ice box while the rear end is provided with a counter. At 6 P. M. he pays a visit to the market where he makes his selections. At 9 A. M. he returns and starts covering his route. In this fashion the store comes to the customer instead of the customer going to the store. The butcher is thus able to do his selling and delivering in one trip. The saving in time and operating expense permit him to sell fresher meats correspondingly more reasonable.

would overflow if melted into the groove. Of course this will not always work because the groove width may vary. It is obvious that a metal thickness of an inch would take a filler rod an inch or more in diameter, which would be practically impossible. So we can not give absolute rules governing the selection of filler rod sizes. And after all, the welder needs but few rules, because he learns by experience to select the correct size. For the work at hand let us select a three-sixteenths filler rod of soft gray cast iron.

It is also difficult to lay down rules for selecting the correct sized tip for each metal thickness. A small tip will not melt the weld fast enough to add the new metal, while too large a tip will probably burn the metal. A number five tip of one make of torch will be about the same as a number seven of another. So it would be too ambiguous to state the size tip for this particular job. Therefore we will leave the selection of a tip to the reader who endeavors to weld a job like it. He will naturally try a medium size tip, first.

We can however control the flame. It should be a strictly neutral one, composed of half oxygen and half acetylene. To have either gas in excess will impair the quality of the weld in a greater or lesser degree. A flame carrying an excess of oxygen will burn the metals. One having an excess of acetylene will make the metal hard and brittle. Under either of the aforesaid conditions it is difficult to make the metals fuse. Therefore we will employ a strictly neutral flame.

The Welding—By the time we have gotten the equipment and supplies in readiness the casting should be properly heated. Then part of the asbestos directly over a portion of the groove of one break is pulled aside. Only enough is removed to permit the flame and filler to be handled through the opening. The flame is brought in contact with the bottom of the groove to melt about an inch of it together; the flame is played back and forth until this is accomplished. Meanwhile the end of the filler rod is being heated by holding it close to the flame. The filler is melted into the groove without being permitted to drip therein. The flame is then revolved in small circles over the weld and filler; this movement prevents it from pausing long enough to burn the metal. When the first inch is melted full another inch of the groove is filled, then another inch is filled; another and so on until the entire groove is filled. Each one is added as rapidly as possible. Flux is applied to each inch as frequently as is needed throughout the entire weld. A slight surplus of new metal is piled up along the groove as the weld is made; this is carefully melted into the casting along the edges of the weld; the pressure of the flame is utilized to paint it smooth as the weld progresses.

The weld is started at a point near the middle and worked out to one end, then back to the middle and out to the other end. The outward ends are melted out and a surplus of filler added.

Then the second weld is commenced, after covering the first with asbestos paper. This recovering allows the first weld to become hot again, thus counteracting, the effect of unequal expansion. The second weld is treated identically as the first. The welding being done through an opening in the asbestos, which is replaced as fast as the weld is finished. Like the first, the second weld is started near the center and worked out to each end. When complete it is entirely covered with asbestos paper.

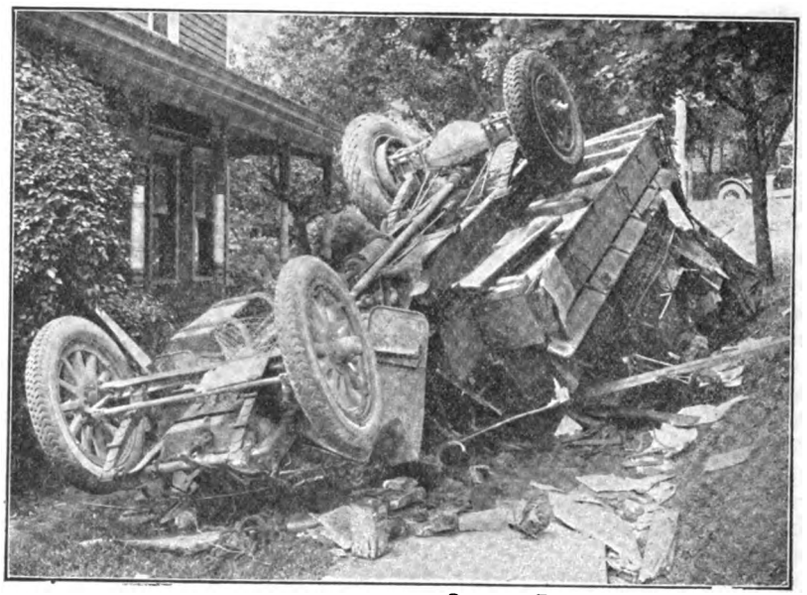
Cooling—After the last weld is finished the oil heater is permitted to burn several minutes to even up the temperature, thereby equalizing the expansion. Then as soon as the job is red hot all over, the preheater is shut off and the job is allowed to cool as slowly as it will.

The cooling of cast iron welds of this nature should be very slow in order to allow the light sections to cool in unison with the heavier ones, in order that the contraction will be equal. If a thin section gets cold and then an adjoining heavy part contracts later, it will undoubtedly cause a crack. To prevent cracking this casting is cooled under cover to prevent air currents from causing one part to cool faster than another. Under cover the light sections have a chance to draw heat from the heavy one as fast as they cool. Radiation also tends to equalize the temperature. The casting is allowed to remain under cover an hour or more before examining it. At the expiration of this time if a drop of water fails to sizzle when striking the bottom of the casting, it is safe to uncover it.

The welder is warned to be sure that the casting is cold before making the water test. If it is warm he may have the job to weld over.

What Becomes of Your Old Car

HAVE you got a lamp bracket that will fit my 'Slips Loose'?" asked a customer, who entered a Chicago auto wrecking establishment. "No we haven't" said the proprietor shaking his



Courtesy Travelers' Insurance Co.

THIS TRUCK RAN OFF A FOURTEEN-FOOT EMBANKMENT—A TOTAL WRECK AND NO INSURANCE

head. "That was a pretty good old bus and they haven't started to wreck many of them as yet." "Maybe we can find something, that will answer the purpose."

Then he lead the customer through a wilderness of parts all assorted and arranged to make them as nearly accessible as possible. These parts had served their usefulness, as component parts of some car, because of the failure of other parts, upon which they were dependent. But nevertheless they were still useful to help some more fortunate car, limp a little further along the road of destiny.

"Here's one off a 1915 'Rolls Rough', that you could use." "You can have it for half a dollar". "But mine was wider than that" rejoined the caller. "Any blacksmith can spread it out for you and it won't cost, more than a quarter for the job."

It didn't take a great deal of mental arithmetic on the part of the buyer to figure how he was saving at least a dollar on the deal, by not having to buy a new one. "I'll take it."

That is just what happens a good many times every day in the hundreds of auto wrecking establishments, spread over the entire country. Parts that are no longer useful collectively, but that are still serviceable when sold separately, are sold at a fraction of their original cost, which gives a profit to the wrecker and a saving to the consumer. It is a great process of reclamation, that save thousands of dollars to car owners every year, and that pays those who have had the misfortune to wreck their car, many times what they would have received had they sold it, merely for junk. It is a form of conservation, that is indeed in keeping with the doctrines of the day.

What becomes of the cars of yesterday, that pass out of existence through fires, accidents, collisions or that are just naturally worn out? These men, who know are not prone to say. Yet, we know there are thousands, that make their dimise annually. It is that condition which has brought about the auto wreckers.

He is in a class by himself, entirely separate and distinct from the man, who buys up old cars and rebuilds them. The wrecker is just what the name implies. His business is to take cars apart, which he does so thoroughly, that no two units are left intact. Those parts, which still have a commercial value, aside from their intrinsic value as junk, are sorted and put away, until they can be sold.

The margin of profit for the wrecker is more or less speculative, since it depends on the number of parts he is able to sell, the length of time to make a "clean up" and the possibility of having to sell some parts for junk because they are unmarketable.

It is hard for that reason to determine the actual cash profit. Either the wrecker doesn't know exactly what he made, because of the very nature of his business, or else he is reluctant to divulge any of the trade secrets. However the record of one car which is a fair average, although it seems a trifle high; is as follows:

Purchase price of collision car		$125.00
Carburetor, sold for	$6.00	
Magneto, rebuilt	28.00	
Engine, overhauled	110.00	
Four tires	14.00	
Four inner tubes	4.00	
One head light	2.00	
Windshield glass	6.00	
Rear fenders	4.00	
Two wheels	6.00	
Storage battery	10.00	
Generator	15.00	
One seat	2.00	
Hair	1.00	
Top	4.00	
Aluminum	15 00	
Bronze	9.00	
Steering gear	8.00	
Gasoline tank	2.00	
Transmission	25.00	271.00
		146 00
Cost of wrecking		15.00
Profit		$131.00

The Church Garage

ERNEST A. PHILLIPS

The first glance a stranger takes of the establishment naturally causes him to believe it is a house of the Gospel, but soon as the unacquainted one passes the side of the structure and hears the roaring, snorting, barking motors within and sees the curling, wafting, lead colored smoke rolling out the side entrance it flashes through his mind that he is passing a garage, and such he is—the church garage; and perhaps the only one of its kind in the United States!

The church garage is the works of veteran overseas soldiers, which explains the novelty and curiosity of the plant and demonstrates the resourceful business methods so well known in America.

When Sergeant Guy Williams and Chauffeur First Class Harry Apple recently returned to their homes at Lonoke, Arkansas after a faithful service overseas, the future looked rather gloomy. But not for long, however.

Unable to secure employment of a nature they preferred it dawned upon the youthful mechanics to launch a business for themselves,

"THE CHURCH GARAGE"

and this, of course, is something most men in early twenties would rather touch with a fifty foot pole; but not so with these two ex-soldiers.

Displaying the same determination that they showed against the

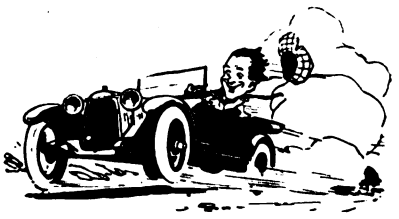
(Continued on page 121)

A six cylinder car, that was damaged by fire; the engine in this case was virtually undamaged and was sold intact; showed the following profit to the wrecker:

Paid for car		$120.00
Motor, magneto, generator and storage battery; overhauled	$200.00	
Three tires	18.00	
Head lights	8.00	
Transmission	25.00	
Radiator	4.00	
One wheel	4.00	
Bronze, aluminum, iron	15.00	274.00
		154.00
Cost of wrecking		10.00
Profit		$144.00

And thus it can be readily seen, that money can be made by salvaging automobiles. There is a good return for the enterprising individual, who goes about the work in a systematic manner.

High Spots



It is wonderful how many people are willing to help you when you start out to make a fool of yourself.

The foot and mouth disease may be dangerous. But it isn't half as bad as the ear and mouth disease contracted by the gossipers.

When two women happen to hate the same woman they are the closest of friends.

The loudest prayer often comes from the biggest hypocrite.

Any time an old maid and a widow are chasing the same man, get yourself a bet on the widow.

Before marriage he tells her that he isn't worthy of her. And after marriage he does all he can to prove it.

The way some men arrange their napkins when they sit down at a table you would think they were going to get a shave instead of a meal.

A man will hope for the best and get it. Then he will be sore because he didn't hope for something better.

Another way to tell a liar is by the way he wants to bet on everything he says.

What has become of the o. f. bowler who couldn't make a good score unless there was a beer frame every second frame?

The trouble with a pretty girl is that she can't help acting like she thinks she is twice as pretty as she is.

One of the father's duties is to tell the kids that castor oil isn't bad to take. Then father wonders why the kids grow up in the firm belief that he is a monumental liar.

The attorneys for most of the murderers blame the deed on the fact that when the murderer was a boy some one hit him on the head. The trouble is that the man who did the hitting didn't hit hard enough.

A woman is just naturally bound to be contrary. She is now wearing her feathers upside down and is wearing her beads down her back instead of in front.

A man will tell one lie to keep out of trouble and then has to tell 100 more to get out of the first lie.

A woman hasn't much use for a telegram. Somehow or other it seems unsatisfactory because it never contains a postscript.

You can stop a river by damming it. But it is a waste of words to try it on your wife.

The man who agrees with nobody is about as unpopular as the man who agrees with everybody.

Another thing to worry about is how the heck could you keep your spectacles on if nature hadn't supplied you with ears and a nose?

Another thing we can't understand is why a girl of 33 imagines that her skirts should be shorter than those of a girl of 13.

Before the honeymoon they are love sick. And after the honeymoon they are sick of love.

WE'LL WAIT TILL YOU GET THE REST ON

We are ready for you in underwear hosiery and mittens.—Ad. in Sarnia, Can., Observer.

THE EFFICACY OF PHYSICAL CULTURE

FOR SALE—A physical culture restaurant and institute Reason for selling, ill health.—Ad in Chicago Tribune.

THIS GUY'S HUNTING TROUBLE

WANTED—Successful writer, westerner, is unmarried. Would like to hear from buoyant-hearted young women of trim build with a little of the rebel in them, a love of books and new horizons, an enough of the actor to be able to adapt themselves to varying circumstances.—Ad in the Masses.

MAD FORD ATTACKS OWNER

Frank Berger of Scottdale narrowly escaped serious injury last night when attacked by his Ford car while he was cranking it Berger's car stalled on the North Gallatin avenue hillside and when he tried to start the engine the machine pounced upon him. Taken at a disadvantage, Berger was pushed forward down the hill and unable to get out of its way was crashed against a telephone pole. He suffered lacerations of the left arm and body bruises.

The Ford had never before shown evidence of such a mean disposition and the attack was entirely unexpected. Berger does not know whether to have it killed or get even by running it to death.

Funny how a boy can study spelling and grammar for ten years and forget all he learns about both ten minutes after he gets out in the world.

Every woman believes that she is the only woman in the world who never chased after a man.

When a fellow is in love he believes that the poetry motion is the way his girl's jaw waggles when she is chewing gum.

Every good housekeeper is expected to make a slave of herself when she has company. And she does.

When a man feels good and his stomach is in fine shape he isn't happy until he goes out and does something that knocks his digestive apparatus out of kilter.

Another good bet is that there would never be any gambling done if men had nobody to gamble with but their wives.

Any time a sales person in a department store assumes dignity it is the kind of dignity that drives away trade.

No wonder they call matrimony a lottery. Matrimony makes one man and unmakes another man.

Twelve Things To Remember

The value of time.
The success of perseverance.
The pleasure of working.
The dignity of simplicity.
The worth of character.
The power of kindness.
The influence of example.
The obligation of duty.
The wisdom of economy.
The virtue of patience.
The improvement of talent.
The joy of originating.

Old John Barleycorn may not be completely knocked out but he comes up groggy.

Say what you will of the chronic kicker, he at least varies the monotony of life.

The world moves. If you have any doubt about it try to keep up with your running expenses.

You never can tell. The fellow who always looks out for himself may need looking into.

Enthusiasm is too often a pleasurable sensation we experience over things that are none of our business.

No, Maude, dear; water can't run uphill. A crick in the back couldn't possibly develop into water on the brain.

The man who feels that the world owes him a living is generally too poor to put his case in the hands of a collecting agency.

The reason why you think that the other fellow can afford to take the vacation he is on is because you can't see through pocketbooks.

Probably it was just as well that polygamy petered out in this country when it did. If a man had to support five wives these days, all five of them would starve to death.

The American husband was always a great bluffer. Most of the signers of the Declaration of Independence were married men.

Another reason why baseball is so popular is because no ball player wears whiskers.

A lot of men who got married since they returned from fighting over there are now learning more about censorship than they ever learned in the army.

With most women and too many men there is no particular difference between accusation and conviction.

Any sidewalk see-more seeker can tell you that there are a lot of new things under the sun.

It makes a woman mad to frisk her husband's pockets for coin and find some old letters she gave him to mail a week ago. If she mentions the letters she'll have to admit frisking his pockets.

When your job bores you just remember that there are a lot of jobless men who envy your job.

The way we understand Bolshevism is that the capitalists will have to live on snowballs while the common peepul will have bank accounts, check books, fountain pens and limousines.

One thing we like about a man who stutters is that he never speaks unless he has something to say

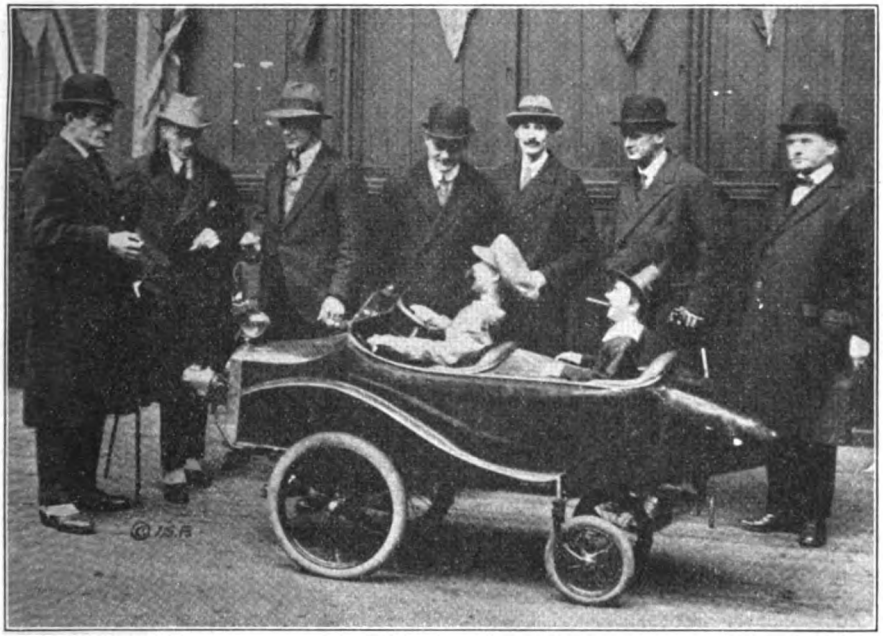
A woman can get a whole lot of excitement out of trying to guess who it is when the telephone rings.

Any woman who must stay around home and hear the telephone bell ring is entitled to some excitement.

THROWING THE BULL IN SERBIA

Copyright, I. F. S.

Ox-shoeing not horse-shoeing forms the principal source of income for the village smithies in Serbia. It is apparent, that it is no simple job, as the ox has to be thrown and "hog tied" then the smith proceeds without interruption. This particular ox was on a Red Cross convoy, carrying supplies to a remote village. It took three Americans to put the animal on it's back.



HARNESSED SOUND—INVENTOR USES LIGHT AND SOUND WAVES TO CONTROL MOVEMENTS

Controlling a small electric motor car and making it stop and move in any direction simply by blowing a whistle. This is the astonishing feat performed by Captain Alan Roberts, a prominent physicist employed during the war. Captain Roberts gave a demonstration of the possibilities of sound and light control. Standing in the middle of a crowd of men, Captain Roberts blew a blast on an ordinary police whistle. Immediately the electric motors in the car started and the little vehicle in which were seated two models slowly glided across the floor to him. He blew another blast, and the car stopped, turned around, glided deftly around chairs and apparatus and finally moved slowly back to it's starting place. By turning a beam of light on and off, a gong was made to sound at will and by blowing on whistles of different keys, small electric light bulbs were lit up thirty yards away.

Benton's Recipes

Ink for Writing on Celluloid—Ink for writing on celluloid triangles, etc., can be prepared by dissolving a tar dye stuff of the desired color in anhydrous acetic acid.

To Remove Grease or Dirt From Mercury.—To cleanse mercury first put a ten per cent solution of nitric acid in an iron ladle, and then the mercury to be cleaned; place same over a blacksmith's forge until the nitric acid boils. The dirt will then rise to the top, and leave the mercury perfectly clean in the bottom. Care must be used not to let the mercury boil, as the fumes are very poisonous.

Holes in Boiler Settings—I have successfully used the following simple mortar for stopping leaks in chimneys, etc.; it is good for stopping cracks in boiler settings and other brickwork structures where not exposed to very high temperatures. Although of an improvised and primitive nature it answers the purpose very well, and has the merit of being made of materials available almost everywhere. Mix hardwood ashes, 3 quarts; chimney soot, 1 quart; common salt, 1 quart; and sufficient water to make a stiff mortar Apply at once as it hardens quickly. This is a very old recipe; in various proportions it was used by our forefathers years ago.

To Preserve Screws—Some toolmakers —and others—like to save their small old screws, nuts, etc., the common practice being to keep them in small tin boxes where they soon become rusty and unfit for use. A good way to keep such scrap or new screws of various size, is to keep them in small large-neck bottles, each provided with a cork and labeled if desired. In this way one can always see instantly just what they have and how many of each and the pieces never get rusty.

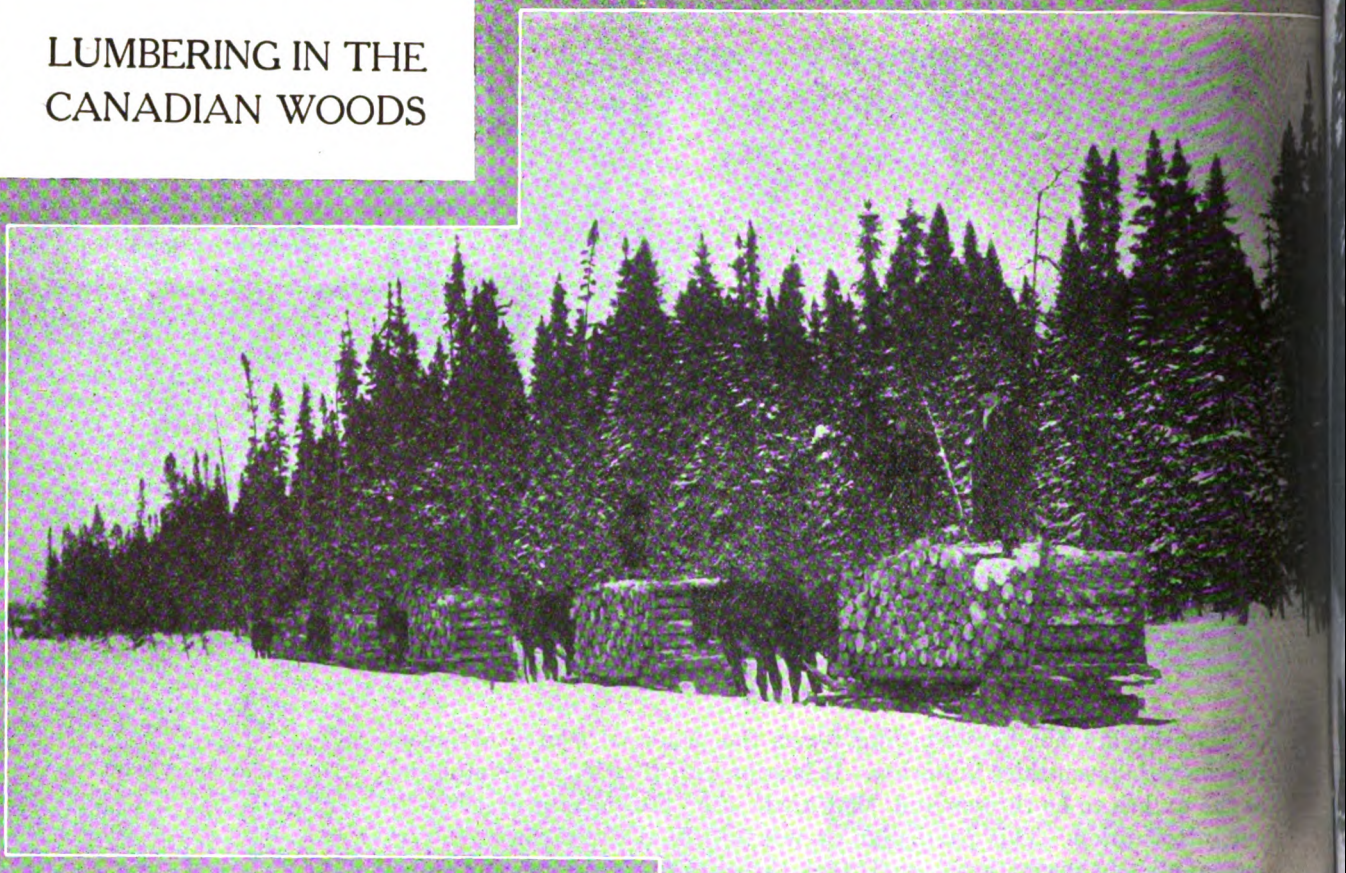
To cut glass without a diamond, lay the glass on a straight, flat surface; make a mark at either end, or where you wish to cut the glass. Heat a piece of wide, thin iron, perfectly straight or in a desired curve, and place it on the glass to the marks made; the heated iron will cause the glass to expand on upper surface sufficient to crack the glass on the heated part, the crack extending clear through the glass.

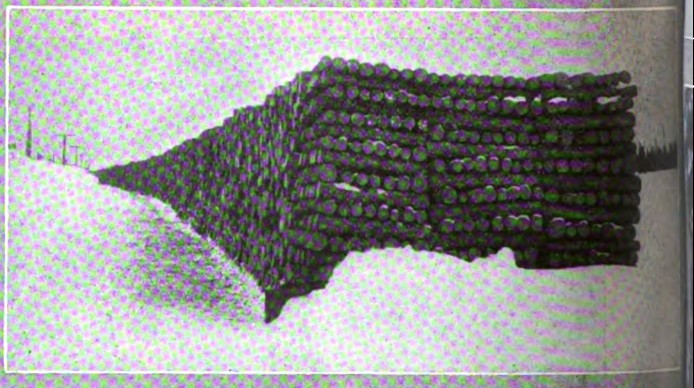
White Writing Fluid for Blue-Prints—A fluid which I find is as good as any I have ever used for writing white on blueprints is made of equal parts of sal-soda and water. Another fluid, not as good, is made by mixing equal parts of borax and water. Both these fluids must be used with a fine-pointed pen; a pen with a blunt point will not work well.

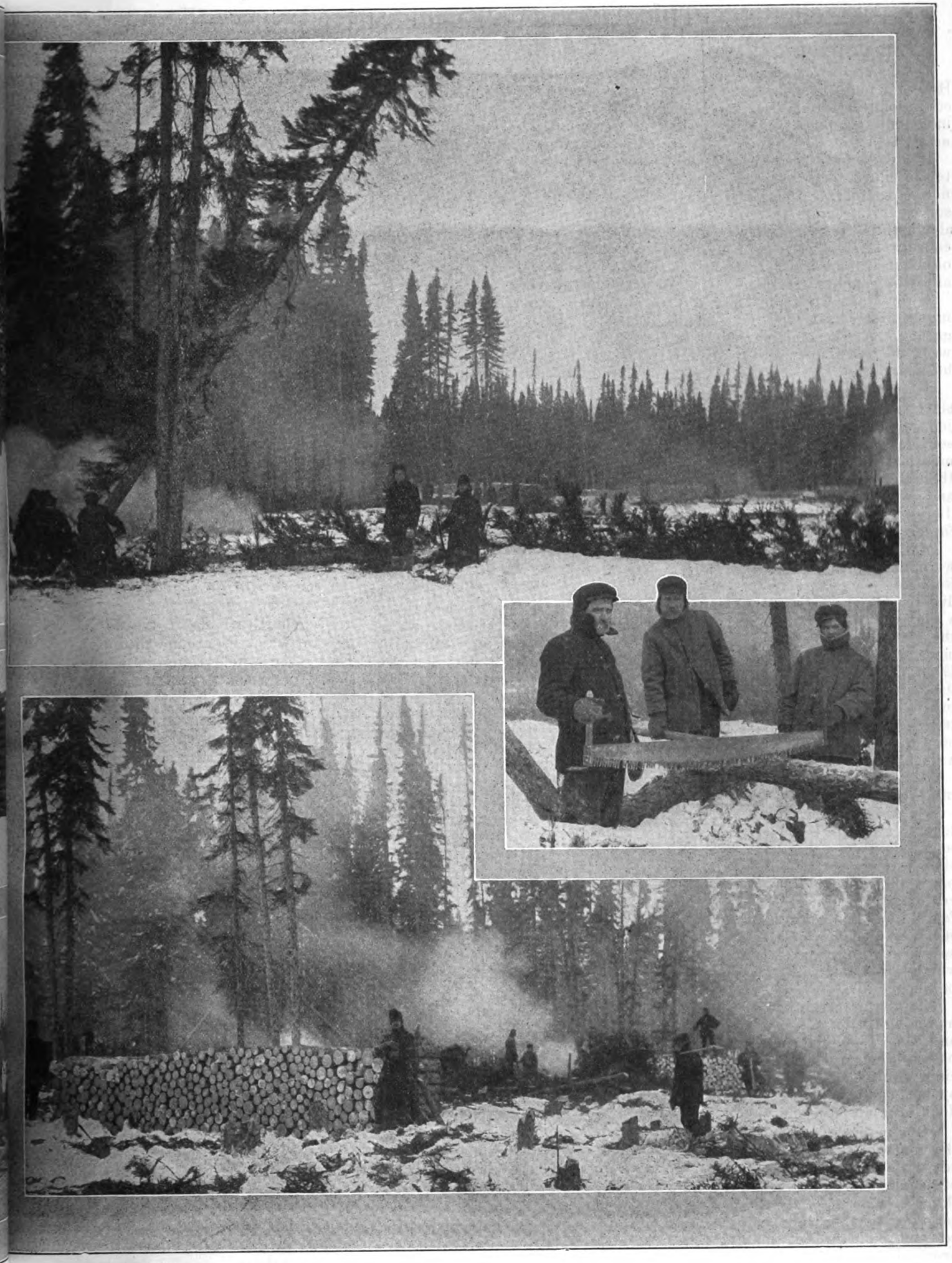
Marking Fluid for Blue-Prints—The following recipe for marking fluid for blueprints has given me satisfaction. The fluid is composed of potassium oxalate, 1 ounce; gum arabic, 1 dram (60 grains); water, 6 ounces; cobalt-blue to color.

To Preserve Reference Tables—Reference tables are very convenient to use but soon get dirty and torn. To prevent this pour some lacquer in a shallow tray and dip the paper into it and hang it up to drain and dry. This not only makes the paper dirt-proof but toughens it as well.

LUMBERING IN THE CANADIAN WOODS







THE CHURCH GARAGE

(Continued from page 116)

Huns for many months, they formed a company, raised capital and immediately plunged into the business world.

It so chanced that the Presbyterian church had just completed a new structure. After many unsuccessful attempts to rent a suitable building for their purpose, they conceived the idea of renting the old church; and shortly afterwards all arrangements were made.

A few days work put the building in first class shape for a small garage. At the end of their first week they were open and ready for business.

At first business was rather slack, and several excellent paying jobs were lost because they had no service car, but within the first month they had more work on hand than they could possibly do alone and a brother of one of the soldiers, was added to the working force.

It was not long before the three were unable to handle the work. Realizing that automobile owners dislike delays and will patronize a shop that offers punctual service; they employed two more mechanics. Even this crew was incapable of handling the increased trade, and now they occasionally employ a sixth mechanic.

THEY HAVE BUT ONE ENTRANCE AND EXIT

At any hour during the day from one to five and sometimes seven cars may be seen standing outside, waiting for repairs. Their regular customers are perfectly willing to sacrifice an hour or so waiting for work which they know will be dependable.

The writer recently visited this humming little place of business, and, even though the plant doesn't possess the most modern and efficient equipment, and is hampered by lack of floor space, the work is done in a most thorough manner.

"Our main difficulty," explained the youthful owner when approached with the question, "is lack of enough floor space for one thing". Cars started coming in to us so fast that we were soon swamped and had to quit making improvements until we got caught up". "Always one or two cars waiting, and just when we think we'll have a few hours, in pops another car for repairs."

"Look out there," and they pointed outside to where three cars stood waiting for attention." Three machines out there and inside we've got nine parked as close together as we can get them leaving us very little working space." "It is not enough room."

It was true. And, in addition to the three touring cars there was also a tractor and a truck from one of the rice farms.

OWNERS AND CREW OF THE "CHURCH SHOP"

"But it is too late to do anything in the improvement line now," they hastened to add. "It is merely a matter of time until we'll have to find a far larger building, and if business keeps up as it is now we'll have to act quick.

"Of course it's rather bad to do garage work in here because we're handicapped for suitable light. These windows served the church favorably but they don't answer the purpose for us. They're situated in such a way that they don't give the light from outside, we should have." And after a moment they added: "But of course a fellow had to get started in this old world someway, you know. Can't always have the best in the very beginning. We shouldn't complain."

"Handle much tractor work," I next asked them.

"Well, not so much here in the shop, but we have frequent calls from the country to repair them in the fields; and when they're running in the rice harvest it keeps us somewhat on the go. We get occasional calls from pumping stations and wells on the rice farms. Gas engines will go wrong now and then."

And lastly I asked them to give their frank reasons for their success.

"Simply this: We always do dependable work; and we do it in the shortest time possible. The motorist, you know, is won't to fret and worry, hem and haw around a good deal when he's told his car will be ready Wednesday then has to wait 'till Saturday. If it's a short job we never tell them it'll be ready at three o'clock and then make them disappointedly wait till five or six.

"We never accept a job unless we know we can do it, and do it in a satisfactory manner. I mean jobs that our meager equipment prevent us from doing satisfactorily. When a case of this nature turns up we always explain that we're just starting in and aren't able to handle such work just yet, but that so and so around the corner will do a good reliable job.

"In short, we don't try to do jobs for which we are not equipped. That's the whole thing in a nutshell. As soon as we're able to enter a new and larger establishment we'll have one or two agencies, carry a line of accessories, have the free air hose out in front beside a gasoline stand, and the very best of equipment necessary to handle the demands of a town this size."

SERVICE DE LUXE

One of the latest and most progressive features in garage design is the addition of a women's rest room, to accommodate the ever increasing number of ladies who drive their own cars in Salt Lake City, Utah. The rest room contains a lounge, wash bowls, magazines and many other conveniences for the tired women motorists.

"This feature is much appreciated by the women visitors to our garage and we have received a great deal of commendation for it," said Mr. Farrington, who is the proprietor. "A rest room is practically a necessity in every up-to-date garage as it gives the ladies a chance to freshen up after a strenuous drive."

TRACTOR HITCHES

Various conditions govern the method and manner of hitching the plow to the tractor to meet the special requirements of and construction of the attachments used and this description has to do with the attachment to the tractor of Grand Detour junior rigid beam two, three and four bottom plow gangs.

First, drive the tractor as close to the furrow wall as conditions will permit. By reference to the accompanying illustrations it will be seen that in Figures A, B and C that the line of draft of the plows is as follows: 2 bottom 14 in. plow 19 in. from furrow wall; 3 bottom 14 in. plow 26 in. from furrow wall; 4 bottom 14 in. plow 33 in. from furrow wall.

Measure the distance from the furrow wall to the center of pull of the tractor, or estimate the distance you expect to drive from the furrow wall and add to the distance from the center of the tractor to the outer side of the rim.

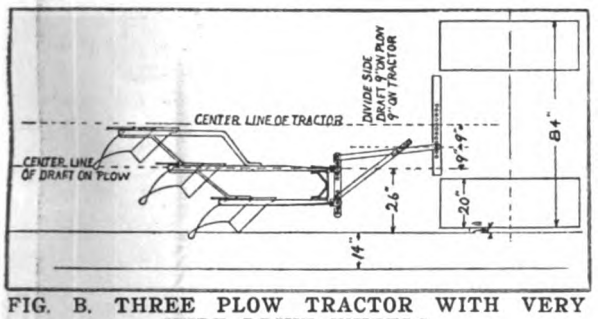


FIG. B. THREE PLOW TRACTOR WITH VERY WIDE DRIVE WHEELS

After determining the distance from furrow wall to center of tractor, deduct therefrom the distance represented by the draft line of the plow, shown above. For the best results this distance should be equalized between tractor and plow by moving the hitch connection of the tractor toward the line of draft of the plow, approximately one-half the difference between center of tractor and line of draft of plows, as shown in figures A, B and C.

Attach plow hitch to plow approximately, as shown in the illustrations, so that the front end of the drawbar meets the tractor hitch when the plow bottoms are in the proper relation to the tractor drive wheel.

Example: See figure C.

Line of pull tractor 44 in. from furrow wall.

Line of draft of plow 33 in. from furrow wall.

Difference 11 in.

To divide this difference equally between plow and tractor it will be necessary to hitch approximately as shown. After opening land make the necessary adjustments on the diagonal brace until the plows maintain the proper width of cut and run straight behind the tractor with beams parallel to the furrow wall.

As to the height of hitch, a wide range of adjustments is provided in the plow clevis jaws to accommodate the varying heights of tractor hitches and to suit the different plowing conditions.

No definite rule for satisfactory plowing under all conditions can be laid down, but these general rules will be found to be approximately correct for normal conditions of plowing with the plows in good condition and the shares properly sharpened.

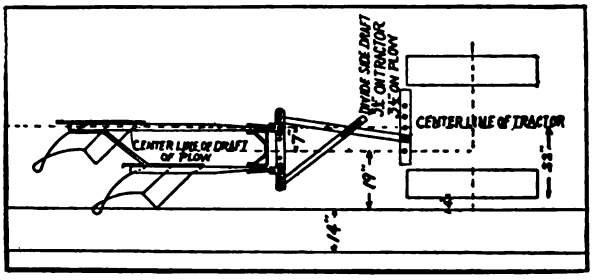


FIG. A. TWO PLOW TRACTORS WITH EXTENSION RIMS

GAS 'EM

Australian Uses Modern War Methods by Employing Fumes From Motor Car to Exterminate Jack Rabbits

Early in the nineteenth century, the pioneers of Australia, confronted by the problem of obtaining fresh meat at low prices, began to breed rabbits for table purposes. The experiment proved a success from the very start, but it was not many years before the blessing of plentiful rabbits began to take the aspect of a plague of the most serious character.

Multiplying with amazing rapidity, they began to overrun the rich ranch and farm lands and the damage resulting from their feeding on the crops ran into the millions of pounds sterling a year. To combat them, organized drives in which all the settlers in a wide area would participate, were staged and thousands of the pests were killed from time to time. But the problem has never been completely solved and today the Australian farmer looks upon the extermination of rabbits as part of the routine of farming.

The customary method of extermination is by digging out the burrows, but Walter Hawker, a rancher of Anama Station, Clare, has devised a means which enables him to kill rabbits quicker and more cheaply than by using a pick and shovel. He uses a Dodge Brothers motor car.

His method is described in a letter which he wrote to the Cheney Motor Co., Dodge Brothers dealers in Adelaide:

"You will be interested to know a new use for the Dodge Brothers car. I am fumigating rabbits with it. I remove the silencer and fit on a piece of 1¾ inch pipe with a reducing socket and a water pipe union, get 30 feet of 1-inch bore hose, go to a burrow the up-wind side, face the car to the wind put the hose into the burrow in the most up-wind hole, and fill that hole up with dirt. As the smoke comes out of the other holes, fill in till all are packed. If a large burrow, run the car for five minutes, when every rabbit will be killed. The exhaust fumes are mostly carbon monoxide, which forms a certain compound with the blood of the rabbit and poisons it. I worked the Dodge car for six hours for a comsumption of two gallons of petrol, and fumigated seventeen large burrows. This would have taken seven men eight days to dig out.

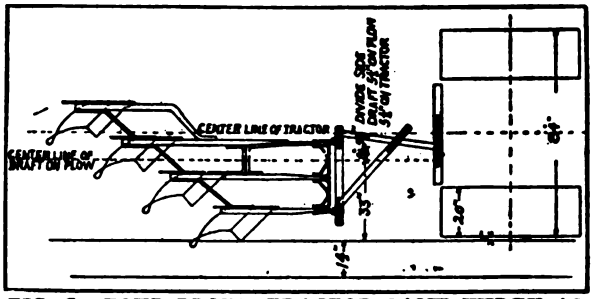


FIG. C. FOUR PLOW TRACTOR SAME WIDTH AS THREE PLOW TRACTOR SHOWN IN FIG B.

Heavy Duty British Trucks

By JOHN Y. DUNLOP

THE transportation requirements of the various branches of the engineering trade can be met in no more satisfactory manner, than by the adoption of motor transportation. Due to the heavy nature of work, motor trucks and tractors with trailers attached, effect a greater saving in this particular line of work, possibly, than in any other trade, because there is practically no limit to their radius of operation.

In the old days, when a heavy piece of machinery had to be moved from the works, the machine had to be disassembled and packed, and then hauled by horse to the railway to be forwarded to it's destination. This method required more handling, and increased the possibility of breakage, which in the case of machinery is a serious item not only because of the cost of replacement but because of the time required to do so.

Today many of modern engines and heavy machines are built and assembled in the workshop. Though the development of motor trucks these machines leave the shop as complete assemblies often for long journeys, a task which could not be undertaken by horses, especially if the district was hilly.

The achievements of automotive engineers and manufacturers has been one of importance, because we have not only reached the stage where motor transportation serves all districts satisfactorily but we are able to transport in bulk, loads which were formerly impossible to handle.

There are a great variety of gasoline, steam and electric trucks in service in the various engineering trades in the Clyde River district. These machines cover a vastly increased field and reach remote places which our former means of transportation left untouched. So that not only may the factory supply it's workers with spare parts while doing construction and repair work, but they may be able to obtain raw material from places inaccessible by rail.

It is quite easy to understand the advantage of being able to draw supplies for parts from a larger area for by doubling the radius of action it is possible to obtain a greater and more regular supply of raw material without which no manufacture can hope to be successful.

The illustration shows several trucks being loaded with heavy castings. They have been cast by firms, who are from 10 to 20 miles away from the place where these castings are to be used. By the use of motor trucks it is possible to deliver them and make the return trip in less than a day; whereas before for motor transportation was used it was necessary to resort to the railroad with it's attendant delays and breakage. But most discouraging of all was the loss resulting from such delays and the inability of the manufacturer to take advantage of a nearby market due either to the congested railway conditions or the inaccesibility of the place by rail.

The road tractor has brought about a great change in this respect. In can not be seen too greater advantage than in the Clyde area where most of the leading makers of steam lorries and tractors have their vehicles in operation. The value of steam vehicles for this particular kind of work is being recognized more every day and makers of this type of truck should have no difficulty in increasing the number already in use if they take advantage of it's popularity and develop this type of truck.

In the history of the Clyde River district traffic has never before reached it's present volume. Transportation facilities have had to be improved to accomodate the increased business resulting from the expansion of all the iron and steel industries in the vicinity.

Even the casual visitor at the docks is impressed by the volume of traffic and the conspicious part which the motor lorrie and steam tractor plays.

Improvements which were made for naval purposes during the war and which include mammoth buildings, tower and crane derricks, have all been converted for commercial purposes. A great increase has been made in the number of building slips along the river and devices for loading and unloading ships more speedily, but without adequate transportation facilities all of this work would have have been done in vain.

The motor and steam lorrie have solved the problem, to some extent, of quickly and economically moving merchandise at these large shipping and manufacturing centers and have they prevented a reoccurence of the congestion and stagnation which existed previous to their advent.

YES, THE HORSE IS COMING BACK

"The last of the Kankakee livery stables of importance, that of Arnie Baker, on North Schuler avenue, will soon be transformed into an automobile garage and the housing of horses will be replaced by that of machinery.

"Mr. Baker, owner of the building, will have for a partner Jess Duncan, a grocer on Harrison Avenue and ex-alderman of the First ward. Messrs. Baker and Duncan went to Chicago this morning to negotiate for the agencies of two makes of machines.

"This makes the fourth local livery stable to be transformed into garages. The first was that of Dick Fortin, on Station street, which had been a livery stable since the early days of Kankahee, before the '60's, if the writer's recollection is correct. Its most noted keeper was Leroy Payne, who also had a stable on Schuyler avenue, where Speicher Bros.' jewelry store is now located. Payne later became noted in Chicago as a liveryman and drove the four-horse team that carried General Grant in the great parade in Chicago on his return from a trip around the world in the '80's. He also the built the horses' home, near Chebanse, and after various fluctuations died in poverty.

"The quarters now occupied by the Ford agency on Station street was a livery stable conducted by the late L. E. Fenouille, country coroner. The Al Wadley livery, on the same street, was first conducted as a livery, later as a garage and now as an automobile supply house.

"The only livery stables left in Kankahee, and they are not strictly of that nature, are the hitch barns on East avenue, north of Court street. "Horses for Hire" signs and "Entertainment for Man and Beast" are fast disappearing before the all conquering automobile and the end of hitch barns are even in sight."

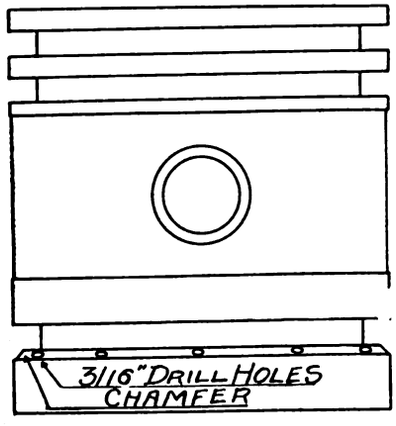
—Kankakee Democrat.

Useful Hints for the Repairman

STOPPING PISTON FROM PUMPING OIL

Not infrequently, the Automobile mechanic encounters a motor on which one or more of the pistons persist in pumping oil. At best, if it resulted only in the motor smoking, it would be of sufficient annoyance to merit correction, but as every motorist knows the trouble does not end there. Oil is wasted through excessive consumption, spark plugs are fouled, valves often fail to seat properly and deposits of carbon are bound to accumulate rapidly. New piston rings sometimes afford only temporary relief.

A satisfactory way of remedying this condition is to chamfer and drill the offending piston. It is an



operation not difficult to perform and can de done without the use of any machinery.

The piston rings are first removed from the piston. The edge or corner formed by the side of the ring groove and the skirt of the piston is chamfered to a width of 3/16" and at an angle of 45 degrees. A file is used for this purpose, but it must be used carefully otherwise the opposite side of the ring groove will be mutiliated. 10 or 12 5/32" or 3/16" holes equally spaced should be drilled through the piston in the center and perpendicular to the chamfer.

These dimensions will work very satisfactory on a piston with rings ¼" wide. When this method is to be used on a piston with narrower rings the width of the chamfer will have to be correspondingly narrower, otherwise too much material will be removed from the piston when the chamfer is cut. When the piston ring is installed it will be found that the piston does not properly support it. A little judgment on the part of the person doing the work will avoid this difficulty.

A GOOD IDEA

If you and I each have a dollar and we exchange them, we still have only one dollar each.

If you have an idea and I have one too, and we swap them, then we each have two ideas.

You have an idea of how to make some handy device for doing some particular thing around the shop.

Send your idea to us, accompanied by a rough sketch so that we will not miss any of it's good points, and we will send you a nice crisp dollar bill for it.

Then you will still have your idea, a dollar as well and fifteen thousand others besides yourself will have been benefited.

Isn't it a good idea?

When the ring is installed after the work has been properly done it will act as a scrapper, collecting the oil in the groove provided by the chamfer. The oil finding easy access through the holes back to the crank case.

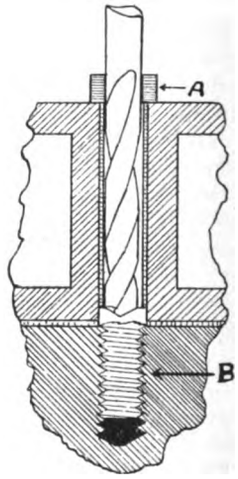
REMOVING A BROKEN CYLINDER HEAD CAP SCREW

A broken cylinder cap screw can be removed very easily without danger of mutilating the threads or unbolting the cylinder head by the use of a flanged bushing as indicated by A in the accompanying cut. The repair man who has a lathe can make several of these bushings of various size to accommodate the different sizes of bolts, very easily and they will repay him many times over not only in time saved but patients as well.

The bushing is inserted in the hole and acts as a guide for the drill permitting it to be automatically centered on the broken cap screw indicated by B and preventing it from destroying the threads by running off.

A bushing to be used in removing a 7/16" cap screw, which is the most common size in use, can be made from a piece of scrap steel. The inside diameter is 23/64" and the outside diameter 7/16" . The length may be varied to suit the particular needs of the user.

To remove a broken cap screw of that size it is necessary only to insert the bushing in the hole and drill



it out with a 11/32" drill. A 7/16" 14 U. S. S. tap with a long shank is used to clean out the threads.

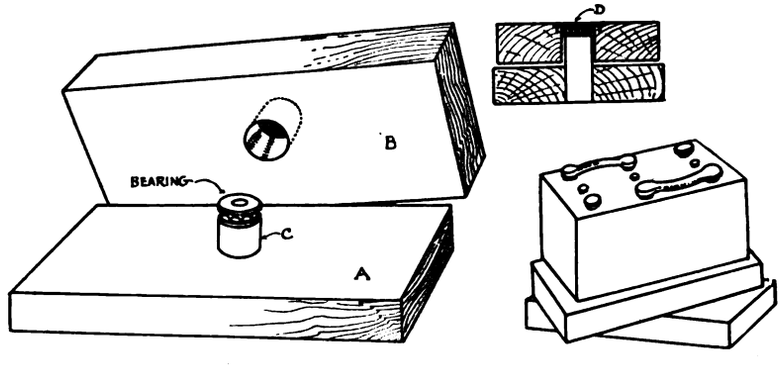
Any size broken stud may be removed in this manner as long as the drill employed is slightly less in diameter than the size of the stud minus the double depth of the threads. The double depth of the various U. S. S. in common use is as follows.

5/16"-18-.096"; 5/16" and 3/8"-24-.072"; 7/16"-14-.123"; ½"-13-.133".

A MOVABLE BATTERY TABLE

No one is better qualified to pass judgment on how heavy a battery is or rather seems than the repair man, who is handling them all day. Turning them first one way and then another to admit of the most advantageous working position, isn't exactly childs play.

A simple miniture turntable, on which



Ford Starting and Lighting System

TO some people the starting and lighting system of the new Ford is going to cause some trouble, for the reason they think it is like the rest of the car and will not require any more attention. This is hardly so and it will have to be cared for like the starting and lighting systems of higher priced cars.

This system is known as the "two unit" system and consists of starting or cranking motor, generator, battery, ammeter, etc.

The starter is on the left side of the engine and is bolted to the transmission cover. It starts the engine by means of the Bendix drive gear engaging with teeth cut in the flywheel rim of the engine. The spark and throttle levers should be placed the same as for crank starting. The ignition switch can be placed on either the "Bat" or "Mag" side, but if the engine is cold it is better to start on the battery but when the engine is warm it is better to run on the magneto. When the switch is on the side marked magneto the engine is running the same as the old ones used to that never saw a self-starter. In starting with the self-starter care must be taken not to have the spark lever advanced too far, as a back kick might break the starter, just as it will break an arm when the spark is advanced too far.

The starting motor is operated by a starter button located on the floor. When this button is pressed it completes the circuit between the storage battery and starting motor, and this causes the Bendix drive to engage with the teeth on the flywheel and turns the engine over until it begins to go under its own power. When starting cold the priming wire should be pulled while the starter is turning, just as you used to do with the old crank. Do not do as some, when you hold the button down and the engine does not start; don't say the starter does not work, for it does, all it is supposed to do is to revolve the crank shaft of the engine. If the engine does not start there is some other trouble, and the starter button should not be held down too long as it will discharge the battery. If the engine does not start after three or four attempts, then it is time to look for trouble somewhere else. If the starting motor does fail to go when the button is held down, you should look at the storage battery terminals, see that they are tight and if found to be loose take them out and scrape with a knife and scrape the hole clean and then tighten in place. The terminal on the motor and the two on the switch should be looked at to see that they are tight. All electrical connections should be kept clean and tight. Look for breaks in the wire where they touch any metal. Test the battery with a hydrometer. If the hydrometer reads less than 1.225 it shows the battery is weak and should not be used to start with. The crank should be used for a while and if every thing is all right it will soon build up.

The generator will be found on the right hand side of the engine and bolted to the cylinder front

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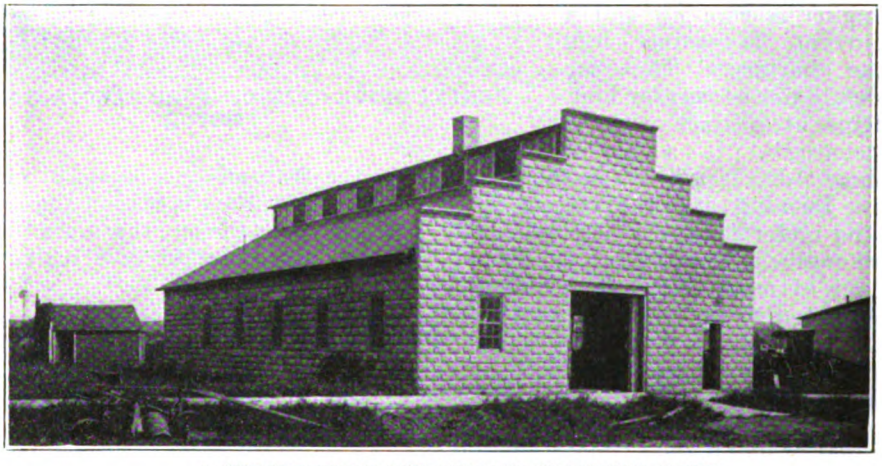
the battery can be turned in any position with scarcely any effort, so that it will be in the most convenient working position while burning straps together or doing any other work, can be made very easily from discarded material found laying around almost any shop.

Two pieces of heavy wood are cut to a size that the user finds most convenient for his work. A hole is drilled part way through one piece of wood into which is fitted a piece of steel tubing. It is cut off flush with the board and a washer or suitable piece of flat steel is fastened at the bottom of the hole.

The other board is then drilled and a piece of solid steel smaller in diameter than the inside diameter of the tubing is forced into the hole. This piece of solid steel which is to act as the bearing support is cut off at a height equivalent to the depth of the tubing into which it is to fit. A small set of ball bearing is placed on top of the solid piece of steel and the other board is set over it with the bearing and support inserted in the tubing. The height of the bearing will afford ample clearance between the two boards so that they will turn freely.



A WESTERN BLACKSMITH'S SPACIOUS SHOP

The blacksmith shop of Soren Peter Jensen of Rodney, Iowa, is one of the best of its kind in that section of the State. It was erected by Mr. Jensen and his son Arthur in 1909. It succeeded the wooden building on the same lot in which Mr. Jensen and a Mr. Christianson had carried on a very successful business since his coming to Rodney in 1892.

This fine building of cement blocks was built in a very careful manner, and attracts the attention of all strangers who pass through the village. It is sixty feet long and forty feet wide, and has an up-to-date equipment.

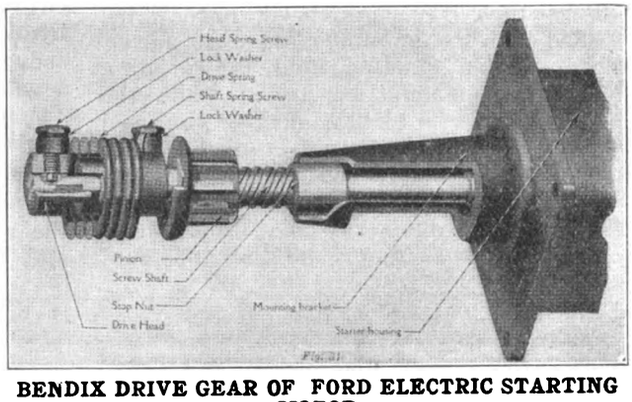
For some years Mr. Jensen and his sons, and son-in-law, Paul Rudbeck, have made, by their prompt and careful work, a wide reputation for their shop. Mr. Jensen was born in Denmark and learned the blacksmith's trade in a seaport town. He came to Omaha, about 1888, accompanied by his wife. Thinking that a small town was better for the rearing of their children, they removed to Rodney, Iowa. There they secured a cozy home, which is noted far and wide for its generous hospitality, and in this, their eight children were born. The four sons are hardy and intelligent workmen, the two older ones served in the world war, and a sister is cashier in the Rodney Bank. Mr. Jensen has a farm of sixty acres on the hills, and another in the valley of the Little Sioux River. Though the wide-spread use of automobiles has cut down the work of the shop Mr. Jensen makes a good living and "Looks the whole world in the face and owes not any man."

end cover. It is driven by a pinion on the armature shaft that engages with the large timing gear. The charging rate of the generator is set so that when the engine speed corresponds to ten miles per hour it begins to charge and will charge the highest when the engine speed reaches twenty miles per hour. The thing that controls this is the "cut-out" and is mounted on the dash. This is adjusted at the factory and should not be touched unless by someone who knows what he is doing. There is no place for oiling the starting motor as it is oiled the same as the engine and transmission. One end of the generator is oiled by splash from the timing gears, but the other end has an oil cup that should get a few drops of oil when oiling other parts of the car. Whenever there is any repairing to be done to the starting system, one of the wires should be disconnected at the storage battery and hitched up so it cannot come against the frame of the car. The charging indicator, or ammeter, is located on the dash. This should show "charge" when the engine is running and a current is going into the battery. The car should not be run for long trips at a time without "charge". It should show "discharge" when the lights are burning and the engine running under ten miles per hour. At an engine speed of fifteen miles per hour of more the ammeter should show ten to twelve with the lights burning. If the engine is running above fifteen miles per hour and the ammeter does not show charge, something is wrong, and the terminal posts on the ammeter should be inspected to see if they are tight. If they are tight, disconnect the wire from the terminal on the motor and with the engine running idle, take a screw driver and touch across from this terminal to the motor housing, if it is generating a good big spark will jump from the screw driver. Do not run the engine very long with this wire off as you may damage the generator. Look the wires over carefully for breaks and loose connections.

You will find that the lights contain two bulbs and the tail light has one, these are operated by a combination, or selective switch, on the dash. The large bulbs are six-eight volt, seventeen candlepower. The small bulbs are six-eight volt two candlepower and the tail light the same. These lamps are connected in parallel so that if one light burns out the others will not burn. The current for these lamps come from the battery and if they are connected to the magneto they will be burned out.

Now, the Ford people say that if any of these pieces of the starting and lighting system give any trouble they should be taken to a Ford service station and they will be taken out and sent home for repairs. The starter and the generator can be removed and there are plates furnished to go over the holes and the car can be operated without them.

It is a little more of a job to re-



BENDIX DRIVE GEAR OF FORD ELECTRIC STARTING MOTOR

line the transmission bands in one of these cars then it was in the old Fords and for the one that does this work I am going to give instructions.

The first thing to do is to remove the engine pan on the left hand side of the engine, take a screw driver and remove the four small screws holding the shaft cover to the transmission cover. Be careful not to break the gasket. After this is removed turn the Bendix drive shaft around so the set screw on the end of the shaft is in a horizontal position. Under this set screw is a lock washer, with lips, one of these is turned against the collar and the other is turned up against the set-screw head. Bend this one back and remove the set screw. Now, pull the Bendix drive assembly out of the housing, being careful that the small key is not lost. Take out the four screws that hold the starter housing to the transmission cover, and pull out the starter, taking it down through the chassis, that is why we took off the engine pan. If for any reason the generator has to be removed, first take out the three cap screws holding it to the front end cover and by taking the point of a screw driver between the generator and the front end cover, the generator may be forced off the engine assembly. Start at the top of the generator and force it backward and downward at the same time.

The storage battery should have a little care if one wants it to last as long as possible. You should look after the storage battery at least once a week if the car is used every day. Water must be kept above the plates, and do not try to see where the level is by holding a lighted match over the opening as the gas that comes out of a storage battery is very apt to light and cause an explosion. Nothing but pure water should be put into the battery, and this does not mean pure spring water, but distilled or clean rain water. When the weather is cold, water must be added only before the engine is in operation so that the water will become mixed and there will be no danger of freezing. Test the battery often with a hydrometer so you will know what shape the battery is in. A fully charged battery will show a hydrometer reading of 1.275 to 1.300 and will not freeze. When testing a battery be sure to replace the liquid in the same cell it was taken from. When making a test do so before putting in water. Keep the battery connections covered with a coating of cup grease or vaseline so they will not corrode.

DANGEROUS FUMES

Many lives were lost last year from motorists inhaling poisonous gases in garages. Here is a timely warning from Dr. Wilmer Krusen, director of the department of public health and charities of Philadelphia, which should be read carefully by every man or woman who owns a motor vehicle. It calls attention to the danger from fumes in private garages and precautions that should be taken against the menace of petromortis.

"The increase in the use of motor cars and the proportionate demand for home garages has created a comparatively new health problem; that is, the prevention of poisoning from gasoline fumes," warns Dr. Krusen.

"While few cases are on record of gas poisoning, known as petromortis, it is anticipated that the fall and winter months may bring to light cases of gas

AT THE SIGN OF THE ANVIL. A TYPICAL SHOP OF A BLACKSMITH OF THE OLD SCHOOL

The Iron Workers of Old New Orleans

JOHN B. WOODS

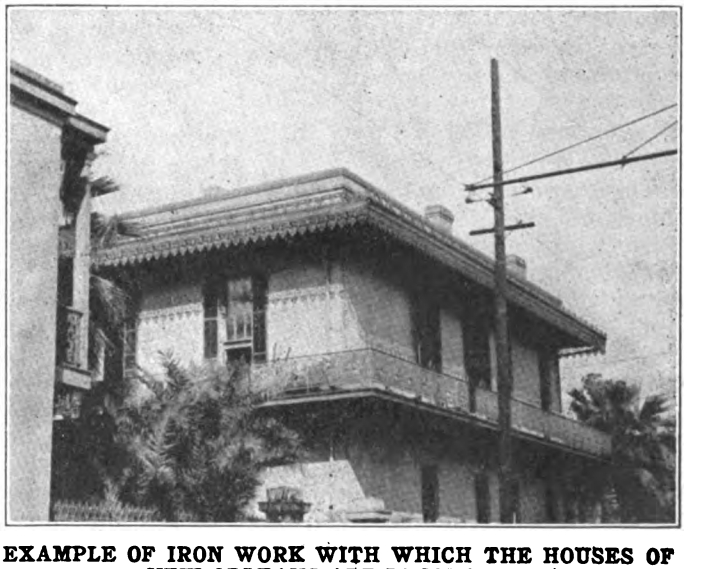
BETWEEN Canal Street and Esplanade Avenue, with the Mississippi forming the base of an extremely long triangle, lies the Vieux Carre or Old Quarter of New Orleans. Since the early days the town has changed hands several times, French to Spanish, Spanish back to French and then to the United States, and every period left its mark upon the old part of the city. Fire has destroyed much of the original construction on at least two occasions, but always enough of the old has remained to be copied faithfully by those who rebuilt it. And anyone who wanders about the historic streets of the Vieux Carre, with their French names, Royal, Bourbon, Dauphine, and the like, must have noticed the prevalence of iron-work upon the gates and balconies. The artisans of Old New Orleans were skilled in iron-working; in fact one still finds survivors, jealous of their skill, who spend portions of their working days repairing old railings.

In the Rue Royal is the home of Monsieur Mangin, related perhaps to the French General of the recent war although he does not say, he is. In front of Mon. Mangin's brick house, with its ancient balcony loft across the entire facade, can be seen the sign of his trade, It is a wooden anvil set upon a pole, with the iron-worker's name painted upon it. And above the anvil, as evidence that his skill does not stop at pounding upon an anvil, is a marvelous door-key, carved in a complicated pattern as were the door-keys of long ago. His ware-room and shop are down-stairs, while his home is above. His Sundays are spent out upon the iron-railed balcony and reading French papers, which are a month old.

There are hundreds of patterns to be found upon the houses of the Old Quarter. Possibly the most popular, as evidenced by its more frequent appearance, is the grape-vine motif, very heavily done in iron and looking quite like a vine growing across the front of the it. Usually there is a balcony railing, with a narrow decoration along the under side of the floor. Then along the roof there is a border to balance the decorations of balconies. Some houses have two or even three tiers of balconies and marvellous is the displays of iron-work there-on. The more ornate among the grape-vine patterns are thin castings, made in small sections, but they do not show the painstaking handiwork of the wrought iron designs.

Next in popularity among the patterns are those which have oak-leaf motifs, with acorns plentifully sprinkled among the leaves. And then there are heavy scroll designs, with various flowers, leaves and ferns. The better examples of skill are to be found most often in the old simple, geometric patterns which the iron-workers evolved out of their own ideas and converted into metal without the aid of a foundry or European artists. Iron arrows, crossed upon a simple circle; slender tapered shafts, circles and curlicues; diamonds and triangles; were made by the iron-worker in his little dark shop. The heavy iron gates in this city show the influence of old Spain, and here again the iron-craftsman found work to do. Great doors give access to long broad corridors, where beyond graceful arches, the white courtyards gleamed beneath their sheltering palms. These doors were of massive wood, studded with iron bolts and locks, or re-inforced with bars, where ever the wood was cut away.

Door-keys are still in demand, although the modern locks do not call for such ornate and clumsy tools for their operation. And there are still balconies to be repaired from time to time. The people of New Orleans, particularly in the Old Quart-



EXAMPLE OF IRON WORK WITH WHICH THE HOUSES OF NEW ORLEANS ARE DECORATED

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poisoning caused by inattention to proper ventilation required in the home garage. The public garage is safer than the private garage, because in the former there always are means for the escape of partly combusted gases and volatile by-products which arise during the operation of gasoline engines.

"The greater number of cases of petromortis have occurred in the private garage during the cold weather, when engines are allowed to run in the course of some repair or adjustment. It is for this reason that we extend this warning with the coming of cold weather. The most serious part of this type of poisoning is that death may be caused in a short time without due warning.

"Avoid any possibility of such an accident by keeping your garage open and well ventilated while running the motor."

er, still ride about in their high-wheeled carts and market wagons, so that the horse and his natural trailer, the wheeled vehicle, are still factors in the blacksmith's life.

One is often surprised when wandering about the streets, to come upon a particularly beautiful specimen of the old-time city house, brick or stone with tile roof and high gable windows, iron-railed balconies and beautiful courtyard, and then to find upon closer investigation that the building really houses a thriving livery-stable and wagon yard. From the street, when the doors are closed for the Sabbath, the old structure looks like a deserted specimen of ancient architecture, left perhaps through the benevolence of some historical society. And when on Monday morning the proprietor and his black workmen open up, the scene changes to one of great confusion. The doors are opened and out come delivery wagons and farmer carts on their way back to the bayous of the Acadians.

There is one corner in this region that boasts of a blacksmith shop and wagon repair yard. The proprietors live overhead, of course. They work not only in their shop and courtyard, but also in the busy street. There is nothing unusual to their minds in the proposition of dismantling and repairing a decrepit wagon at one side of the street, directly in the path of traffic. If the repairs are delayed, traffic is obliged merely to turn out to one side in passing, and that is all there is to it. The city fathers apparently consider that old New Orleans has its own time-honored customs, which are to be preserved, regardless of how much temporary inconvenience passers-by may suffer. And really there is a certain pleasure in finding such an unconcerned attitude toward the hustle of American city life there in the metropolis of the South.

There are no spreading chestnut trees to shelter the blacksmiths in New Orleans. They labor in their dark little shops, where the overhanging balconies keep out the light—and also the heat, or else they move out into the narrow courtyards or into the sun-scorched streets. Methods are of the olden times. No up-to-date ways of routing work or keeping accounts are used. Tools are kept tidily arranged in their places or strewn about the dirty floors, according to the personal tastes of the users. The master may turn from his careful work upon an iron scroll to the fitting of a horse-shoe or the welding of a wagon-axle, and when he finishes he goes back to his scroll. And anyway he takes his own time about whatever he does.

Half hidden in the narrow streets, sandwiched in among furniture makers, tailors, fish merchants and dealers in crockery, the iron-workers ply their old trade, oblivious of the fact that a few blocks away there are several highly organized and splendidly equipped machine shops of the very latest design. The old Frenchmen do not care. They have their clientele and all the work they can do. And really, although they work slowly, the products of their forges and anvils are beautifully turned out, and as artisans they have contributed much to the beauty of the city.

FARMS PROFIT BY GROUP OWNERSHIP OF MOTOR TRUCKS

APPROXIMATELY 20,000 farmers' cooperative societies in the United States are potential rural motor express operators, according to a survey recently made by the Firestone Ship by Truck Bureau.

"Many farmers hesitate to buy a motor truck because of the cost," says E. Farr, of Akron, O., director of the bureau. "Yet as labor gets scarcer and wages higher, the farmer must use more machines of all kinds on his farm and save the time and wages of a hand wherever he can.

"If after carefully considering possible savings as compared with costs he feels that he cannot own a truck individually, he can well afford, we believe, to consider a substitute for individual ownership which farmers in some sections are finding highly successful. This substitute is co-operative ownership.

"We find the co-operative idea spreading into the rural motor express field particularly in those states in which the farmers have been schooled in the principles of co-operation through such associations directing creameries, grain elevators and marketing agencies.

"Co-operation in these instances came as a means of reducing costs. There has been such a wonderful awakening in the last five years regarding its possibilities in this respect that there are today, according to estimates based on good authority, about 20,000 farmers' co-operative associations of one kind or another. The majority are located in New York, Wisconsin, Michigan, Minnesota, the corn belt states, the Dakotas, Nebraska, Kansas and the Pacific coast states.

"While most of these associations are not now using the motor truck, we believe a majority will in time add the motor express to their list of activities. We are strongly of this opinion for the reason it can in so many instances reduce costs of transporatation, even as co-operative effort has reduced costs in other ways in the fields already entered by the associations.

"The average farmer if he feels he has need of a motor truck only for going to market might hesitate to buy because he thinks the truck often would be idle. He will more readily lend support to the co-operative motor truck association, made up of himself and ten or fifteen of his neighbors. The truck or trucks it operates will have few if any idle days. It will be busy doing his work and the work of his little community.

"It will carry not only his grain and livestock economically, but it also will open up to him new or neglected avenues of profit. As an instance, more than one general farmer has told our investigators that he is earning $50 or more monthly from milk the co-operative association truck carries to market. If the trucks' services were not available this milk would be used on the farm in some time-consuming or less prifitable manner. Whatever loss resulted would of course be felt by the city consumer as well as the farmer.

"It is not possible to determine in many instances the motor truck needs of the individual farmer by the size of his farm or the kind of farming he is engaged in. The kind of farming practiced determines the needs of the farmer, however, more often than does the size of the farm. Generally speaking, the average farmer engaged exclusively in dairy work or in the work of the truck gardener will want a small truck of his own, while the average grain or livestock farmer may feel that the co-operative motor truck line can serve his marketing needs more economically."

Queries-Answers-Notes

THIS department is the meeting place where you are free to ask for information, answer questions, discuss shop matters and business conditions and any other notes you feel would be of interest to a fellow mechanic. Make use of this Department as often as desired.

Here's a Blacksmith who runs a paper—I have enjoyed your excellent journal and have received many helps from the perusal of it. I have recently sold my blacksmithing business but am always interested in reading your paper which every blacksmith should read. For the last three years I have been editing the Sun the county paper after doing a strenuous days work in the blacksmith shop. I suppose I hold or have held a most unique position in so combining these two widely separated callings. The subscription price has been raised 3 times since I took over the paper and the list has more than doubled and is on a cash basis. All this has been accomplished by giving the people a Newspaper covering the local field and conducting a vigorous editorial department in which we have been looking after the taxpayer's interests by exposing matters that are not according to law, insisting that "Public Office Is A Public Trust." Wm. Grote, Kentucky.

Information Wanted:—Could you tell me through your Queries and Answers, whether it is possible to weld motor car axles satisfactory. I welded a Studebaker axle but it broke off close to the weld, as if it had been overheated. I butt welded it in the fire and I don't think I heated it any higher than was necessary. I have welded the cam shaft of an Overland, using plain borax and it stood alright. I shall be glad to have any information on the subject as it is a job that crops up here often and we can't get new parts when wanted. Archibald Clark, Queensland, Australia.

Enlarges His Business—I am running a general shop and employing about an average of ten men at present, and wish to install a system of shop and time cards, that will cover the business.

Am spreading out into spring making, truck and automobile repairing and also, body making. My business has reached a stage that makes it impossible to keep checked up without a thorough system.

E. T. Pybus, Washington.

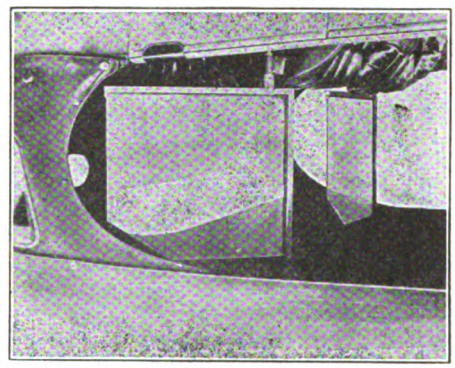
Trouble With an Overland—I am a reader of the Auto and Tractor Shop and think it is O. K. I have picked up a lot of points out of it. I have a problem, I wish you would solve for me. I have an Overland Model 90 and lately it has gone wrong. The other morning I started out with it and it stopped ten times going two miles and then it went fine for the rest of the way about three miles further. When I came home it started and went fine for three-quarters of the way then it stopped and I could not get it to go except by jerks and sputters. If you fed in more gas it would only sputter and smoke more.

Now I know the carburetor is O. K. also, the coil and breaker points.

Today my wife went down town a distance of five and a half miles and it went fine. But when she got it there, she had to leave it.

Wm. Fuller, Wisconsin.

Judging from the symptoms it appears, that you have a complication of troubles. Black smoke is indicative of a rich mixture, which might be caused by the choke valve on the carburetor; remaining closed, in that way diminishing the amount of air entering the carburetor. But it would rather appear, that there is some foreign substance, either in the carburetor or in the gasoline supply line, which intermittently cuts off the supply of gas. Valves that leak, or that do not seat properly, due to the adjustment on the push rod having worked loose and preventing the valve from closing properly; is frequently the cause of faulty operation.



A NOVEL TONNEAU WIND DEFLECTOR

Examine the wires of the electrical system for lose connections or broken wires. Clean all the spark plugs, examining them carefully for cracked or broken porcelains. Replace the spark plugs and crank the motor slowly, observing, whether or not, the compression is good on all cylinders. Lack of compression on one or more cylinders, usually indicates leaky valves. Examine the push rods to see, that the valves are not being held open, through lack of clearance between the push rod and the valve stem. The clearance usually allowed is the thickness of an average calling card. Having determined, that the push rods are not at fault and the compression still remains weak, it may be necessary to grind the valves.

Drain the gasoline from the carburetor by opening the cock, provided for that purpose. This will free it from water or any foreign substance. It would be well to drain the sediment sump at the bottom of the gasoline tank.

Fine—I see in the last journal you have built a new shop. I find one fault with it which, to my mind should be remedied. You have the forge placed in a corner, which for general jobbing and repair shop is all wrong. If nothing but shoeing is done it would be all right. Still if it was where the drill is you would not have to walk so far to fit your shoe. My reason for the change is that one should have the fire, so as he could get at all sides of it. There are many jobs too long for a corner fire, more so s nce the advent of the auto. There are many parts of an auto which will need warming to straighten, that a corner fire would be of no use. Also, your your anvil is not set right, as one has to turn half around to get to it. Set the anvil so one turns only one-quarter way and the helper in taking out a heat only travels one-half as far.

H. N. Pope, Connecticut.

By All Means Yes—I would like to ask my fellow blacksmiths a few questions in regard to the usefulness of a power hammer for plow work. I sharpen from 1,000 to 1,200 shares a season and what I want to know is whether a power hammer would pay on this work. Also, can a man do as good work with a power hammer, as he can on the anvil? I run three fires in plowing time and my customers are very particular about their plows.

I get forty to fifty cents for shaping and $1.25 for pointing, $2.60 for shoeing and from $4 to $5 for tire setting, 2-3/8" wagon spokes single, forty cents; felloe 2-3/8"x1½" sixty cents; wagon pole only, $5. I charge eighty cents and hour for labor.

Blacksmiths are getting scarce here only the older men are working at the trade and the younger men are not learning it. Everybody is getting into the auto game and I am afraid there will be as many cut-throats as there were in the smithing business years ago.

Wm. Hollenberg, Missouri.

The following observation from our Canadian contemporary very aptly answers the above query.

There is not doubt that the trip hammer is a wonderful help to the country blacksmith, especially in these days when skilled help is so hard to get. Seldom, however, have we heard from a hammer owner who has so great praise for this shop help as Geo. Evans. Mr. Evans writes as follows:

"Say, boys, I'm feeling good these days. The fact is that I have invested in a trip hammer. I only wish that I had done so long ago—a fact that I'd like to impress upon every smith who does not have a hammer. It used to give me a severe pain to see those thick shares tumbling into my shop to be pounded out. But now I don't care how thick they are or how hard they hand them to me. I can turn them out much better and in far less time, and the work is a pleasure compared with the hard labor of pounding.

"I don't feel tired out when the day's work is over nowadays, and I believe that the hammer will add a few years to my life, so great a labor saver is it. I strongly advise every smith who has not a hammer to get after one and he will be

surprised at the difference that it will make in his work.

"To my mind, the hammer will soon pay for itself in any shop. I have only had it three months and already I calculate that it has paid for half the purchase price. In time saved, muscle saved, and the speed with which you can turn out the work, I am sure that no man can make a better investment than in a good trip hammer. No piece of shop equipment is a better investment for the country blacksmith who has rush work to confront—especially those thick, worn shares that take the body and soul out of you before you get them done. If you are wise you will get a hammer and take life easier."

Making a Preheating Torch — I am writing you or some brother mechanic as to what kind of a torch or burner could be made to use gasoline for preheating in connection with oxyacetylene welding. I would appreciate any information I could get on the subject. I expect to get a welder and want to fix up some sort of a gasoline preheating device.

J. W. Simmons, Kansas.

If any of our readers have made a gasoline torch for preheating, we would be glad to have them tell us how it was done.

Central Iowa Price List:—We are indebted to Mr. O. H. Thorsrud of Iowa for the following list of prevailing prices, in central Iowa:

Horseshoeing—New shoes, per set of 4, $4.00; Re-setting, each, 50c; Draft stallion shoes, set of 4, $8, each $2.00; Stallion shoes, re-set, 4, to 6, each $1.50; Bar shoes, common, each $1.00; Bar shoes, hand-made, each $1.50; Screw calk shoes, each $1.25; Screw calk, per shoe, each 25c; Trotting horse, hand turned, each $1 up; Side and toe weights, each 75c; Leather pads with packing, extra, each 50c; Air cushion pads, extra, each $1.25 up; Paring horse's feet, each horse 50c; Pulling shoes, each 5c.

Wagon Iron Work—Box strap iron, each 25 and 30, Box strap iron, put on, 50c; Box rod, ⅜, 30c; Box rod, 7-16, 35c; Bolster plates, complete, $3.00; Sandboard plate, $2.00; Bolster plate only $1.00; Bolster and irons, pairs 50c; Bolster stick irons, each $1.00; Bolster stick iron, welded, 35c; Circle post, each 50c; Center clip on singletree, 35c; Center in neck-yoke, 75c; Ferrules on singletree, 25c; Ferrules on neck-yoke, 25c; Hub bands, new, 50c; Hub bands, welded, 35c; Hammer strap, 50c; Hound brace, new, 75c; Hound brace, welded, 50c; Hound place, complete, $1.75; Hound plates strap, 35c; King bolt, $1.00; Rub irons, steel, put on, each 50c; Rub irons, steel, each 35c; Seat hooks, 1 set, $1.00; Seat springs, 2 leaf, each $1.50; Seat springs, 3 leaf, each $2.00; 4 Skein 3¼x10 in. with boxing, put in, $15.00; 1 New skein only, put in, $4.00; 1 New boxing only, $1.50; 4 3¼x10 in. steel skein, extra; Top irons on box, each box $1.25; Tongue cap, each 75c; Tongue rod, 75c; Tongue plate, 35c; Tongue hounds iron replaced, $1.25; 3 Tires re-set, up to 2 in., $4.00; 4 Tires, 3 in re-set, $5.00; 4 Tires, 4 in. re-set, $6.00 1 Set of new tires, 1¾ x⅝ in., $22.00; 1 Set of new tires, 3x⅞ in., $28.00; Wagon wrench, 50c; Wagon wrench, hand made, 75c.

Wagon Wood Work—Axles, 3½x4½, mapple, $6.00, hickory, $7.00; Axles, 4x5 in., maple, $8.00, hickory $9.00; Bolsters, front or hind, $4.00; Bolster sticks with old irons, $1.00; Box bottom, labor, $5.00; Box bottom cross piece, center, $1.00; Box bottom cross piece, end, 75c; Endgate dump complete, $4.00; Endgate, plain, $1.25; Eveners, 2-horse, 2¼x4½ in., $1.75; Eveners, 3 horse, $2.00; Eveners for 4 horses, 6 feet, $3.00; Eveners for 4 horses, 7 feet, $3.50; Eveners for 4 horses, 8 feet, $4.00; Felloes, wagon, each 75c; Felloes, wagon one wheel, $4.00 Felloes,, truck, 2½ or 3 in. each, $1.00; Felloes, truck, 3½ or 4 in. each $1.25; Hounds, tongue per pair $4.00; Hounds, tongue, each $2.00; Hounds, front, per pair $5.50; Hounds, front each $3.00; Hounds, hind, per pair $4.00; Hounds, hind, each, $2.50; Hounds bent, $7.00; Hub boxed, each $1.50; Neck-yoke, old iron, $1.75; Reaches, 10 feet, $2.50; Reaches, 12 feet, $2.75; Rims, set or 1¾ (tire set extra), $18.00; ½ Rims, 1¾ (tire set extra), $2.50; Rims, set of 2½x2 (tire set extra), $20.00; ½ Rim, 2½x2 (tires set extra), $2.75; Rims, set of 3x1¾ (tire set extra), $24.00; ½ Rim, 3x1¾ (tire set extra), $3.25; Rims, set of 4x1¾ (tire set extra), $28.00; (single), each 50c; Spokes for whole wheel, each 35c; Singletrees, old iron, each $1.00; Sand-Boards, $4.00; Setting of old box, 75c; Setting of old box skein, each 75c; Tongues, 3½x3½ in. with old iron, $7.00; Tongues, 4x4 in. with old iron, $9.00; Wheels cut down, 1¾ job complete, $24.00; Wheels cut down, 3 in., job complete, $30.00.

Buggy Iron Work—Axle stubs up to ⅞ in., each $3.50; Axle stubs, 1 to 1⅛ in., $5.00; Axle stubs 1¼ to 1½, $5.00 Axle clips, 25c; Axles set, each $1.50; Axle welded and set, $2.00; Bow rivet, each 15c to 25c; Clip king bolts, $1.50; Eveners, center plates, per pair 50c; Fifth wheel, 10 in. and 12 in., $6.00; Pole brace welded, 75c; Pole eye, $1.00; Reach, iron welded on old reach, 50c; Shaft end sockets, $100; Shaft iron welded, 75c; Shaft shackles, each 50c; Shaft eye, $1.00; Steel bow socket, $2.00; Saddle clips, 40c; Sprink welded, per leaf $1.00; Singletree cleves, each 35c; Singletree ferrules, each 15c; Singletree cock-eye, 15c; Top prop nut put on, 15c; Top prop, each 50c; "T" Hammer strap, $1.00; 4 Tires, set $4.00; 4 Tires, new up to 1 in., $12.00

Buggy Wood Work—Axle bed up to 1 in., $2.50; Axle bed up to 1½ in., $3.00; Bows put in, $4.00; Doubletrees, old iron, $1.50; Head block, $2.00; Pole only, put in, $7.00; Pole circle, put in, $3.00; Reach, pair, $4.00; Rims, set of ⅞ and 1 in. (tire setting extra), $10 00; ½ Rim, (tire setting extra), $1.50; Rim, set over 1 in. (tire setting extra), $12.00; ½ Rim, (tire setting extra), $1.75; Shaft, 1 side, old iron, $2.50; Shaft crossbar, old iron, $1.50; Spokes, single, each 50c; Spokes, 5 or more, each 35c; Spring bar, $1.50; Spring wagon seat complete, $6.00; Singletrees, old iron 75c; Wheels cut down (tires extra), $12.00; Wheels, new, set of 4, up to 1 in.; 1 New Wheel.

Plow Work—Cultivator singletree, each 50 and 60c; Cultivator hanger for seat, 75c; Cultivator point and sharpen shovels 4 or 6 in set, $4.00; Cultivator shovels ground only, set $1.00; Cultivator shovels, polished only, set $1.00; Cultivator shovels ground and polished, per set $1.50; Cultivator shovels sharpened, per set $2.00; Corn planter shoes polished only, $1.00; Corn planter shoes sharpened and polished, $2.00; Corn planter shoes heeled, $4.00; Corn planter shoes, extra for taking off and replacing, $1.00; Discs sharpened only, per blade 25c; Discs polished only, per blade 25c; Disc, short tongue, oak, $2.00; Disc lengthened out, work only, $4.00, Landside plate, steel, $2.00; Landside plate, iron, $1.50; Landside plate heeled, $1.00; Plow lay, new, 14 in. soft center, $6.50; Plow lay, new, 16 in., soft center, $7.00; Polw lay, new, 18 in. soft center, $7.50; Plow, point and sharpen lay, $2.00; Plow, sharpen lay, each, $1.00; Plow, heel on plow lay, $1.00; Plow, polished complete, $3.00; Plow, setting beams (walking), $1.00; Plow, setting beams (riding), $2.00; Plow handles, straight, $1.50; Plow handles, bent, $2.00; Plow rounds, each 40c; Plow eveners, $1.00; Plow singletrees, 75c; Plow tongue, pine, $3.30; Plow tongue, pine, put in, $3.50; Re-stopping riding plow axle, $3.00; Rolling coulter shank welded, 75c; Sharpening rolling coulter, each 50c; Standing coulter for breaking wav, $2.50; Fin cutter, $2.00; Surface blade ground, $1.50; Surface blade sharpened and polished, $2.50; Stalk cutter blade ground, each 25c; Sharpening harrow teeth, each 5c; Sharpening seeded teeth, each 20c; Sharpening drill shoes, each 35c; Sharpening road graders, per foot, 60c; Extra for taking off and replacing, $1.00; Links in chains up to ½ in., 20c; Grab hooks up to ½ in., 75c; Grab hooks up to ¾ in., $1.25.

Sled and Sleigh Work—Pole, flat, replaced, $6 00; Pole, square, replaced, $6.00; Rollers, replaced, per pair $.00; Rollers, replaced, per pair $3.00; Bench beams, each $4 00; Short tongue, $1.75; Bolster, $3.50; Runners up to 2x4 in., old iron, $3 00; Shoes, new, steel, put on, each $3.00; Shoes, cast, put on, per set $12.00; Shoes, cast, one only, $3.00; Beams put in, each $4.00; Knees put in, each $1.50; Raves, each $2.00; Sled sticks, each 30c.

Saw Sharpening—Hand or Buck saw filed and set, 40c; One-hand saw filed and set, 75c; 6-foot cross-ut filed and set, $1.00; Circle saw filed and set, $2.00; Ax sharpened, 25c; Scythe sharpened, 25c; Ensilage knives sharpened, per set, $1.50; Lawn Mowers sharpened, $1.50; New iron, per pound, 10c; Odd work, per hour, $1.00.

Front Wheel Brakes—The automobile show recently held in Paris showed many cars which have adopted the front wheel brake. This a feature which has been used for some time past by British, French and Italian manufacturers. It has not been used by any American maker presumably because of it's expensive construction, which would limit it's use to only high priced cars.

The front wheel brake possesses some noteworthy advantages. When used in connection with the rear brakes it utilizes the entire weight of the car for brake adherence. This minimizes the strain on each wheel necessary to bring the car to a stop and makes the possibility of locking the wheels more remote, effecting a saving in tires in that way. The car can be stopped more quickly and in decending long hills less trouble is experienced from brakes overheating.

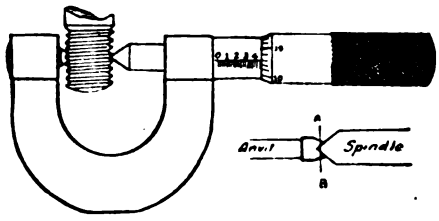
The most attractive feature of the front wheel brake is it's anti-skidding quality. Every motorist is familiar with the sensation that results from a sudden application of the brakes on a slippery road and particularly when decending a slight grade. The car is most apt to skid because the wheels are easily locked and when in that condition, it is just as easy for them to slide sideways as in any other direction.

When the front wheels are locked the tendency to skid is greatly reduced, due to the steading action of the rear wheels, but when the rear wheels are locked only a slight obstruction is necessary to change the center of resistance and start the car skidding. This is due to the fact that the propulsive effort of the car is centered about the axis of the chassis. As long as the resistance meets this force squarely, no skidding results.

The Screw-Thread Micrometer — The chief feature of this calliper is that the end of the movable spindle is pointed and the fixed end or "anvil" is V-shaped. Enough is taken from the end of the point, and the bottom of the V is carried down low enough so that they will not rest on the bottom or top of the thread to be measured, but on the sides of the thread only. It will thus be seen that the outside diameter of the thread does not enter into consideration. As with gearing, it is the pitch diameter which is most important and is the one which is measured.

As one-half of the depth of the thread from the top on each side only is measured, it follows that the diameter of the thread as indicated by the calliper (or the pitch diameter) is the full size of the thread less the depth of one thread. When the point and anvil are in contact, the O represents a line drawn through the plane A B in the accompanying illustration, and if the caliper is opened to, say, .600 in. it represents a distance apart of the two planes of .600 in. The full depth or size of the thread may be calculated from the following formula:

Depth of Whitworth threads= .64÷pitch
Depth of U. S. threads=.6495÷pitch
Depth of U. S. threads= .866÷pitch



A Novel Solution—The owner of a garage in Banville, Va., discovered an unusual solution of a difficult problem. He bought a five ton iron drum to hold 10,000 gallons of gasoline. A fifteen foot hole was dug into the solid rock along side of the building in which to bury the tank. How to lower it into the hole without damaging it on the sharp jagged edges of the rock was a delicate undertaking.

Borrowing a hose from the Fire Department he filled the hole with water and literally launched the big drum. Then by pumping out the water, the heavy tank was gradually and gently lowered into place.

Shoeing Prices in Alberta—Herewith is a list of prices charged here, which we agreed upon when organizing two years ago. Common shoes set of 4 up to 4s, $3.50; 4s to 8s, $4.00; Never slips or drive calks, $10.00 to $12.00; Resetting set of 4, $5.00, calks extra; sharpening shoes 12s to 14s, $1.25 per pair; 16s to 18s, $1.50; Pointing, each, $1.50; Sharpening disc harrow, per blade, $.50; Setting tires up to 2" each, $2.00; Over 2", $2.00.

Louis Norgard, Alberta.

Repairing a Concrete Mixer—I have a job, which puzzles me and I am going to ask your help. I have a concrete mixer to repair on which the drum heads are pretty well worn. I had the heads turned down to 48½" in diameter. Now I want to shrink a ½"x3" cold rolled flat band on the track flange of the drum, which will bring the drum up to it's original diameter of 49½". The drum is cast iron and is ¾" thick.

How much draw shall I allow in the run, or circumference of the band to keep it on tight and still not break off the ¾" cast iron flage.

F. M. Browning, Kentucky.

The subject of expansion and contraction of iron and steel has not infrequently been the source of disputes. Some authorities claim that the coefficient of expansion for steel is .00000156" per foot for every degree raise in temperature (Fahrenheit). Others dispute it and claim that the unit of expansion does not remain constant. That is, that the expansion is greatest between certain temperatures, and which seems most likely to believe.

It would be a matter envolving quite some technical data to determine exactly what the shrinkage would be and how much compressive strain the cast iron drum is capable of withstanding.

Since there are so many unknown quantities we have to contend with, let us take an arbitrary figure using for an example the method employed in shrinking on locomotive tires. An allowance of 1/64" per foot diameter of the wheel is made for shrinkage. The tire to be shrunk on a 5' wheel would have an inside diameter of 4' 11 59/64".

Since the drum is hollow and the band rather light in comparison with a locomotive tire, the allowance should be a little less. A band 1/32" less in inside diameter, than the outside diameter of the drum will hold and will not be apt to break the drum. Thus the length of the band should be slightly over 3/32", less than the circumference of the drum.

Even though the drum was capable of withstanding almost any pressure it would not be a good practice to allow too much for shrinkage, as the band would be subject to such a strain while cooling that the granular structure of the steel might be effected. This would consequently lessen the strength and wearing qualities. It is necessary to heat the band only to a dark red.

Information Wanted on Spoke Timber—A question for the columns of your journal, which I wish some reader who has had experience in spoke making would answer; what is the best method of preparing and handling spoke timber before turning it in the spoke lathe. I would be very grateful to any of your readers who would give me any general information that would be applicable to this or wagon spoke work.

Charles Hall, New York.

Editor's Note—We would appreciate having some of our readers give Mr. Hall the information he desires.

Owners of Garages Liable for Cars—Garage owners cannot limit their liability for the theft of cars by posting signs reading, "Not responsible for cars stolen or damaged by fire or water," the State Supreme Court has ruled.

When an automobile is stolen from a public garage according to the Supreme Court decision, written by Judge Homer B. Dibell, the garage keeper must prove to the jury that the loss did not come from his negligence.

Hoel's car was left at the Flour City garage in June, 1917, and a week later, when he called for the machine it was conceded that it had been stolen.

The company offered to prove that two signs quoted above, were posted in the garage. The Supreme Court, however, upheld the trial court in excluding the proffered testimony, and found no evidence that Hoel had seen them or that his attention was called to them.

WANTED AND FOR SALE

Want and For Sale advertisements, situations and help wanted, five cents a word. Send cash with order. No charge less than fifty cents. The small cost of these advertisements prevents our investigating and guaranteeing them. WE WILL NOT knowingly accept any but reliable ones.

FOR SALE:—Automobile. Marine and stationary engines 1 to 100 H. P. Best makes, good condition, very low prices. State your power needs. We take engines in trade. What have you? Magnetos, coils, carburetors, mechanical oilers, water pumps, etc. Also car parts of every nature sacrifice prices. Write about your requirements.
BADGER MOTOR COMPANY, Milwaukee, Wis.

BLACKSMITHS LISTEN: Save time and money by doing your own auto and tractor blacksmithing with Toy's modern methods doing hard jobs easy. Forging and making solid welds, hardening and tempering to a standard with colored tempering charts. All for one dollar. Samples free. **W. M. TOY, Sidney, Ohio.**

FOR SALE—Blacksmith shop well equipped with modern machinery. Good stock of materials, plenty work for two men; all in best shape; sale on account of health. Price very reasonable. **F. T. TOMANEK, Bruno, Neb.**

WRITE for new price list on Circular style Cutter Heads for wood frame Jointers 5-in to 12 in. Combined outfits Jointers and rounding heads and saw arbors. Prices from $20.00 to $50.00.
W L. SHERWOOD, Kirksville, Mo.

FOR SALE—No. 4 W. W. punch with 8 punches, 7 dies, practically new $39.00. Little Wonder disc sharpener with coulter attachment. $18.00.
STUEKERJUERGE BROTHERS, Pilot Grove, Iowa.

BLACKSMITH shop wanted.. Send description.
C. C. SHEPARD, Minneapolis, Minn.

BLACKSMITH BUSINESSS FOR SALE—Owner retiring; 35 years of excellent trade from 10 miles around. County seat 2,000. Will sell residence and gas welding plant. For particulars write
L. B. YOUNG, Guthrie Center, Iowa.

WANTED Fifty pound power hammer. Must be in good working condition. Write
FARBER & WESTON, Reedsburg, Wis.

FOR SALE—All or half interest in good Blacksmith shop. Cheap. Write
N. S. ZIMMERMAN, Inman, Kansas.

WANTED—To hear from owner of good blacksmith shop for sale. State cash price, description. **D. F. BUSH, Minneapolis, Minn.**

FOR EXCHANGE—Variety woodworker for Power Hammer or Wagon Shop Special
F. M. BLOUNT, Samson, Ala.

FOR SALE—L. S. P. Calking Machine complete. No. 25 This air drill, Stewart flexible shaft with emery attachment.
CHAS. HARDIMAN, Howe, Ind.

WANTED—A trip hammer; stating kind, giving full particulars and price.
A. J. HILLER, Keokuk, Iowa.

FOR SALE—General Blacksmith and Horseshoeing shop. Electric power and light; Combination Woodworker almost new; two fires; plenty auto work; only shop in town of over 5,000. Hollow tile building 35x55, two story, corner lot 150x50; only block from two main streets; two apartments upstairs with all improvements; only 2 years build; owner wants to retire. For particulars write to
FRED RECKNAGEL, Cranford, N. J.,
About 20 miles from New York City.

FOR SALE Horseshoeing and Repair shop, with electric power, stock and tools; also, 8 room house on same lot. On state road. For full particulars, address
OLIVER YOUNG, Osseo, Mich.

WANTED—To buy a new Ideal Root Bro. Lawn Mower Sharpener and one No. 10 Edwards Iron Shear. Quote you lowest price. Write to **LOUIS KRUG, Mayville, Wis.**

WANTED—Good Blacksmith, March 1st.
C. Z. MACK, Clarence, Iowa.

WANTED—Electric light plant suitable for shop use. **E. E. SMITH, Murray, Ky.**

WANTED—A carriage blacksmith by March 1st. One that can work at woodwork preferred. Also wanted a trimmer on auto tops and repairing. **CRAM & SON, Geneva, N. Y.**

CARRIAGE SHOP for sale Equipted with improvsed machines and tools and stock of materials apply to
THOMAS BALL, Sinton, Texas.

AMERICAN BLACKSMITH AUTO & TRACTOR SHOP

VOLUME 19 MARCH, 1920 NUMBER 6

BUFFALO, N. Y., U. S. A

WILLIAM F. WENDT, *President.* L. J. WISCHERATH, *Editor.*

SUBSCRIPTION PRICE:

For $1.00 per year, payable in advance, The American Blacksmith, Auto & Tractor Shop will be sent, postage prepaid to any postoffice in the United States. To Canada, $1.25; to other countries, 6 shillings. Reduced rates to clubs of five or more on application.

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ADOPTING THE METRIC SYSTEM

If Thomas Jefferson had lived in this enlightened age, he would not have included in his famous declaration, the assertion, that "Mankind are more disposed to suffer evils while they are sufferable, than to right themselves by abolishing the forms to which they have been accustomed." He would have, more than likely, said "mankind are more disposed to change the existing forms lest they become accustomed to them."

We are in the throes of an epidemic of changes. If it is a change, we want it, regardless of consequences. We've changed this, altered that and amended something else, until the original law is dwarfed into insignifiance by its amendments. It is nothing short of astonishing how America ever reached her present state of prosperity with the amount of legislation, which as our reformers who have us believe is laid on principles, basically incorrect.

If the bill introduced by Senator Shaffordth of Colorado, which provides for the compulsory adoption of the Metric System of Weights and Measures in the United States, is enacted, industry in this country will suffer a loss of millions of dollars and will be thrown into a state of chaos, that would result in industrial paralysis.

The mis-leading propoganda, which has been directed by proponents of the Metric System, has been wide spread and successful insofar as it has induced various chambers of commerce and semi-trade bodies to pass resolutions favoring the adoption of this system, and forwarding ing them to Congress. These organizations do not represent the manufacturer who is the one actively concerned in the issue. In fact, it is doubtful whether the manufacturers as a whole fully realize that this danger has reached such a menacing status.

Transition from our present standard to those of the Metric System would mean the introduction of a dual standard as has been the case in other countries where the change has been made. Results would be exactly opposite to those claimed by its advocates—complexity instead of simplicity, confusion instead of order and diversity instead of uniformity. Not only would there be confusion and loss through the necessity of converting from one standard to another in commercial transactions, but it would require complete new equipment of measuring tools, gauges, and innumerable articles of manufacture, not to speak of changes in designs, plans and soforth.

Advocates of the Metric System argue on the advantages of a uniform world system, but this disappears in the face of the fact that its adoption in no country has brought about system in domestic affairs, while in other countries it has been grotesque. The most favorable result has been nothing more than a partial change, the old system continuing in use along with the new, and leading to nothing but hopeless complexity, confusion and disorder.

If the Metric System possesses any merit, it would have been put into use in this country long ago, not by force of laws but by that of expediency. The very fact that the people of the United States have declined to avail themselves of its principles, and to abandon the system to which they are accustomed, should justify the denial of the passage of a law to enforce its adoption.

Whatever the nature and purpose of this metric propaganda that is so effectively making its impression in this country, it behooves every American citizen to realize the influence such an enactment would have upon American life and industry, and to act accordingly, lest we learn its results when it is too late, as has been the case with other forms of insidious propaganda.

COUNTRY SCHOOL GARAGES

Up in Kansas the country schools are building garages for the motor cars that bring farmer children to school. This is important news. It reflects prosperity and the passing of oldtime living conditions in the country.

But we wonder what the Little Red School House thinks of the garages. And surely it must think, for somehow it always seemed a very human institution, its front like a face, the two windows for eyes and the door for a mouth, with a chimney cocked on one side of its peaked head like a little hat. The awe we felt when that great door-mouth yawned and swallowed us with our slate and McGuffrey's Reader and the little lunch wrapped in one of mother's clean, white napkins and a newspaper!

These garages, which are not limited to Kansas, may forecast the passing of rural schools. The farmer children who can motor to the Little Red School House will not be long in yearning for a further ride —on into the city, where the schools are better equipped.

The motor car has already put an unsolvable problem up to the rural church. Kansas has 1200 such churches, abandoned because the farmer with an auto is tempted away from the rural flock by the pipe organ, talented choir and more comfortable pews of city churches.

Not long ago we stopped at the Little Red School House, we attended as a boy It was the same old building, for in those days they put up buildings to last. A concrete garage filled with jitneys stood on the site of the old shed that formerly housed Dan, our patient pony, during school hours, and which also shelterd cutters and bobsleds on cold, wintry nights when "oratoricals" or "spellin' bees" were in session.

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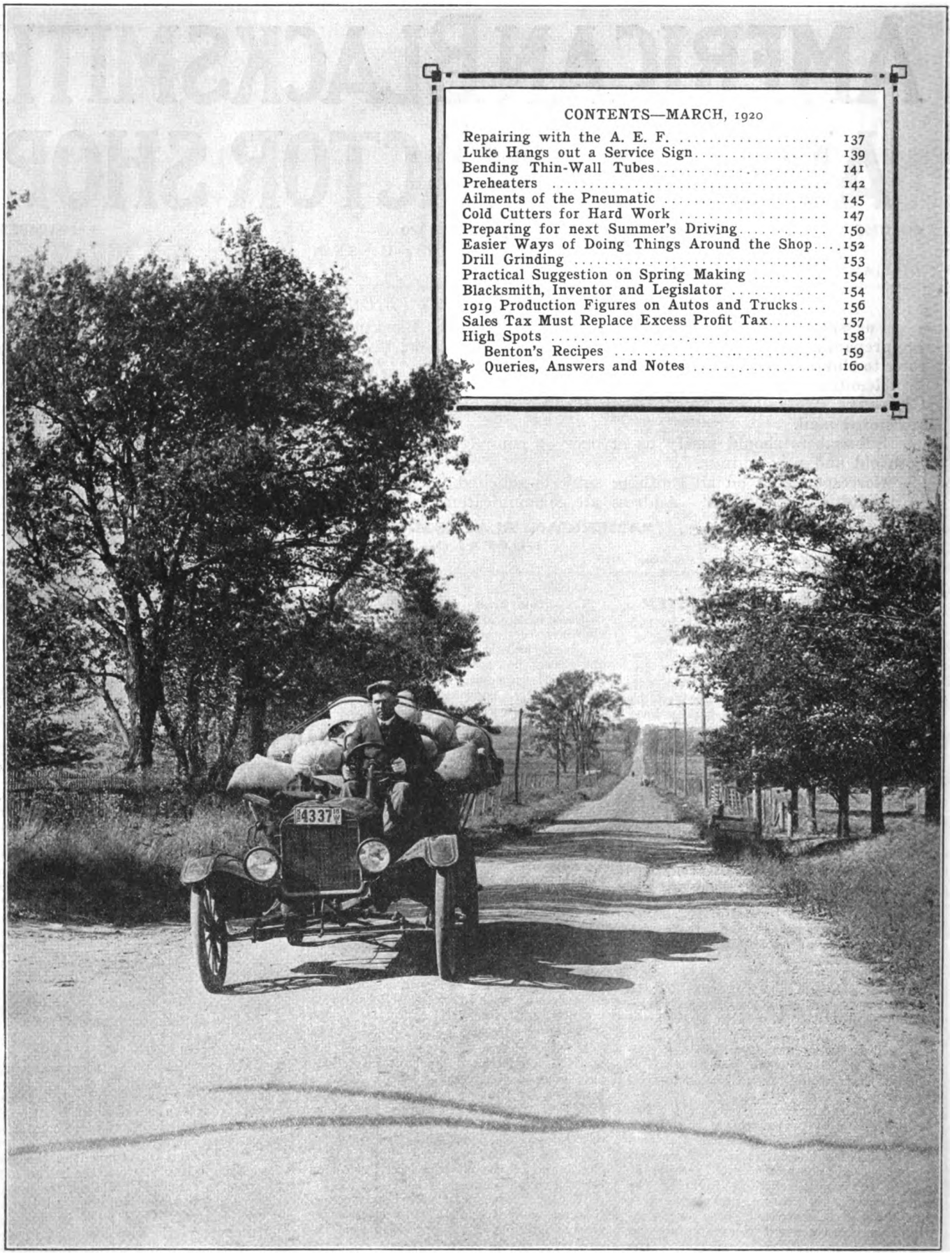
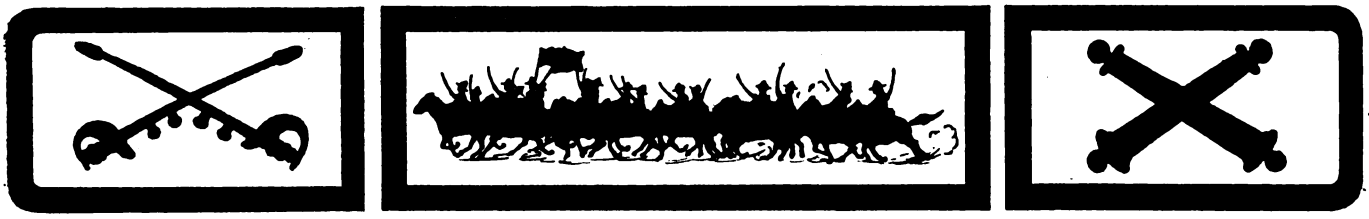
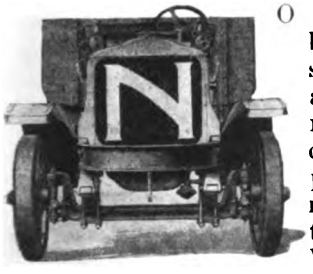


"THERE AND BACK" IN LESS THAN HALF THE TIME



Repairing With A. E. F.



NO institution, built exclusively for automobile repair work could compare in magnitude to the one at Verneuil.

In a previous issue was briefly described the magnitude of the undertaking and the effort involved in erecting in a little over sixty days a repair shop not only capable of keeping the fifty thousand odd motor cars of the A. E. F. in repair, but one so well equipped as to be able to make almost any piece, which could not be found among the myriad of parts carried in stock in the Main Supply Depot.

When the United States entered the war, despite three years of warning, with the exception of the experience we had with Mexico and the mobilization on the border, our army was unprepared with any sort of sufficient motor transportation facilities. The result was, that when we declared war, we began immediately after to comb the country for all kinds of available motor cars and trucks and bought no less than one hundred and fifty thousand vehicles representing 216 separate and distinct varieties. In this number was not only included nearly all the American makes, but most of the foreign products as well. Old cars, which had about served their usefulness, were sold to early arrivals of the A. E. F. to fill their pressing needs.

The seriousness of this condition becomes at once apparent, when repairs on a major scale are attempted. At Verneuil alone, the principal reconstruction park in France, a supply depot having 120,000 square feet of floor space was maintained and in which was carried in stock 57,000 non-interchangeable spare parts and 13,000 kinds of nuts, bolts and screw making a total of 70,000 separate items. Thus, we gain some idea of the price we paid for our lack of foresight in not having some semblance of a standardized equipment.

To guard against a shortage of parts, the variety being almost infinite, parts were bought in unheard of quantities. Whole assemblies were purchased, and in many instances only an individual part was used. Such conditions were more the result of an inability to anticipate the needs of such an infinite variety of cars rather than a lack of judgment on the part of those making the purchases. Criticism, it is true, has been offered both pro and con, purporting to the inefficiency of the method of handling these supplies, but since the project succeeded in the main, it would seem that the execution of details were at fault, rather than the conception of the basic principles.

In a large field adjoining the Main Supply Depot, thousands of cases of automobile parts were stacked, exposed to all the inclemency of the weather. This was the surplus, which could not be accommodated in the warehouse. Most of this material was never used and was ultimately abandoned at the cessation of hostilities. How much of it would have been used had the war continued, is speculative.

In another part of the field was a veritable wilderness of solid tires stretching out nearly as far as the eye could reach. In the neighborhood of forty thousand tires were represented in this pile. At another point in the yard a minature

THOUSANDS OF CASES OF AUTOMOBILE PARTS, WHICH COULD NOT BE CROWDED INTO THE SUPPLY DEPOT, LAID FOR MONTHS EXPOSED TO THE INCESSANT RAIN OF "SUNNY FRANCE." IN THE FOREGROUND IS A TYPICAL FRENCH TRAIN BRINGING IN CAPTURED GERMAN EQUIPMENT.

mountain was formed from discarded tires.

Securing the proper parts and the necessity of having to make those not readily obtainable and the inability to obtain proper raw material, were but a few of the obstacles which impeded progress and which had to be overcome, if results were to be forth coming.

THE CASUALTIES OF THE MOTOR TRANSPORT. PILED ON BOTH SIDES OF A DOUBLE TRACK FOR OVER A MILE, WAS THE BATTLE SCARRED AND SHELL TORN EQUIPMENT BROUGHT DOWN FROM THE FRONT BY RAIL

An Overhaul Park differs in work and nature from that of a Service Park. The later, because of the prominence of the motor vehicle in modern warfare is situated close behind the lines and is an active factor in the work of the combat troops. Their equipment consists of a mobile repair shop, to which the lame, damaged and sometimes decrepit trucks come under their own power for repairs. Such a station maintains a wrecking car and crew, who bring in wrecked cars and arrange for their evacution to the reconstruction Park if an overhaul or any major repairs are necessary.

The Reconstruction Park, such as the one at Verneuil, serves two main purposes. Every piece of mechanism used in transportation has to be overhauled periodically, it is there that work of that kind is done, besides, it acts as an advance depot for supplies material and equipment.

It is at such a Park, that the real casualties of the transport are seen. There one finds assembled, the maimed and battle scarred equipment brought down by rail and truck, for renewal and rebuilding. Twisted bundles of steel, which one time answered the purposes of a motorcycle, passenger cars shattered and riddled with bullet holes, shrapnel torn trucks in every imaginable condition are among the debris which is constantly arriving. The interior of many a shattered ambulance bears the crimson evidence of the "Gas Hound" having stuck to the wheel until the last. Every tradegy of war is written in these mute symbols of service and sacrifice. Our Reconstruction Parks are a combination of what the British call a heavy repair shop and a salvage station for spare parts and the work done amounts to nothing short of actual manufacture.

Then too, there is another factor which tends to increase the amount of work to be done at one of these parks and greatly decreases the amount of service which a truck or car renders, even after it has been properly repaired. In the hustle and excitement trucks never received the attention and consideration to which they were entitled. They were loaded in most cases, until the body space was filled, no attention having been given to the load's weight. It was evident from the way that most of the drivers handled their trucks, that they must have had an utter disregard for the life and limb of the bystanders, to say nothing of the welfare of the truck's mechanism. It was not an infrequent sight to see trucks loaded until the elliptic springs were not only flattened out, but bent in the opposite direction. Then, if you can imagine that same truck, bounding along at top speed irrespective of road conditions, you may better understand why so many repairs were necessary.

The volume of work and the number of trucks to be taken care of prevented the authorities from seeing that the truck received something near the proper attention, when they were not in use. Not a few, but hundreds of cars were left standing, without the water having been withdrawn from the radiators, with the result that when an attempt was made to use these cars, it was found that radiators and cylinder blocks had frozen and were damaged beyond repair.

No concentrated effort was ever made to induce drivers not to abuse their trucks. Even in those rare cases where a driver was assigned to the same truck for several consecutive days, little attention was ever given to the mechanism. The slogan, it would appear, was to run it until it stopped.

Chauffeurs were shifted from one truck to another, and trucks were changed from the jurisdiction of one responsible officer to another without notice. These conditions fostered carelessness as it was next to impossible to check up on the drivers. Such conditions did little to reduce the amount of work necessary to keep the equipment in the proper repair.

Building material was scarce, extremely so, and only those trucks which were being rebuilt or overhauled, were under cover. All emergency and expedite work was done in the open regardless of the weather conditions. When one reflects, that out of a year there are about two hundred days of rain in "Sunny France," one wonders, if trucks and material wore out or rusted out, as the natural consequence of their exposure.

If a conscientious driver did have a desire to oil the various parts of the truck and the chassis, that desire vanished with the thought of of having to build a platform to hold him out of the mud while thus

THOUSANDS OF NEW SOLID TIRES, STACKED 15 TO 20 HIGH COVERED A FIELD AS FAR AS THE EYE COULD REACH. IN THE NEIGHBORHOOD OF 40,000 TIRES ARE IN THIS PILE ALONE

LUKE HANGS OUT A SERVICE SIGN

by D. G. BAIRD

WE like to prate about the wonderful progress that's been made in invention, and science, and woman's suffrage—and I don't let no false modesty stand in the way 'uv my admittin' that I've done my share toward the advancement of civilization along these noble lines—but take it from me, these useful accomplishments 'ar a thousand years behind the times compared with the fine art of extractin' capital from the patient public.

W'y just think of it: A few thousand years ago when a big business man saw a young fellow livin' real frugal, and workin' hard, and layin' up a goodly supply of cocoanuts—which was capital in them days—he just picked up his war club and sauntered over and proceeded to rap the aforementioned young sport on that part of his anatomy which we have since named in honor of the also aforementioned fruit, and appropriated his goods without so much as sayin' thank you! All of which, while no doubt very effective, was considerable trouble to Mr. Business Man and occasionally peeved the the recipient of his solicitious attentions, seein' as how his wishes weren't consulted in the matter.

"SLIGHTLY INCLINED TO BE MUDDY" WAS BUT ONE OF THE ADVERSE ELEMENTS. CONDITIONS SUCH AS THESE WERE NOT CONDUCIVE TO GIVING THE TRUCKS PROPER ATTENTION

But what does the modern business man do? W'y he locks hisself up in a little room and writes "private" on the door and has a lot of folks hired to take in the cash that the others rush in and hand over to them. Pretty soft for Mr. B. M., eh? Yep, but that ain't all. Instead o' having his feelin's hurt by the rude manners' uv Mr. B. M., Mr. Customer now finds that worthy just achin' to be of service to him, and if there's any argument about the matter Mr. B. M. smiles real pleasant and lets him have his way and tells him to call in again and he'll do the same. Yessir, I can take you right over on Woodward Avenue to Luke Gannon's garage and show you a sign—but then I wouldn't have any story to tell.

Luke was by nature and inclination one of the first mentioned type of B. M.—the kind that likes to get a club and go after the coin—but I showed him the error of his ways and he repented in sackcloth and ashes—or maybe it was in overalls and cylinder oil—anyhow he repented, likewise reformed.

You see, I'd known Luke nigh onto ten years and thought enough of him to trust my Ford to his gentle ministrations whenever she happened to need her appendix removed or her lungs scraped or the like, so when I found him adoptin' the cave man policy in his business I just naturally had to take a hand and demonstrate to his entire satisfaction the great superiority of the "customer's-always-right" plan.

Well, anyhow I happened to be in Luke's place one day when a custo-

engaged. Or, if having donned a diver's suit, he succeeded in gaining access to the many oil and dope cups, they would be found so encrusted with mud and clay, as to render the oiling process only prefunctory in nature. Nuts and bolts were not tightened for the same obvious reason and a much traveled route could be readily distinguished not only by the condition of the road but by the presence of various truck parts strewn along the way. The loss of a muffler was frequently overlooked by a driver, who continued placidly on, until some vital part of the mechanism dropped off.

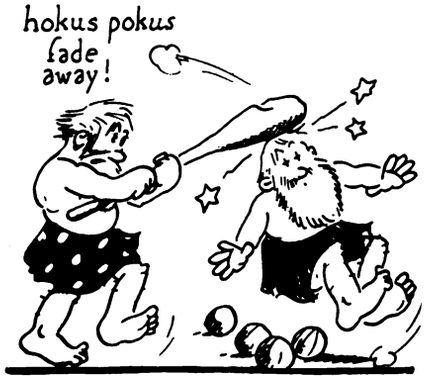
The average driver's tendency was to get there just as quickly as possible, regardless of any condition. To accomplish this purpose the governor which controlled the speed of the engine was invariably "Jimmied", so as not to interfere with his speeding proclivities. In spite of the vigilance of the officers and inspectors, few cars ever reached the shops for repairs with governors intact or in working order.

If cars failed under such conditions and required an unprecedented amount of repairs to keep them in order it could hardly be regarded as a weakness in their design, but rather the inevitable consequence of such operating conditions. Everything considered the motor vehicle did wonderful and efficient work, and such greuling tests which are unparalleled in their industrial use was bound to disclose weaknesses which were never before known to have existed.

It was such handicaps as these that kept the four thousand men who toiled at Verneuil, working like automatons, day and night to overcome the innumerable obstacles which would have robbed our men of the adequate transportation facilties which were always at their command.

A MINATURE MOUNTAIN WAS FORMED FROM DISCARDED TIRES

mer comes in and makes a howl about a cracked spark plug, he claims Luke's men put in his tin lizzie and demands a new one in place of the damaged goods. But Luke can't see the business advant-



HE PICKED UP HIS WAR CLUB AND RAPPED THE YOUNG SPORT ON THE COCOA

age o' givin' the gent another stopper when flash corks 're sellin' for around 85c each, and he hints like the customer's broke the porcelian hisself and just wants to get another one in place of it without puttin' up the requisite collateral.

I see Luke's about to lose a customer and make an enemy, so I put in with a little o' my soothin' diplomacy. "My dear sir," says I in my most genteel manner, "just what is the contents of the bill of particulars with which you condescend to favor us?" In other words, I hasten to add as I see Luke's adam's apple begin workin' up and down preparatory to makin' impolite remarks, "what imputation, or delation of questionable, derogatory, or discreditable practice on the part of our subalterns do you have to present?"

"W'y, I had my machine repaired here yesterday," he says real sociable when he sees he's talkin' to a educated man and a gentl'man, "and your repairman put a cracked plug in. O' course it was probably done by mistake," he goes on beginnin' to get apologetic, but I cut him off politely.

"All our fault I assure you, Mr. Smith," says I jovial like. "We'll gladly provide you with another plug forthwith. Any time there's any complaint to make about our service we're pleased to have you call the matter to our attention. You thereby perform a noble service both for us and for humanity." And with this I tell Luke to get another fuse for the gent right off. He don't like it a bit the way I've usurped his authority in the case, and he gives me a terrible look 's if to say," I'll make you pay for this," but he gets the accessory and the customer bids us a pleasant good mornin' and I tell him if that plug cracks inside o' three months to just bring it back and get his money back, and he goes on his way rejoicin'.

I know the storm's comin', so I'm all prepared for it when Luke turns loose on me." Just fork over eighty five beans, Mr. Blowhard," he says some scornful," and hereafter I'll thank you not to st your nose in my business," he says.

But it don't do no good to paint your radiator when it's the motor that's knockin', so I set to work to remedy the cause o' the trouble. "Now just hold on a minute, you bonehead," says I real affectionate, "d'you mean to insinuate that you're addicted to habit o' treatin' your customers in such a inhuman way as all that?"

HE GAVE ME A TERRIBLE LOOK

"Just come across with the eighty-five and never mind how I conduct my business," Luke comes back's if he's got all the evidence on his side and's sure o' winnin' the judgement.

"That's all right about the mesely little sum o' money," I rejoin patiently, seein' how dense he is, "so far's the price is concerned it's worth more'n the cost 'uv admission just to see a freak like you. W'y man, you oughta be runnin' a three-card-monte game. You're wastin' your wonderful talents in this—"

Just here another customer steps in and I don't give Luke no chance to heap further ruin on his own head. Instead I steps right up and greets the gentleman real suave: "Come right in sir. In what way can we be of service to you this fine morning?"

"Here's a couple lights I got here yesterday on my way home," he says smilin' cheerful and showin' he appreciates my kind treatment, "and when I got home and got rumagin' around in the garage I found I had plenty o' globes on hand already, so I brought these here back."

"I see. And I presume you gave forty cents in exchange for the goods in question, "I rejoin, takin' the globes and strollin' over to the cash register. "All right, sir; the price's went up since you purchased these—they're now forty-three cents—her's your money. Any thing else today? No? Then call again when we can be of service to you" And with that I give him the forty-three cents and shake hands with him and bid him good day and he goes out with a big smile on his map.

But say, maybe Luke wasn't hot under the collar! He begins blowin' off somethin' scandalous, but I'm in no mood to listen to his ravin', so I halt him and make him listen to reason.

"Just answer me one question," I cut in on his rude expostulation; "have you or have you not got any regular customers? Now just tell the truth, the whole truth, and nothin' but the truth."

"Regular customers?" Luke stalls like he don't get my drift.

"That's what I asked; meanin' by my interrogation to ascertain whether or not there's any person or persons who habitually, as a matter of custom, or frequently conducts his gasoline buggy hither that he may submit it to your careful diagnosis, prescription, or cure,

COME ON OVER—IT'S MY TREAT

or who invests from time to time in the usual appurtenances thereto."

"Aw, you can't expect regular customers in a place like this,"

Luke growls somewhat pessimistic.

"And yet there are many Fordomaniacs who pass your portal daily, are there not? Yes? And there are also on both sides 'uv Woodward Avenue within your territory many hundreds of human bein's that own automobiles, cars, machines, or Fords, are there not? Of course. Then why is it that these victims of the traffic laws fail to transact their business in your establishment? Answer that."

Luke begins to see the drift 'uv my remarkable logic, but he still harps on his contention that a fellow in his location couldn't expect nothin' but transient trade.

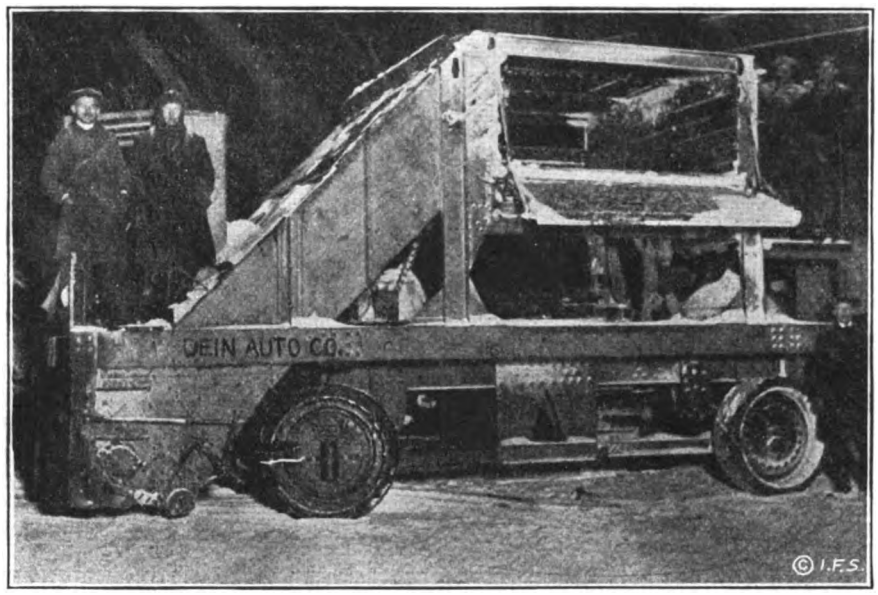
"Now, you just listen to my words o' wisdom, Lucas," I go on when I see he's cooled off a little. "You just adopt this motto, and I'll guarantee the results: THE PUBLIC'S ALWAYS RIGHT. You may lose a few cents by givin' a man a new spark plug when he claims the one you put in his buggy's cracked, but you'll gain a lot o' dollars from that man's future patronage. A crook may bring you a glim that he never bought from you and want you to take it and give his money back, but you won't lose anything by accommodatin' him. You can put the cost down to advertisin' if you want to, it'll be the best advertisin' you ever bought."

"But, you windbag, d'you think I'm goin' to let anybody run a thing like that over me? Give a fellow money back for somethin' he didn't even buy from me? Well I guess nix!"

"That's all right if he didn't buy it from you. Take it and give him his money anyhow. If the goods're any count you can sell 'em, and if they ain't you can put it down to advertisin'! That fellow'll go out and tell folks how nice you was about takin' it back, but he can't tell 'em he was dis'onest about it cause he don't want 'em to know he's a crook and his friends'll be droppin' in to trade with you, knowin' they'll be satisfied or get their money back. You make the public understand that absolutely, they'll get their money's worth or their money back, and you'll find you're makin' regular customers that'll bring in a regular stream o' coin instead o' foolin' along with a little transient trade and havin' to answers a lot of complaints all the time."

Luke still don't like the idea, but I've got business o' my own, so I crank up and mosey along. "By the way," I suggest as I'm about to drive out, "you try my scheme and if you're not doin' more business next time I come around I'll pay you that little bill I been owin' you."

NEW YORK'S RECENT BLIZZARD



SNOW REMOVER DOES THE WORK OF 500 MEN IN A DAY
SIDE VIEW CLOSE-UP OF A GASOLINE MOTOR SNOW PLOW USED DURING THE RECENT BLIZZARD IN NEW YORK

It was nearly three months before I saw Luke again. When I do happen to find it necessary to halt at his place one day I find it all painted and dressed up. There's a lot o' fresh paint and plate glass out in front, and a big sign hangin' over the door that reads: "WE TAKE THE POSITION THAT THE CUSTOMER IS ALWAYS RIGHT!"

Luke, himself meets me with a big grin on his physlob and after a cordial salutation he says real friendly: "Come on over to the Liberty Cafe—It's my treat."

Well, we stroll over to the swellest Chinese joint in town and Luke orders the best that's on the card. We chat along real sociable till we get to the Havanas and then Luke shows, he's a man after all. He looks across at me real contented like and says, "By the way old top you needn't bother about that little bill you been owin'; I've put that down to advertisin'."

Bending Thin-Wall Tubes

MARK MEREDITH

It is difficult to form long bends in thin-wall tubes or pipes or short bends in relatively thick wall tubes without kinking or flattening the tube or splitting it along one of the the seams unless a proper procedure if followed. If the method described below is used, such accidents will be prevented. First, stop up one end of the tube, which is to be bent, with a soft wood plug. Second hold the tube vertical and fill it with rosin which has been rendered liquid by heating. Third, bend the tube into a contour desired. The bend having been formed, the rosin filling can be melted out by subjecting the tube to the heat of a forge, a gas stove, a Bunsen burner, or a blow torch. In melting the rosin preparatory to pouring it into the tube, it should preferably be heated in a water-jacket glue pot or some similar steam-jacketed utensil, because there is less danger of the rosin taking fire. Smooth bends of even contour are easily made if this method is used.

GOOD ROADS

The federal government has placed $200,000,000 at the disposal of various States for the purpose of building roads during 1919, 1920 and 1921. That the States have availed themselves of this opportunity is indicated by the fact that in 1920 they themselves made an aggregate appropriation of over one and a quarter billion dollars. The era of good roads is seemingly at hand.

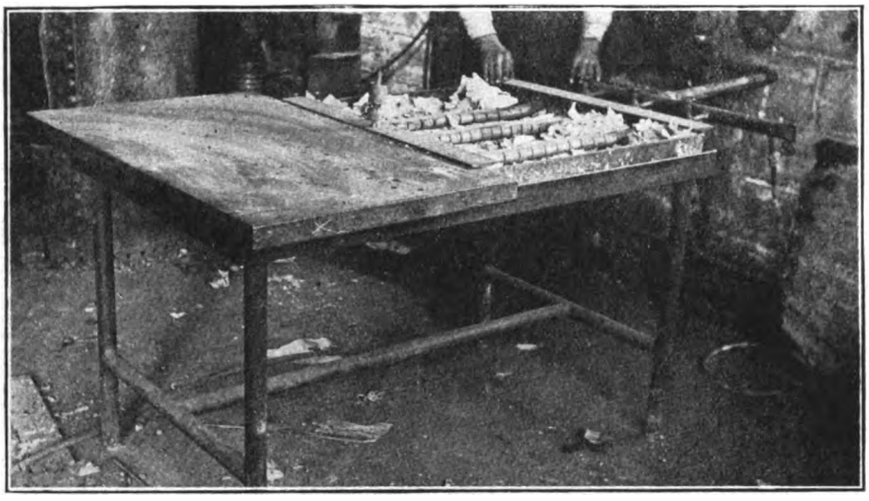
Be progressive; have a good shop sign and advertise in the local paper.

PREHEATERS

by DAVID BAXTER

A brief discussion of the use and misuse of a very important part of the Welding Shop's equipment, together with an explanation of the different devices for that purpose

WELDING shop equipment is scarcely complete without some sort of a preheating device. It may be only a home made affair but it is absolutely essential on many kinds of work, both to regulate and control the heat reactions of the welding torch and to conserve welding gases; and too, it is much easier to weld a hot casting, than it is to weld a cold one, due to the obvious fact that heated metal will melt quicker and fuse easier under the welding flame, than cold metal. Which should in itself be proof enough that a preheater is a very necessary part of the torch welders' equipment.



A COMBINED PREHEATING AND WELDING TABLE WITH A TORCH LIGHTER IN THE CENTER

Now the blacksmith who has an oxy-acetylene welding plant in connection with his smithing business will find himself handicapped if he possesses no preheating devices other than the ordinary forge. Of course a great many welding jobs may be heated on the forge but there is always danger of burning some part of the work while another part is still cold or practically so. Not to mention the danger of cracking the casting, due to the unequal expansion caused by the forge method of preheating. Nor to mention the time and trouble required to turn the job over and over on the forge in order to heat it thoroughly. It is a process always attended by risks due to the chance of cold air striking the job at a critical period.

Probably the best way to use a forge for preheating is to use it merely as an accessory. In which event the preheating fire consists of charcoal while the blower of the forge merely furnishes the air with which to keep the charcoal burning. Even then the capacity of the forge as a preheater is limited; it will not accommodate large jobs or castings that occupy large space.

Another disadvantage of the forge process lies in the fact that it is often impossible to weld a job on the forge because the torch operator does not have ready access to all sides of the work. There are often times when he must step quickly to the other side of the job in order to complete the welding without loss of time or melting heat.

And after all, perhaps the worst that can be said about the forge as a preheater is that it can not be controlled at all times. There are often times when it is very desirable to cut off part of the heat; in fact, it is essential to decrease the heat quite rapidly at time. It is next to impossible to do this without disturbing the heating job if it is one that has required a considerable bed of charcoal or coke fire.

Nor can the charcoal or coke fire be directed to some certain spot or portion of a job, which is often so essential in good welding practice. Altough charcoal fire may be localized by putting it in wire baskets where it is used with good effects by suspending it beneath some particular portion of a job, such as a large gear wheel. However the basket is not a part of every day equipment, being used mostly for special work.

An improvised basket may be made quite easily by cutting an empty carbide can in half and punching it full of holes to permit a free circulation of air. A wire attached makes the basket convenient to handle.

In a discussion, the nature of this one, of the various preheaters and preheating methods it is hard to say which is the best, since conditions vary a great deal in different establishments; what may be fine in one place is unobtainable or useless in another. Also, to attempt to recommend an all around all purpose preheating oven is futile, since this is matter also governed to a great extent by conditions. There are, however, a number of preheaters and preheating devices accessible to all, if we leave out the discussion, of which is the best.

Therefore a description of several of these devices together with a discussion of their advantages and disadvantages may prove beneficial to the blacksmith readers, in view of the fact that this magazine has received numerous inquiries relative to that subject. The choice rests with the individual.

First a consideration of the preheating fuels: Natural gas is probably the ideal fuel for the average welding shop, with manufactured gas as a close second. Either of these are readily adaptable to al-

most any shop condition and are as near controllable as any preheating fuel can be. Either may be regulated from a tiny jet to a mass of roaring fire. They may be utilized to entirely envelope the casting to be welded, or may be directed to and concentrated upon any particular spot or portion of the casting. Or the gas flame may be inserted or injected into the inner portions of the work. The job may be made merely warm or it may be heated white hot according to requirements. The preheating temperature may be increased or diminished at the will of the torch operator.

Common stove types of burners may be employed when using gas, or special burners may be made or purchased. And any desired number of burners may be connected to one gas main, which will permit the operator to heat several jobs at one time or one job in several places at one time.

When the gas is shut off there is no waste of fuel as there is when charcoal, wood or coke is used, because the fire is out as soon as the valve is turned and there are no cinders or partially burned fuel to clean up after the weld is made.

But many blacksmiths do not have access to either natural or artificial fuel gas, since it is not available in many localities. The blacksmith who cannot get gas for preheating fuel may find a very satisfactory substitute in one of several kinds of oil, which kind of fuel is almost as versatile as gas although lacking much in convenience, since there are such items as storage, haulage, and generation, with which to contend.

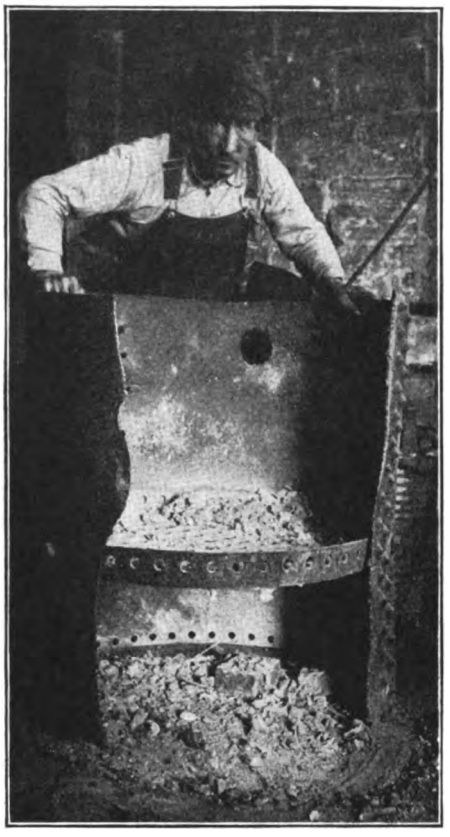
The types of oil burners now on the market are capable of a wide range of heating temperatures and volume. They are almost as easily controlled as gas, since the oil in reality is burned in the form of gas to get the most economical results. This flame may be directed or confined about the same as gas.

One disadvantage of using oil for preheater fuel is the roaring noise accompanying the process. This may be a benefit in disguise, however, since it precludes the chance of visitors distracting the welders attention by talking to him just when he is concentrating his mind on the finishing of a very particular job. The general type of shop loafers do not like to hang around where an oil burner is roaring.

In a class with oil as a preheating fuel, is kerosene and gasoline. The latter, however, is probably dangerous for general use in the average welding shop. But arrangements can be made to eliminate the danger to some extent by installing the system properly.

Gasoline as a preheater is slower and is not so easily directed as oil or gas, nor is it as portable. Its principal use being for smaller jobs on a stationary table or oven.

Kerosene, in reality belongs to the oil classes since it is generated and burned the same for preheating



HOME-MADE PREHEATER. VERY HANDY FOR COKE DESPITE ITS CRUDE APPEARANCE

purposes, as is distilate; both having the qualities attributed to oil as a preheater.

Now, in taking that part of the discussion concerning the preheating apparatus, it will scarcely be necessary to describe any of the different devices for burning natural or manufactured gas because nearly every blacksmith in localities where they are used is more or less familiar with their use. The accompanying photograph will no doubt suffice to furnish the ingenious blacksmith with ideas for working out different ways of employing gas as a preheating agent. The device illustrated is a simple form of combined preheater and welding table. In half of the table is incorporated a set of special gas burners consisting of gas pipes with slots sawed along two sides of each and attached to a manifold. Quite a variety of jobs may be heated on this device, such as auto or tractor work calls for the burners being so arranged that either one or more may be burned at one time.

The opposite end of the table is formed of a cast iron leveling plate, which is an important welding shop accessory; something of this nature is necessary for aligning or truing up many kinds of broken castings.

The leveling plate and batteries of gas burners rest upon a frame work of angle iron welded to legs of wrought iron pipe. The whole thing is easily made in the welding shop with a few tools, other than the welding and cutting torch. And if properly installed all sides of it are readily accessible; the torch operator may work at either side of it, thus reaching any angle of the weld without moving the casting. A feature which is desireable on many classes of work that are liable to become distorted or mis-aligned if they are turned after the welding is started.

However, a preheater such as this combined table has the disadvantage of not being portable. Nor can the heating flame be directed or closely confined to any desired spot or section of the job; thus being a source of wasted heat on some classes of welding. For instance: if a part of the job is heating too slowly and it is desired to increase the heating, there is great danger of overheating the other parts if the gas pressure is increased.

Another disadvantage is the fact that the table form of preheater is not designed to accommodate the larger class of welding. And it is in the large jobs, that the money lies: one large job will often net many times more profit than a dozen smaller ones.

Therefore, while the blacksmith torch operator should have some sort of stationary preheater, he should also possess one or more portable device such as a distilate or kerosene preheater. Both of which may be home made if the smithy is particularly ingenious and possesses a clear understanding of the principles involved. It is not recommended that he attempt to construct one of these preheaters however, because it will no doubt cost as much or more in the end as one purchased from a manufacturer specializing in the line. There are

several good oil-gas preheaters on the market today designed especially for the welder. The cost of each one may vary in different localities so it is probably not advisable to recommend any particular make.

Oil preheaters are all very much alike as to fundamental principles. The oil is changed to gas in some sort of burner or generator. A familiar illustration of this principle is the ordinary plumbers blow torch. The fuel is forced by air pressure through a small orifice into the inside of a heated cylinder where it is turned to gas.

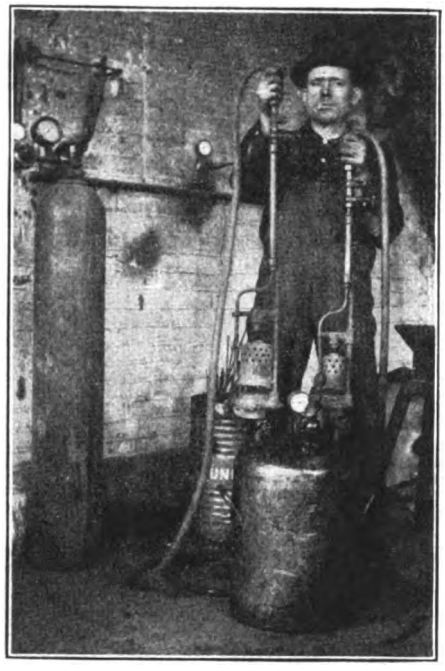
To attempt to instruct the smithy in the making of an oil preheater involves the difficulty of obtaining the required material for the various parts, in different localities, so that specific instructions will not be given. In the first place the factor of size interferes; the device should not be too small or it will be of little use; on the other hand a large apparatus will be cumbersome and probably unnecessary in the average shop. Such things as this should convince the person who desires to construct a home made preheater that he must employ good judgement or he will merely waste a lot of time and effort.

Primarily, he must have a tank or container. Attached to, or incorporated in this must be an air pump similar again to that of the blow torch. The tank must be large enough to hold several gallons of oil and strong enough to withstand considerable air pressure; it should also be absolutely leak proof, especially around the air pump and connections. It ought to have handles for convenience in moving and a pressure gauge to conserve work in pumping. Besides the gauge connection there should be an air tight plug for filling purposes and at least one hose connection for attaching the generator hose. And the usual valves for governing the flame. These connections should be located on top of the tank.

The generator will probably require more skill and care in its construction. In principle it consists of a short cylindrical affair through which the oil is sprayed by the air pressure. This cylinder is heated before turning on the oil and instantly vaporizes it, as it passes through the cylinder. It is then ignited at the outer or open end of the cylinder. The oil is no doubt best regulated by a needle valve.

The cylinder varies in different designs for better or for worse according to the individual ideas of the maker and user. But for the mechanic who intends to build an oil preheater, something similiar to the blow torch mentioned will no doubt serve the purpose, only it should be built on a larger scale designed to burn oil instead of gasoline .

The cylinder or more properly speaking, the generator is attached to the tank by a substantial hose which should be eight to twelve feet long. Between the cylindrical, body of the generator and the hose a length of pipe is inserted, which embodies the necessary valves and



A PORTABLE OIL BURNING PREHEATER

arrangements for fastening the the generator. All joints or connection to be air and oil proof.

One of the accompanying illustrations shows, one type of oil or distilate preheater quite extensively used. While it is patented and may not be used as a model, it will no doubt serve as an example to illustrate the foregoing description.

This type of preheater may be employed alone or may be used in connection with charcoal or coke fires; merely to start or to enliven a coke fire, or to help keep it burning. When placed beneath the grating in some such improvised preheating oven as is illustrated by one of the photographs it will ignite and keep burning a good bed of coke fire. The casting is placed upon the coke fire and enclosed with sheet iron or asbestos.

This oven is merely a part of an old steam boiler with one of the fire sheets welded in place for a grate. It is pictured in connection with this article merely to give the welder an idea of how to construct a makeshift preheating oven which is serviceable despite its crude appearance.

Aside from the fact that the heat of an oil burner may be directed at will, perhaps its greatest advantage lies in its portability. The oil preheater can always be taken to a job that cannot be brought to the shop. The welding, or more precisely speaking, the preheating, may be done in any establishment without the attendant danger of wood, charcoal or coke fires. A heavy job of welding may be preheated in a building having a wooden floor, with the same degree of safety as if done upon the ground.

Then, there is the job which is too large to bring inside of the shop: it must be welded upon the ground outside. This is but another example of where a portable preheater is handy; arguing for at least two of the devices, or at least one with several generators attached.

As a closing reconsideration on the subject of "preheaters" it is well perhaps to advise the blacksmith to equip his shop with several methods of preheating in order to obtain the best and most economical results. He will no doubt meet instances where he can combine two or more methods with good results. If he has the gas he can often combine it with coke or charcoal. Or he can utilize the oil preheater with the forge fire by spraying the oil flame over the top of a heavy job which is heated below by the forge. Or he may combine the oil heater with coke fire.

The gist of the whole thing is to heat, without burning or distorting, the job which is to be repaired and to make the heating of proper duration, both to insure efficient welding and to prevent rendering the metal defective or lifeless and control the preheater to the greatest possible extent.

Don't grumble about conditions which you consider especially burdensome. Probably these are no worse for you than for other people. If the situation can be remedied, set about remedying it. If it cannot, make the best of it—the cheerful best—and sooner or later the tide will turn.

Ailments of the Pneumatic

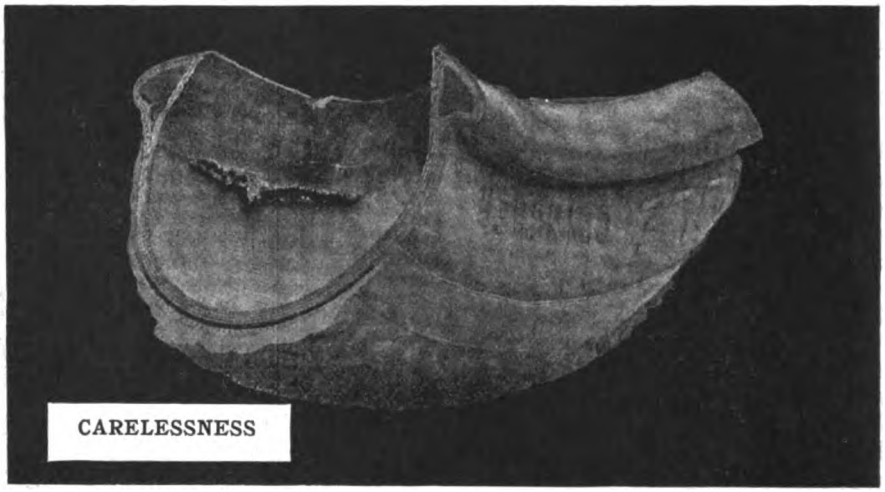
THERE are a great many ailments to which the pneumatic tire is heir and which plainly display their symptoms on the exterior of the casing, and there are still other defects which can be seen, only when the tire has been removed from the wheel. The visible ailments are due almost entirely to the misuse or abuse of the tire and include, such as, under inflation, neglected cuts, running in car tracks, excessive skidding, injury by chains and the use of protectors. All of these visible defects, with few exceptions, may be treated as a bruise and cured by the timely application of some simple remedy, or better still, prevented by a more cautious operation of the car.

Under-inflation means that the tire has been run with too little air in the tube. An excessive overload may produce the same deleterious results. When a tire has been run with insufficient air the tread separates from the fabric and the outside of the tire looks like a mass of interconnected hilly blisters.

An undue amount of heat is generated in an under-inflated tire, which causes the cement between the tread and the fabric and also between the layers of fabric, to become loose. The length of time that a tire has been run with insufficient air is the determining factor of its appearance. It is obvious that the further it is run, the worse its condition will be.

Many owners labor under the delusion, that in the summer, a tire should never be inflated to its stated capacity, because the heat generated by the tire will soon cause the air to expand and bring the pressure to the required point. To a certain extent this is true, the tire will gain in pressure, but they fail to consider the strain and excessive wear that the tire is subjected to while waiting for expansion, due to temperature increase. Then again the car may stop and the tire cool, in which case the pressure drops and the tire is again under-inflated.

Recently this theory of expansion was most exhaustively tested and the results so obviously showed the falsity of the time honored theory, as to merit nothing more than a passing comment, in relegating it to oblivion. During the heat of summer, a tire with half of the requisite pressure was driven rapidly for a distance of several miles, with the result that it gained nearly thirty pounds in pressure, according to a pressure gauge. In a second test the tire was pumped up to its proper pressure and the same run was made. This time the tire gained only three pounds in pressure. This shows in the first case so much heat was generated through the bending of the tire, due to its under-inflated condition, that the pressure increase resulted. The generation of this heat meant nothing more than the excessive wear and involved the possibilities of separating the tread, weakening the fabric and if carried far enough, a blow out would result. In the second case little heat was generated, as is evidenced by the slight increase in pressure.

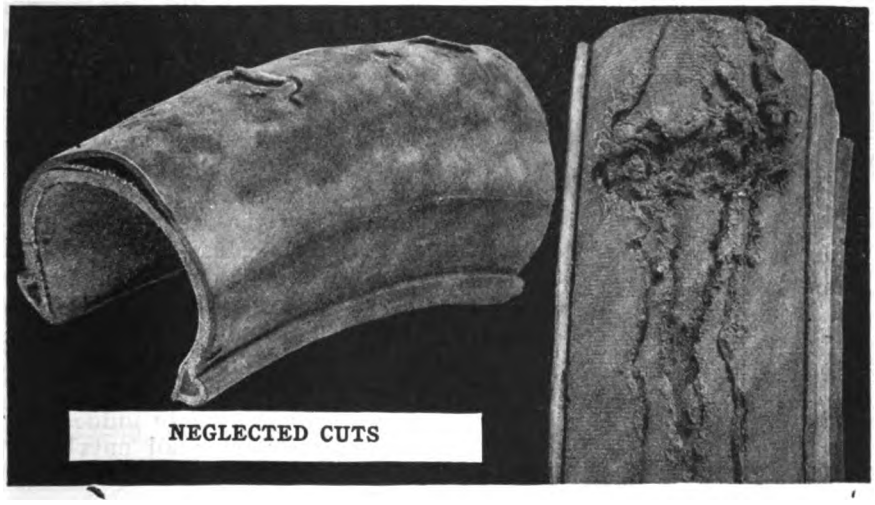


DAMAGED BY IMPROPER APPLICATION TO THE RIM

Since the result of under-inflation is so disasterous and the remedy so simple, it behooves all to use a pressure gauge, for no one can tell by glancing at a tire, whether or not it is properly inflated. With reliable gauges being sold so inexpensively, it is poor economy to deprive ourselves of the assurance, they afford.

Tire manufacturers say that a tire is not injured by running it over the specified pressure, for example a tire designed for 80 pounds, will in reality stand much more. This does not mean however that such a practice should be followed.

There are still motorists, who have an utter disregard for the seriousness of cuts in a tire. A cut in the tread of a tire might be compared to a cut in a man's hand, since both have attendant serious possibilities. In the latter case blood poisoning may result, while in the former, it might be called tire poisoning. By that is meant, the



tread becomes blistered and sickly looking. A cut through the tread offers an opportunity for dirt and water to enter. The dirt enters and forms itself into a ball, due to the rotary motion of the tire, this mass works itself between the tread and the fabric, thus separating the two. Then perhaps it rains, which further complicates matters, for if there is anything that is detrimental to fabric life, it is water. Water will rot the fabric, first one ply, then another and eventually a blow-out results. If small cuts lead to deep tread cuts, and deep tread cuts bring on fabric separations and later blow outs, it follows that these injuries should be treated while in their incipient stages. But motorists in general are drones when it comes to repairing tires cuts. It would seem that they much prefer to have them blow out and then to complain to the manufacturer of the poor quality of his tires.

We all know the man, who enjoys driving his car in the car track, when the street is paved with cobblestones, perhaps he is aware of the damage he is doing his tires, maybe not, at any rate he continues placidly on until he finds sooner or later that the sides of his tires are badly damaged. Running a car in the car track will cause the sides of the tires to become worn, a continuation of this practice causing the fabric to show and sometimes, blisters appear.

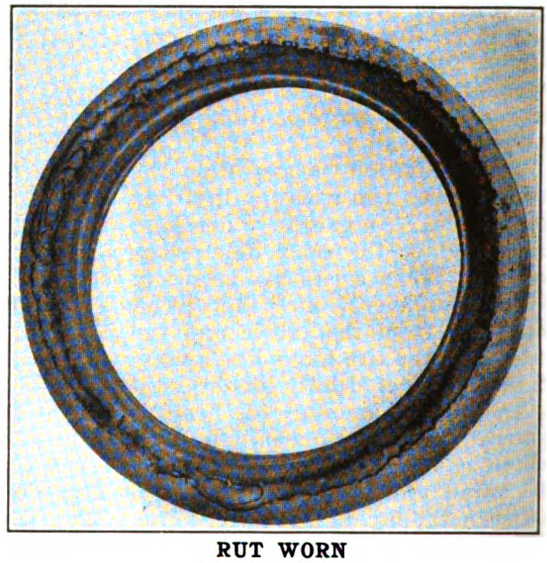
Skidding is another contributing factor very detrimental to the life of a tire. The chief cause for skidding doing damage to the tire is when the brakes are suddenly applied on a country road, the wheels slide, even though it be slightly, the sand cuts into the tread. On city streets too, the skidding causes the tire to wear. Friction causes wear and it might be compared to rubbing the tire against a rough surface with the result, that the tread will wear rapidly and unusually in spots.

Not infrequently, owners will notice a cut through the thread, a close observation reveals the fact that the fabric, too, is slightly injured. The very first thought with some, is the insertion of a blow-out patch. This is exactly the thing to do, if the car is distant from a tire repair shop, or if there is no tire at hand to take the place of the injured one. Owners generally neglect this precaution, because the patch holds out for a time and the break is forgotten and nothing is said or done until the tire blows out. The insertion of a patch, wedges between the two parts of the fabric, it should be remembered, because the patch may be nipped by the sides of the fabric.

Running the car in wheel tracks is responsible for a large number of damaged tires. Motorists are familiar with the condition of country roads in the spring and fall after a rain. The wheels cut tracks or ruts in the roads, which later harden and then presents a number of high and low uneven surfaces. Running in and out of these indentations is a common cause for the side of the tread to wear rapidly, the tire being designated as rut worn. Close curb driving is practiced with the result that the side of the tires are scrapped and sometimes pinched by the curb, giving nearly the same result as running in ruts.

A prominent tire manufacturer draws a good analogy. He advises walking down the street close to the edge of the curb and allowing the upper of the shoe to rub against the edge of the curbstone. He asks "How long would the upper of the shoe last and still the sole be unaffected?" So it is with a tire. The sides become worn but the road contact surface remains unaffected.

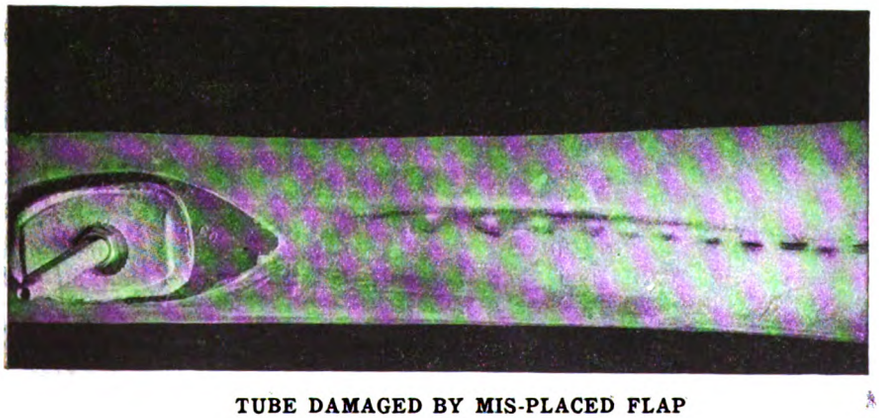
Inside protectors are very injurious to new tires. They are intended for use in old casings that have nearly outlived their usefulness and can be recommended for that purpose. Tires are made to operate under certain conditions. It is the contention of authorities on the subject that the use of inside or outside protectors on new tires increase the number of plies of fabric with a result that an undue amount of heat is generated. The heat causes the tire to wear rapidly, be less resilient and also weakens the adhesive qualities of the rubber between the various plies with the result that blisters frequently appear.



RUT WORN

It is a difficult matter for the garage man to convince the owner that a tire has blown out as the result of a stone bruise or similar shock. This condition exists because of ignorance on the part of the owner. Should a tire run over a stone, the fabric may be broken. Hitting the curbing at right angles will sometimes give the same result. These things may cause the fabric to break and at the same time show no visible fracture. The tread being soft resists the blow unharmed, but the fabric gives away to the shock. Most motorists have been educated to the point, where they know what a cracked fabric means—a blow out in a short time. Or the crack may pinch the inner tube and cause deflation.

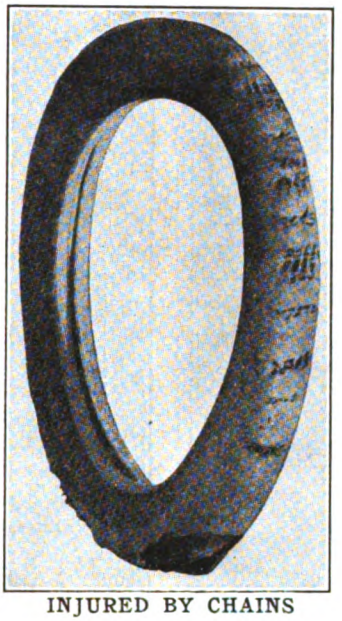
It would be well to induce your customers to have all cuts which pentrate the tread, even if only a



TUBE DAMAGED BY MIS-PLACED FLAP

half an inch long, vulcanized. That may seem extravagant to them at first but the extra mileage they will receive will more than compensate them for the expense.

Does the skid chain injure the tire? A large tire manufacturer says they do, and the makers of the chains say, they do not. In both cases certain suppositions are made but the very fact that tires show wear from chains leads us to believe that chains do wear the tires, when the chains are applied too loosely, or too tightly, or run continually on hard pavement. The continued use of chains will cause the tread to be cut through at the point of the contact of the cross section of the chain. Occasionally the fabric shows. In other instances the tread is separated from the fabric, showing blisters and the impression of the cross links are visible. Tight chains do more damage than those permitted to work around the tire, for in the latter case the stress is applied at various points, whereas in the former the action is local.



INJURED BY CHAINS

From the foregoing it would seem impossible to operate tires as they should be. The use of gauge each week, together with a periodical inspection and repairs made immediately when needed and a little consideration while driving will do much to increase the mileage. When the tire wears evenly and smoothly all around, it is safe to assume that the tire is running alright. By smoothly is meant, that the tread does not appear as if it was scrapped. Sand will cause a rough surface to appear, but then one is aware when he has been running through it, and need not be alarmed, as this roughness will soon disappear. The wear should not be uneven. There should be no low spots here and there. If there are such spots, it would be well to see if the wheel wobbles. If the wheels are lined up and the tire pressure right and the tire wears evenly but rapidly, see the maker of the tire as it is possible that the tire may be defective.

Cold Cutter for Hard Work

J. C. LAMON

HAVING thousands of ¾ inch rivets to cut in dismantling some large steel chuting towers, required a large number of cold cutter that would stand a lot of hardship. To fill this need satisfactorily some old dredge bucket pins which had served their usefulness for that purpose, were used. How they were made, the peculiarity of that quality of stock and the process of heat treatment is given the following account.

The material from which these cutters were made was manganese steel with a large percentage of carbon. They measured 6 inches in diameter and were about 3 feet long. In forging them, a slow heat was employed with a shallow forge fire. The heat was slowly developed until a good forging heat was obtained. They were then worked down under the power hammer until about 1¾ inches square, after which they were cut into conventient length to facilitate handling. The cutter was then blocked out to the proper size by the use of the power hammer. After this had been done, the eyes were punched and the cutter finished. They were heat treated by bringing them to a dull red and then laid aside and allowed to cool slowly. When thoroughly cool, they were ground up on an emory wheel and tempered in the following manner. A clean coke fire was used to bring the cutting edge to a dull red heat. At this point the cutters were cooled in clean water which was about 70 degrees Fahrenheit. They were then polished with a piece of emery cloth in order to watch the color. When it had run down to a dark blue the cutter was plunged in a tank of black oil where it was allowed to cool. It was possible after having been properly tempered to cut between 250 and 300 ¾ inch rivets with these cutters without regrinding. When the cutting edge became dull and the head badly battered, they were reworked at the forge and heat treated in the same manner, which apparently renewed their life and permitted them to do as good work as when originally made.

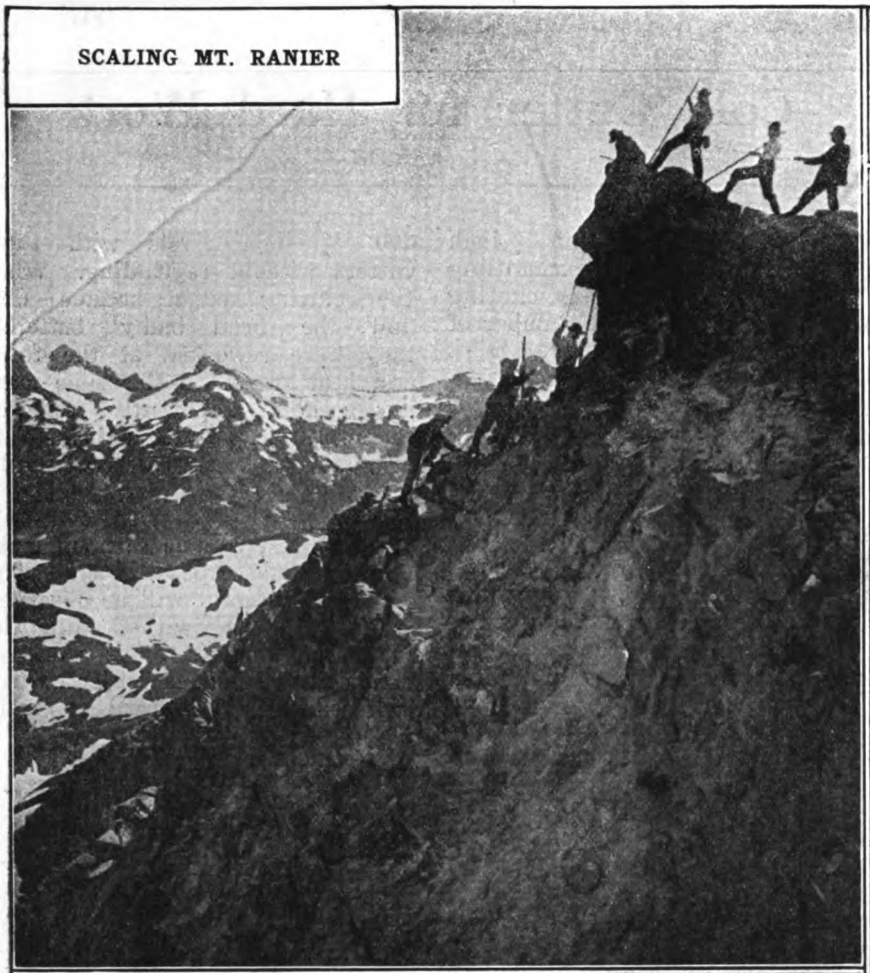
How well they withstood this grueling test can be seen by looking at the accompanying cut. The cutting edge as it will be observed is undamaged notwithstanding the fact, that the strenuous work to which they had been subjected had battered the heads down nearly to the eye of the cutter.

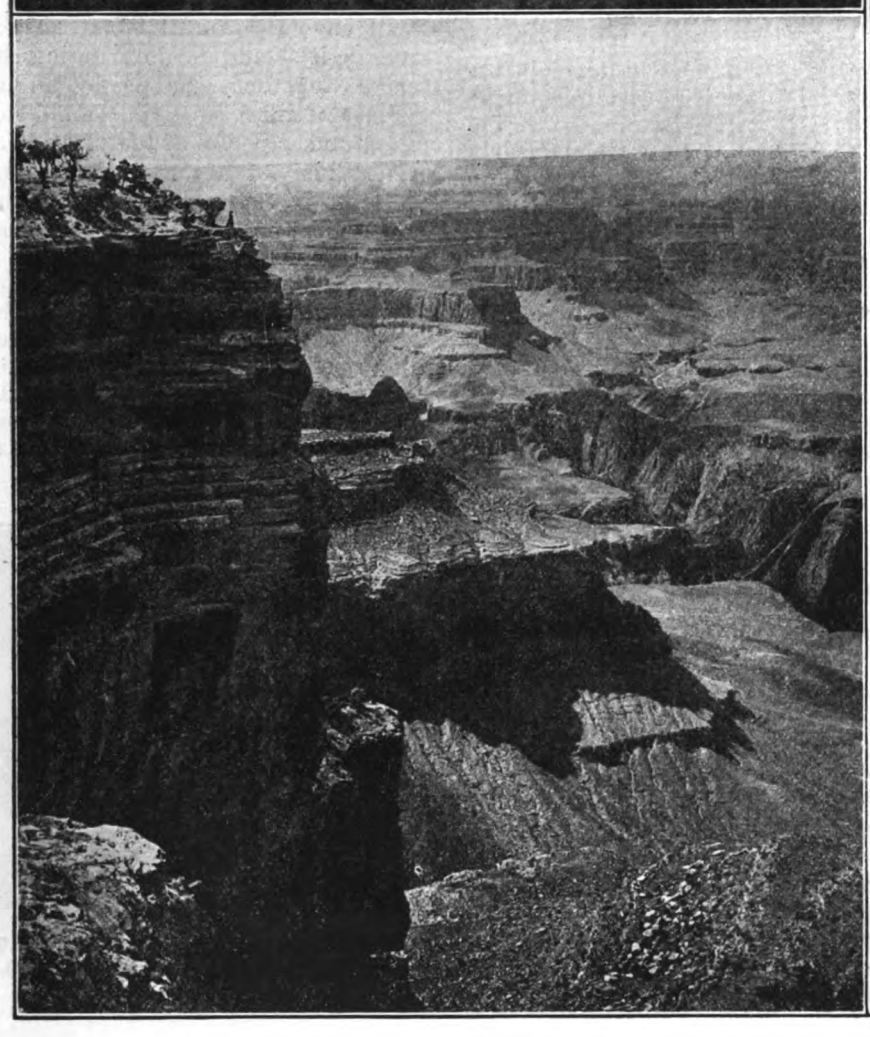
WHAT A GOOD FLUX DOES

The duty of the flux in welding is to oppose or offset certain chemical changes which will be detrimental. It must contain no ingredient which will have a harmful effect on the metal; it should aid in bringing the metal together—that is, by an increase of its fluidity; it should not melt and vaporize at too low a heat and thus not accomplish its purpose in preventing oxidation or decarbonization, as the case might be, and it must not melt at so high a heat that it will remain in the weld. Its weight also, compared with the metal or the metal oxides, is a factor of importance. Inasmuch as fluxes are quite inexpensive, we should leave their manufacture to those skilled in this line and purchase them with a positive guarantee.

ALTHOUGH THE HEADS ARE BADLY BATTERED THE CUTTING EDGE IS STILL SERVICEABLE

SCALING MT. RANIER





THE BEAUTIES OF THE GRAND CANYON
ARIZONA, AS SEEN FROM O'NEIL'S POINT

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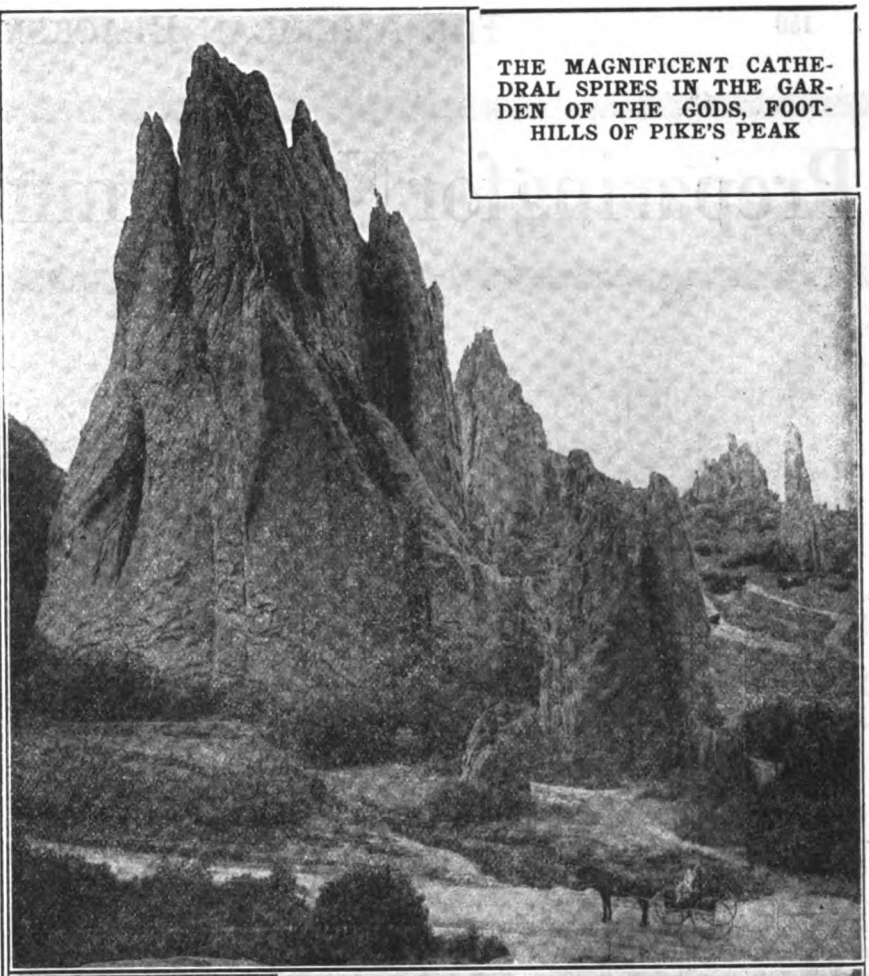
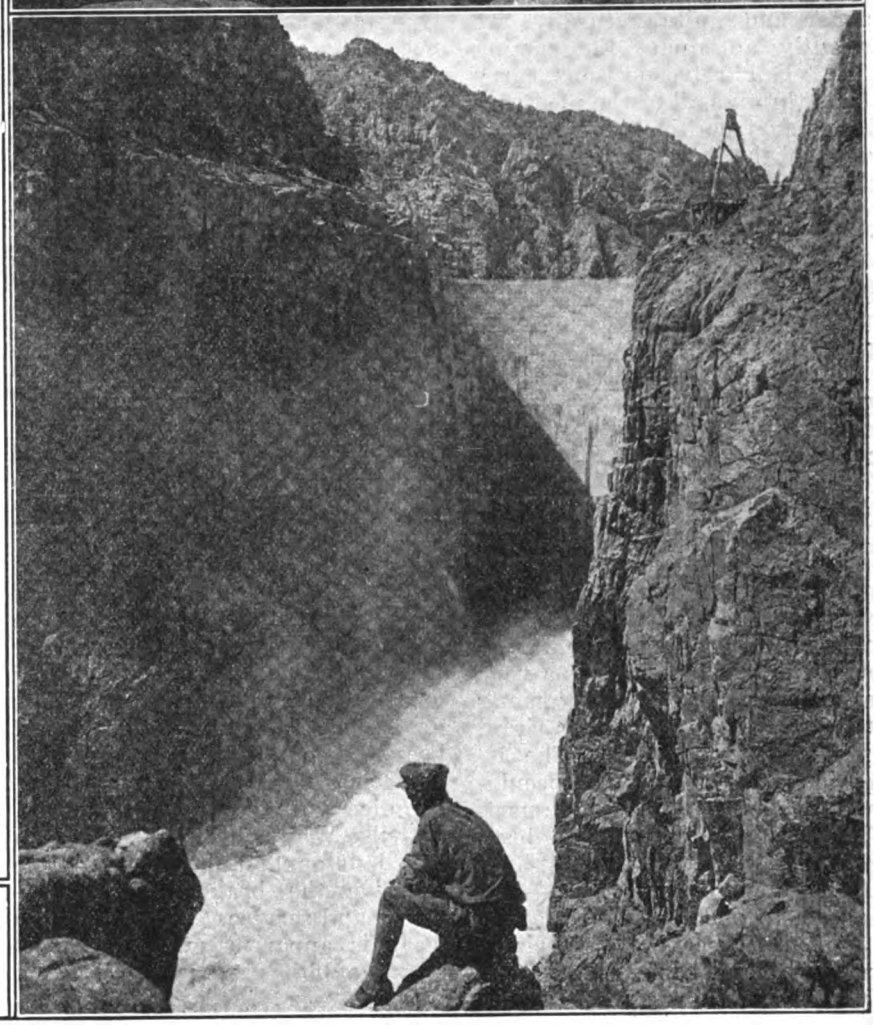
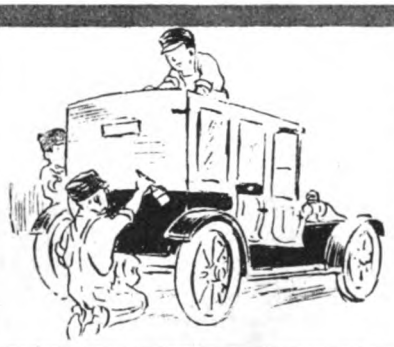
THE MAGNIFICENT CATHEDRAL SPIRES IN THE GARDEN OF THE GODS, FOOTHILLS OF PIKE'S PEAK





SHOSHONE RIVER DAM IN THE GREAT
SHONE CANYON, WYOMING. IT IS ONE OF
LARGEST SOURCES OF IRRIGATION WATER
FOR THE DESERT AREAS OF THE WEST

Preparing for Next Summer's Driving



by

N. WARD GUTHRIE

Then it's a case of "get out and get under" or send for some distant Garage man to fix you up. Take it any way you wish, it is a delay, that ten chances to one could have been avoided, had we been just a bit more careful in our spring inspection.

BEFORE many more weeks, old Sol will unveil mother earth from the covering of white, under which she has lain hidden for the last several months. A bright warm Sun and the gentle breezes from the South entice us to the great out doors. It is then that our thoughts turn to the car which has lain dormant all winter. It afforded no end of pleasure last Summer and quite naturally, we pleasantly anticipate the coming season. Our retrospections carry us back through all of the pleasures of last year, from the balmy days of spring to the hazy afternoons of early Autumn and the whole scene is enhanced by our memories of the perfect operation of the car, which made such scenes possible.

If we are to enjoy that same uninterrupted performance this coming Summer, now is the time to see, that the car receives the attention that its faithful service of last year merits. Sometimes in making the Spring inspection, we are more perfunctory than thorough, with a result that some vital part of the car's anatomy is thoughtlessly overlooked. Or our haste to complete the job may be the cause of such an omission.

"Oh my car hasn't gone far, it wont need any attention" is a very common remark heard among motorists. Perhaps they are right, or perhaps they are not. The assumption at best is only speculative. Some unimportant little part, as they think, may have been neglected, with a result that some fine Sunday afternoon—and cars seem to pick out a holiday to cut up their capers, especially when you have some friends out riding — something goes wrong

To eliminate much of the possibility of overlooking any of these details, it might be a good idea to make a list of the more important things to be done and follow that as a guide.

Beginning with the tires let us proceed through the list in an orderly and systematic manner. The necessary repairs to the casings, with which all motorists are only too familiar, should be made. Tires that have not been off of the rims in some time should be removed and the rims examined. If found to be rusty, they should be thoroughly cleaned and then painted. Rust, like oil, is very detrimental to the life of tires. Should the inner tube show a tendency to stick to the casing, it should be removed the casing brushed out, the tube dusted with talc and then returned to its place.

It might be well, while on the subject of tires to examine the wheels. It is important that they should run parallel and true. Front wheels should be measured to see that they "tow in" slightly, that is the wheel should be from ¼ to 3/8 of an inch closer together at the front than at the rear. This ensures better steering and is less destructive to the tires. The wheel bearings come next. They should be cleaned, inspected for wear, supplied with new grease and adjusted. While the wheel is off, an excellent opportunity is offered to examine the brakes, both emergency and service. If considerable wear is apparent on the linings, they should be replaced. Too much stress can not be laid on the importanc of dependable brakes, your personal safety is vitally concerned. One can start the car in motion at anytime he so desires but the matter of stopping, is in a great many instances, not left to your selection. You must stop when necessity demands it, or suffer the attendant consequences.

Look the brake over carefully, examining the brake rods, levers, pawls and other parts for wear. See that the brakes are so adjusted, that the braking force is applied evenly to both wheels. It distributes the wear better and assures a quicker stop in an emergency. In replacing the wheels, use new felt washers, to prevent the oil from leaking out on to the brakes, as that is frequently a cause for them to work improperly in an emergency. Be certain that the wheel is fastened rigidly to the axle when replacing it.

Remove the front wheels and see that their bearings are none the worse for their experience. Cracked balls or rough cones should be replaced with new ones. Replenish the grease and adjust the wheel so that is turns freely and still has little end play.

The steering arms should not be overlooked. If there is a visible amount of play in the steering arm connecting rod bolts or bushings, they should be replaced with new ones, the same is applicable to the spindle bolts and bushings.

Fill all of the grease cups and turn them down until it is a certainty that the grease has been forced into the place where it was intended to go. There seems to be a general misunderstanding among motorists as to the way a grease cup works. Many people are earn-

est in their belief, that it is necessary only to fill the cup periodically and nature will do the rest. This is an erroneous idea. Unless the cup is turned down the grease will not reach its proper destination and the part which is depending on it for lubrication simply runs dry, the result being quite obvious. Turn the cups down after they are filled or else save the bother of filling them in the first place.

The springs' duty on the car is to absorb the road shocks. How well they accomplish their work is reflected directly from the way they are taken care of. Graphite inserted between the leaves of the spring not only makes the car ride better but is an excellent insurance against spring breakage. A well lubricated spring seldom breaks. Look at the spring tie bolts; it is not infrequent that they are broken quite some time before it becomes apparent. The spring shackles and perches should be inspected and thoroughly oiled.

The differential case should be flushed out with gasoline or kerosene and refilled with fresh lubricant. If the construction permits, the inspection of the ring gear and the pinion, is an excellent idea.

The universal joint should be examined for wear, refilled with new grease and, if the leather boot is torn, it should be replaced with a new one. A torn boot oils everything except the thing it is intended to.

Clean the transmission thoroughly, inspect and refill with a new lubricant. By warming the case, the old grease can be withdrawn more easily.

Next to receive attention is the clutch. Like the rest of the parts, a thorough cleaning prepares it for examination. The multiple disc type will need nothing more than a good kerosene bath and then the thrust spring adjusted, so as to give more tension. The cone type should have the facing examined for wear. If the leather is hard and the clutch has a tendency to grab, neatsfoot oil applied to the facing will soften it sufficiently to obviate that trouble. If an excess of oil is applied and the clutch slips as a result, a little Fuller Earth sprinkled on the leather will quickly correct matters.

The gasoline should be withdrawn from the tank. The strainer and pump at the bottom of the tank should be cleaned to remove sediment and water that may have collected there. Likewise the strainer at the bottom of the carburetor should be removed and if a vacuum system is used it is a good practice to examine it as well.

Now we come to the heart of the car—the motor. The oil should be withdrawn from the motor base and the case, as well as the entire oiling system, should be most thoroughly cleaned with gasoline. If the car has run any distance, now is the time to remove the cylinder head and scrape out the accumulation of carbon. If the valves need attention, which may be detected by a lack of compression, they should be ground. An excess of oil on the piston heads in most instance may be traced to either, too great an oil supply or faulty piston rings. In most cases it is the latter. Rings that have lost their wall tension or that present a gap of over .015" when inserted in the cylinder should be replaced with new rings. The connecting rod bearing should be examined for looseness and likewise the main engine bearings. If an adjustment is necessary now is the logical time to attend to it.

A little care in replacing the valves and giving them the proper adjustment will ensure a more quiet and better running motor. The clearance between the valve stem and the push rod varies on different types of motors, which makes it difficult to give a figure that will suit all conditions. It should be borne in mind that too close an adjustment will result in a valve being held open when the motor becomes hot, while more clearance than is necessary results in a noisy motor. If either the valve stems or the valve guides are worn, they should be replaced for the reason that on the suction stroke air is admitted, the mixture weakened and missing while running at low speeds, will consequently result.

Take the spark plugs apart, being certain that the porcelains are not cracked or broken, and when reassembling the plug, the gap should be close to 1/32 of an inch.

The distributor should be cleaned and the breaker points, if burned or pitted, should be filed smooth so that they meet squarely. They should then be adjusted so that they will open the proper distance. A little thickness gauge attached to the wrench which is provided by the maker for making such adjustments, designates the proper distance.

The starting motor and generator may also need a little attention. The commutator may be dirty, in which event it should be cleaned with some fine sand paper. If the carbon brushes are worn, replacing them with new ones will eliminate future trouble. Treat the commutator ball bearing supports to a few drops of oil.

The entire electrical system should be inspected for loose wires and connections, oil soaked insulation or places where the insulation has become chaffed and the bare wire is exposed. Such conditions are dangerous, as a short circuit is liable to cause a fire or at best, the battery will be discharged.

A hydrometer test of the various cells in the battery will reveal their condition. If they test less than 1250, the battery should be recharged before being placed in service. Do not attempt to bring the specific gravity of the electrolyte up to its proper point by the addition of more acid. The plates should be completely submerged in the solution; if not, distilled water should be added until they are. Where one cell contains much less liquid than the rest, a cracked or leaky jar may be responsible. Batteries that do not hold a charge should be examined for the presence of sediment at the bottom of the cells. This sediment acts as a conductor resulting in an internal short circuit, which discharges the cell thus effected. It should be flushed out and then recharged. The inexperienced person will find it better, perhaps, to leave the last mentioned repairs to a battery man.

The cooling system should not be overlooked, as there is nothing more annoying than a motor which overheats. Besides it carries with it some grave possibilities. Flush out the cooling system with a solution of sal soda and rinse with clean water. The rubber hose connection may need attention, despite their good external appearance. Not infrequently the rubber becomes separate from the fabric on the inside of the hose with the result that the circulation is seriously impeded. The packing glands on the water pump should be refilled with a suitable packing.

If these suggestions are followed there is a reasonable degree of certainty that the performance of our car next season will be such, as to carry with it at the end of the season the same happy memories, as we now cherish of last summer's trips.

Easier Ways of Doing Things Around the Shop

FOR cleaning work in corners and out of the way places it is hard to beat the simple cheap homemade brush shown in Fig. 1. It consists of a short length of tubing with rope yarn secured in one end and steel wires of a piece of cable

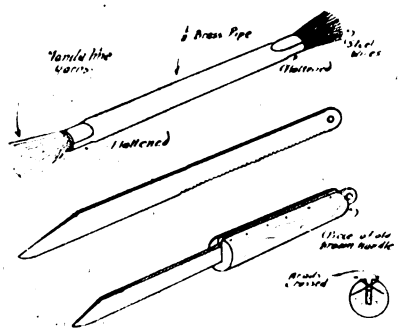


FIG. 1 AND 2

in the other. The securing is done by putting in the wires and yarns and then smashing down tightly the ends, as shown.

About the easiest made knife that one could conceive is that shown in Fig. 2, made from a piece of old broom handle, a few brads, and a piece of an old hack saw. The saw is ground sharp for a portion of its length, as shown in the detail sketch, and the piece of broom handle is slotted by sawing with a hack saw, then the blade is put in and the brads driven so as to clinch it. The brads close the slot and bind the saw blade, and the teeth dig in the bottom of the slot, thus helping to hold it.

STRAIGHTENING TOOLS

For straightening all sorts of work from auto fenders and dash cowls to the engine transmission shaft these tools, which are all home make affairs, are all that seem necessary for a small shop. The straightening bars are of heavy stock to give sufficient strength. There seems no need to describe each one for any good mechanic can make up a set from the sketches. The special shape jaws that attach to the bench vise are very easy to make and are very valuable assistants in straightening small work by aid of the vise screw.

The bench press in Fig. 3 is made from ¾x4 inch stock and is formed to shape out of one long length. A 1½ inch piece of round stock is used as a strong back and the whole thing is held to the bench planks by 8 bolts. A small screw jack is used for the work.

ROD BEARING CLAMP

To aid in the proper fitting of the connecting rod brasses the clamp shown in the sketch was designed. The clamp, as it appears at first glance at the sketch seems complicated and troublesome to make, yet it is very simple and consists of a half round block and a few short pices of 3/8X1 inch stock. If one will give a little close attention to the sketch, its design and construction will be much more clearly understood than written words could make it. The idea of using such a clamp is to bolt the bearing brass hard and solid into the connecting rod end just as it would seat in an assembled

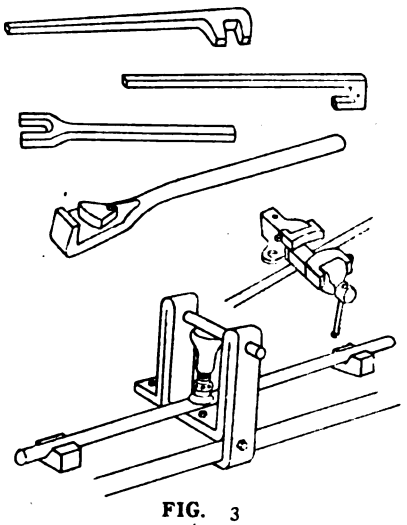


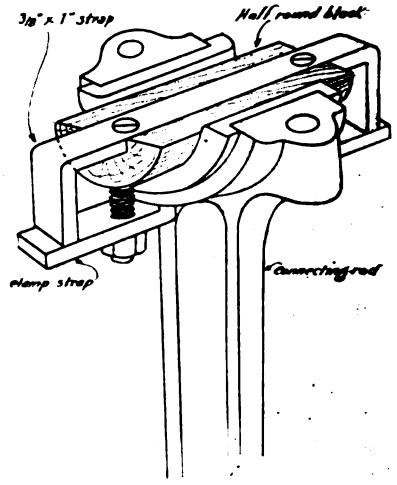
FIG. 3

position, then with this clamp in place the lips or cheeks of the brass are filed flush with the connecting rod ends.

BENCH CLAMP

Here is a crackerjack tool for any shop bench; it is an origination of the writer's—that is not the reason that it is a dandy tool, but several of them are in use along the shop bench and the users of them have certainly welcomed the invention.

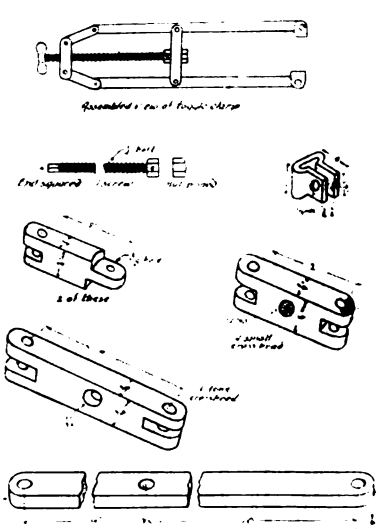
A piece of ⅞ x 2½-inch flat bar stock is machined up with several square holes with keyways, as shown at A, and this strip is set into the bench flush with the top and secured to it by bolts that have a nut and washer on the under side of the bench. The cramp (B) itself is made from 1½-inch square iron bar with the upper end forged as shown, to provide a step and the lugs. The arm (C) is forged up



from ¾ x 1 inch steel to the shape indicated, one end having a U shaped hinged foot (D), the other end receiving the adjusting screw (E).

For adjustment of height, the wedge key (F) is pried up with a small pinch bar and the clamp raised or lowered, and then it is tapped tight again.

By using two of these types of clamps and having many holes along the bench to take them, any large bulky work can be handled with ease, besides they hold work that would be impossible to grip in the vise.



DRILL GRINDING

TO get the maximum efficiency and full life from a drill it is essential that it be properly ground at the point. The two cutting edges must be of exactly the same length, and hence of the same inclination of the axis of the drill; 59 degrees is recommended as the best angle for ordinary purposes (see Fig. 1.)

The clearance angle or lip clearance should be least at the outer edges, and should increase as the center is approached. The reason for this is that, although every point in a twist drill when feeding is moving through a distance equal to the feed of the drill per revolution, the helix angle corresponding to the motion of each point varies according to the distance of the point from the center, increasing as the center is approached. The effective clearance angle is additional to the clearance angle, so that as the latter increases, the whole clearance angle must increase also. The clearance angle of a drill must therefore be greater at the point than at the outside corners. If therefore at any point along the edge the clearance should be too small, the drill will not cut freely and will consume excessive power. If, however, the clearance should be excessive, the drill will chatter and break or wear away at the cutting edge. If the clearance is too small at the center, the drill is likely to split up the center.

It is not practicable in the workshop to provide different clearances for every variation in the penetrability of the different metals, to be drilled. It has therefore been found that ordinary purposes can be served by working to two standard minimum clearances, one for cast-iron and another for steel.

The minimum clearance angles vary from 7 degrees for cast iron to 6 degrees for mild steel at the outside corner of the drill, as shown at B in Figure 2. The maximum clearances in common use range up to as much as 15 degrees.

It must be admitted that the grinding of twist drills is at best only an approximation, inasmuch as the twist drill is itself even theoretically only an imperfect cutting tool, as the center portion or point cannot have any true cutting action, but has to crush or grind its way through the material. A matter which is frequently very badly neglected is the desirability of thinning the point of the drill. The thickness of the point varies greatly with different sizes of drills. A drill which has been thinned at the point will stand a coarser feed and will last much longer than an unthinned drill.

Figures 3 and 4 show a drill-point before and after thinning down. The line across the center of the drill point should be, as in Figure 5, about 135 degrees; never less than 125 degrees.

If the drill-point is ground central, but the angle of the cutting edge different, the drill will bind on the side of hole opposite to that side of the point which is cutting, will drill too large a hole, and all the work will fall on the one cutting edges. Figure 6 illustrates this, while Figure 7 shows a point ground with equal angles, but with the cutting edges of different lengths, which will result in the hole being too large. When both angle and length of cutting edges are wrong, the drill will be laboring under the severe conditions shown in Figure 8, and the support which the drill should receive from the metal in which it is operating will be seriously impaired.

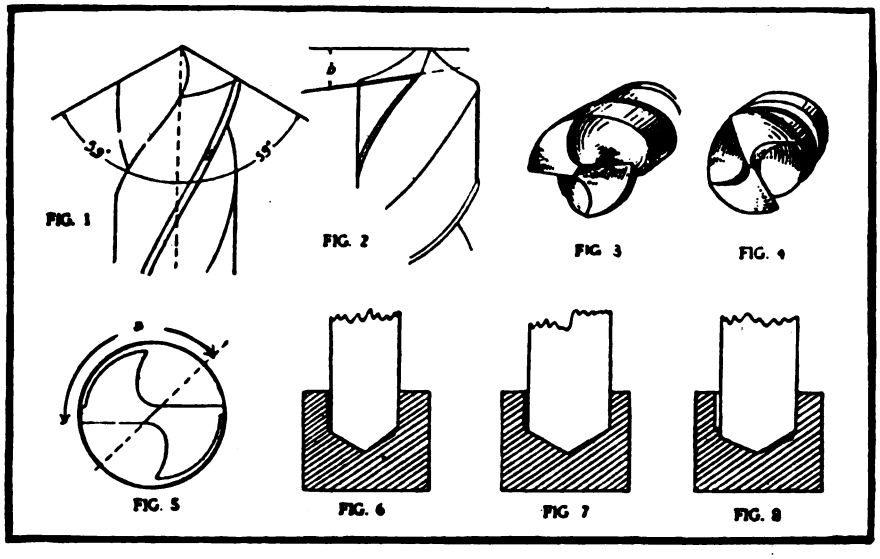
The following notes on drilling will be of interest. If the drill chips out at the cutting edge, it is either running too fast or it has been ground with too much lip clearance. When the extreme outer corners of the cutting edge wear away rapidly, it is evidence of too much speed.

The remedy for drills that chip at the cutting edge, although properly ground, is to decrease the feed and increase the speed. A heavier feed should be used in drilling brass to ensure chips working out, and if lubricated at all, the drill should be flooded with paraffin.

High speeds in drilling cast-iron tend to wear away the small portion of the drill that represent its full diameter call "land" or margin. Variations in the hardness of the material drilled should be met by the operator with changes in the speed and feed. A drill that would be entirely too brittle to work well in softer and tougher material, will work well in hard material. The feed for drills ¼ inch and smaller in diameter should be from .004" to .007" to .015" for larger sizes.

The peripheral or surface speed for drills is: 30 feet per minutes for steel and wrought-iron, 35 feet per minute for cast-iron, and 60 feet per minute for brass. The surface speed in feet per minute is found by multiplying the diameter of the drill in inches by .262 and the product by the revolutions per minute.

The above speeds are approximate for average conditions. They can be greatly exceeded under some conditions, but with others they will have to be reduced.



MAKING HANDY SCRAPERS

There is need in every shop where machinery such as auto, tractor, and truck engines are overhauled and repaired, for a generous supply and varied assortment of scraper tools for fitting new and refitting old bearings, scraping piston rings, pistons, carbonized cylinder heads, etc.

A very good set of such scrapers can be made up easily at the forge from various shapes of worn-out files, forging and framing roughly at the anvil and refinishing on the emery wheel.

PRACTICAL SUGGESTION ON SPRING MAKING

By Merle E. Morgan

FROM my experience in spring making and rebuilding, I have gained some information, which I believe will be of value to those engaged in that kind of work. It is with this hope in view, that I am offering these brief suggestions.

Every spring maker and sometimes even the causual observer, are aware that a spring must be properly balanced, if a reasonable amount

FIG. 1

of service is to be expected from it. More spring failures are traced back to a fault in their design in this respect, than to all other defects combined. It is a feature quite frequently overlooked, but one which can be easily corrected if a little thought is given to the matter, when the spring is laid out.

By the term "Balance" is meant, the arrangement of the leaves in such a manner, so as to afford a maximum strength over the entire length of the spring without impairing its resiliency or exposing a weak place where the spring is liable to break under a severe strain.

One of the most serious faults in spring design is to make the short leaf too long. Figure 2, shows a poorly designed spring in which this defect is most apparent. The excessive length of the short leaf causes the spring to be entirely too rigid between the points AA. The result of such a design is that all movements of the spring occur between the ends of the short leaf and the ends of the spring. It is readily seen, that the portion of the spring laying between points A & A is compelled to rigidly resist all roads shocks. Being unable to bend back and forth and absorb its portion of the shocks, there is but one of two things which can happen. Either the spring will sag at point B or else break off at the tie bolt. Since the presence of the bolt necessitates a hole through all of the leaves, the spring is most apt to break at that point, because the hole naturally weakens the spring.

Figure 1, shows a spring with a layout, which has been found to give very good results. Because of the better distributions of the leaves, the spring is much more resilient and very less apt to break. The shocks which the spring is called on to absorb, are taken up by nearly its entire length instead of being confined to only a portion of the spring.

It is important when making a main plate to have the hole properly located with reference to the end of the spring, which fastens into the solid part of the frame, otherwise it will throw the axle out of true. It is better practice to make the new main plate 1/4" longer than the old main plate, because many swing hangers have a solid bottom if the new plate is short one is most apt to experience difficulty in inserting the shacle bolt.

It is also a good practice, when building a new spring to make it an inch higher than the one on the opposite side of the vehicle, as a properly made spring will settle that much when the weight is applied. When taking spring measurements, it is essential that the spring should be relieved of as much weight as possible.

A main plate which is broken at the center hole can be welded. First, it is necessary to determine the distance from the end of the spring. An ordinary scarf weld gives good results when handled properly if a reliable welding compound is used. The weld should be drawn out the same size as the main stock. Only one heat may be used to make the weld, although experience seems to have shown that better results may be accomplished if the weld is merely stuck at the first heat and the edges of the scarf hammer down closely. More compound is applied to the weld, then it is reheated. The actual welding being done on the second heat. The ends of the scarf should be made thin and sharp and care should be exercised not to burn these thin edges during the welding process.

In welding broken leaves particularly main plates broken at the tie bolt hole, it is impractical to split the spring leaf. It is a difficult and laborious process and an unsatisfactory weld is almost certain to result.

After welding it is more advisable to punch the hole, than to drill it, because the former method will to a certain extent test the quality of the weld.

BLACKSMITH INVENTOR AND LEGISLATOR

HOW many of us plug along every day, consoling ourselves with the happy thought that the particular work we are doing is of such a menial and unimportant nature, that it will never get us anywhere. Drudging along, administering a lot of uncalled for sympathy to ourselves because Dame Fortune hasn't planted us on some pedestal of Fame for which reason we believe that our lot is absolutely devoid of a promising future.

In many instances we are telling ourselves the truth. We are so preoccupied condoling with ourselves over our imaginary misfortunes, that we fail to see existing opportunities. The man who succeeds is the man who realizes a commercial necessity or better still anticipates such a need and then sets about to fill it.

Those of us who are laboring under the delusion that we "haven't a chance in the world" may read with interest the following account of a most unusual blacksmith, who "cashed in" on one of his ideas. He saw an opportunity and grasped it, and has found it pretty profitable to have done so. Besides, he represents his County in the State Senate and despite the fact, he is 72 years of age, he puts in eight hours every day at the forge. This is how Mr. Charles L. Marsh of Solomon's Island, Maryland, tells of his experiences.

"If it does not tire you, I will relate briefly the history of my life. I was born in Ulster County, New York. As a boy of fourteen I started to work at the blacksmith trade,

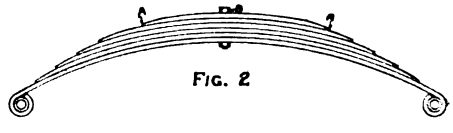
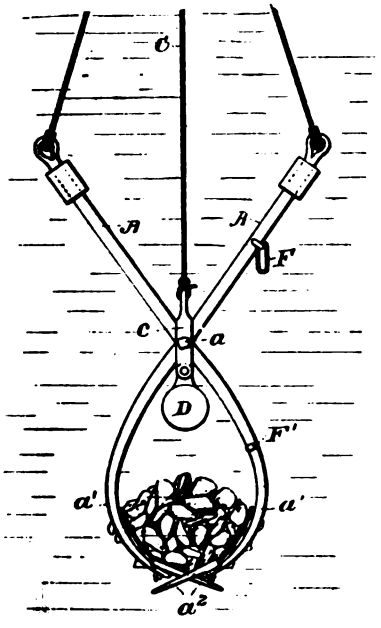


FIG. 2

which pursuit I have followed for fifty-eight years. I served my time as an apprentice in the boiler making trade and have been engaged in steamship building. At one time I had charge of the Hoboken Iron Works.

"Nearly thirty-five years ago I moved to my present address where I started a shipsmithing shop. While engaged in that work I observed with interest the difficulty experienced by oyster fishermen in

obtaining good catches. Their equipment limited them to operation in only shallow water. Seeing the need of an implement, which would work to advantage in deep water, I set about making a device for that purpose. After some experimenting I developed my invention to a point where it worked satisfactorily and then had it patented. It is shown in the accompanying illustration. Although patented some years ago, it is still very popular and in considerable



demand. Eight hours every day, you may find me at the forge hammering out iron and steel in an effort to fill the orders.

"Oysters are found in abundance at a depth of 120 feet. There is an objection to this variety however. They are inclined to have a strong rank flavor, which lowers their market value. But when they are cultivated they develop into specimens, which are extra large and fat and most acceptable for culinary purposes.

"The oyster beds lay in the waters of the Patuxent River and are reached by motor boat. With the use of my tongs which are raised and lowered by means of a line attached to the engine, it is possible for a man and helper to catch from forty to eighty bushels of the finest oysters in a day."

Mr. Marsh, who is a wide awake up to the minute blacksmith does not find that working at the forge detracts from the dignity of being a State Senator. Quite to the contrary, his only comment is the modest admission, "I am all American, like the AMERICAN BLACKSMITH." He has represented Calvert County at the State Legislature for six years and has also been County Treasurer for a number of years.

We do not quote Mr. Marsh's experience in the belief that any of our readers may find it profitable to engage in the manufacture of this uncommon line. Some of our subscribers out in Death Valley might find it rather difficult to market that product, but what we do believe is, that he has displayed some initiative which any of us might well pattern after and look around our own locality and see if there isn't some golden opportunity waiting there, for us to develop.

TRUCKTOR

A dealer in second hand machinery and material in a Western city has devised a novel truck with which to haul heavy casting or machines. And although the machine is rather slow it is dependable. Being originally constructed to travel over any kind of ground it can move loads to places where the ordinary truck would find traction difficult.

This new truck, which might appropriately be called "tructor", is merely a large farm tractor converted into a truck by attaching a truck body or wagon box to it. The photo accompanying this article shows quite clearly the different features of the machine.

Aside from the interesting novelty of the tructor it embodies some useful ideas. Constructed to turn sharply when plowing the original tractor lends the new device a facility for getting in and out of places where a truck would not be able to operate. When the roads are muddy the tructor will wade right through, if the spade lugs are attached to the drive wheel. It will easily haul a four ton load. Thus the farmer could use it for a great many purposes after employing it as a plow.

David Baxter.

ADVERTISING IN VERSE

By Ernest A. Phillips

The progressive advertiser who has on hand or in stock a line or supply of goods he wishes to place conspicuously before the great American public is continually watching for the newest and latest system of advertising, and it is possible he will do well by tending due consideration to the policy of advertising in verse.

During recent months merchants of various commercial establishments have successfully placed their ads before the reading public in verse of unique form, and in so doing they have uncovered a new method of keeping the public informed on what they have to sell; and when these little verse ads are accompanied with an attractive little cartoon of like nature they are practically certain to attract the reader's eye.

One merchant who wanted to advertise in verse found himself up a stump for a poet, but finally hit upon a good plan by going to the high school and offering a prize of five dollars for the best line verse advertising a new brand of coffee, and three, two and one for the next best three verses. The result was that he secured enough verses to run him a year and came near turning every student into a poet.

And poetry in the advertising columns is something that instantly attracts the interest and the eye of the reader; and it will always bring a laugh if not a sale. As one man said after reading a little drug store ad written in verse: "Well, I can't use any of his junk, but I'll drop in and get a soft drink anyway. Any one who advertises like that gets my money."

Why not give it a chance, and surprise your customers with something wholesome, refreshing, and out of the ordinary?

A HOME MADE TRUCK OF UNUSUAL DESIGN, IT IS PARTICULARLY WELL SUITED TO "BAD GOING"

1919 Story of Auto and Truck as told in Condensed Figures

MOTOR CAR MANUFACTURERS

Motor truck manufacturers in production	170
Passenger vehicle manufacturers in production	90
States in which factories are located	32
Employes in automobile factories	580,000
Passenger cars produced in 1919	1,585,787
Motor trucks produced in 1919	305,142
Wholesale value of 1919 passenger cars	$1,399,282,995
Wholesale value of motor trucks	$408,311,585
Average wholesale price of passenger cars	$882
Average wholesale price of motor trucks	$1,338
Automobile tires manufactured in 1919	30,000,000

DEALERS, GARAGES, ETC.

Total dealers, garages, repair shops, etc., in U. S.	62,036
Passenger car dealers	32,317
Motor truck dealers	18,943
Garages	36,247
Automobile repair shops	43,281

EXPORTS

Value of motor vehicles and parts exported in 1919	$146,334,516
Number of passenger automobiles exported	62,624
Value of passenger cars exported	$68,945,740
Countries to which automobiles were exported	81
Number of commercial cars exported	14,748
Value of commercial cars exported	$35,372,419
Value of parts exported in 1919	$42,016,284

MOTOR VEHICLES IN USE.

Motor vehicles registered in U. S. (approximately)	7,100,000
Motor vehicles in New York state	570,000
Motor trucks in use in United States	700,000
Tons of goods hauled yearly by trucks (estimated)	2,200,000,000
Cost of haulage by motor trucks at 18c per ton mile	$1,980,000,000
Cost of haulage on basis of 24c per ton mile by horse and wagon	$2,640,000,000
Value of passenger service at railroad rate of 3c per mile	$2,525,000,000
Number of persons in United States to one motor car	15.96
Percentage of cars sold to farmers in 1919 (estimated)	40
Automobiles in U. S. for each square mile	2.1
Horses displaced by motor trucks in use (estimated)	3,600,000
Acreage released by truck for production of human foods	15,000,000
Greatest percentage of increase in car registrations—Tennessee	29%
Greatest number of cars per capita, Iowa and Nebraska	One for every 6⅙ persons
Revenue to states from license fees	$ 65,000,000

Farmers are largest users of trucks, owning 10 per cent more than manufacturers and 15 per cent more than retailers.

Federal aid allowance to the various states for road construction in September and October amounted to $24,780,906.43. On Oct. 31, 1919, 1927 projects, representing 18,596.7 miles of highway, had been approved and 1065 projects, representing 8407.2 miles, awaited approval.

The first New York show was held in 1900.

In 1898 gasoline sold for 6 cents a gallon.

The first four cylinder car was brought out in 1900.

In 1896 Barnum & Bailey announced that they would exhibit throughout the country a "horseless vehicle."

In July, 1898, the news was given that a plant would be built to turn out "one motor carriage a week."

Gen. Nelson A. Miles, Chauncey M. Depew, and John Jacob Astor were judges of the second automobile run to be held in this country.

In 1896 there were only four automobiles in the United States.

The first long distance tour was made from Cleveland to New York. It took from July 28 to Aug. 7.

The first transcontinental run was made from Cleveland to New York and took over two months, from May 23 to July 26.

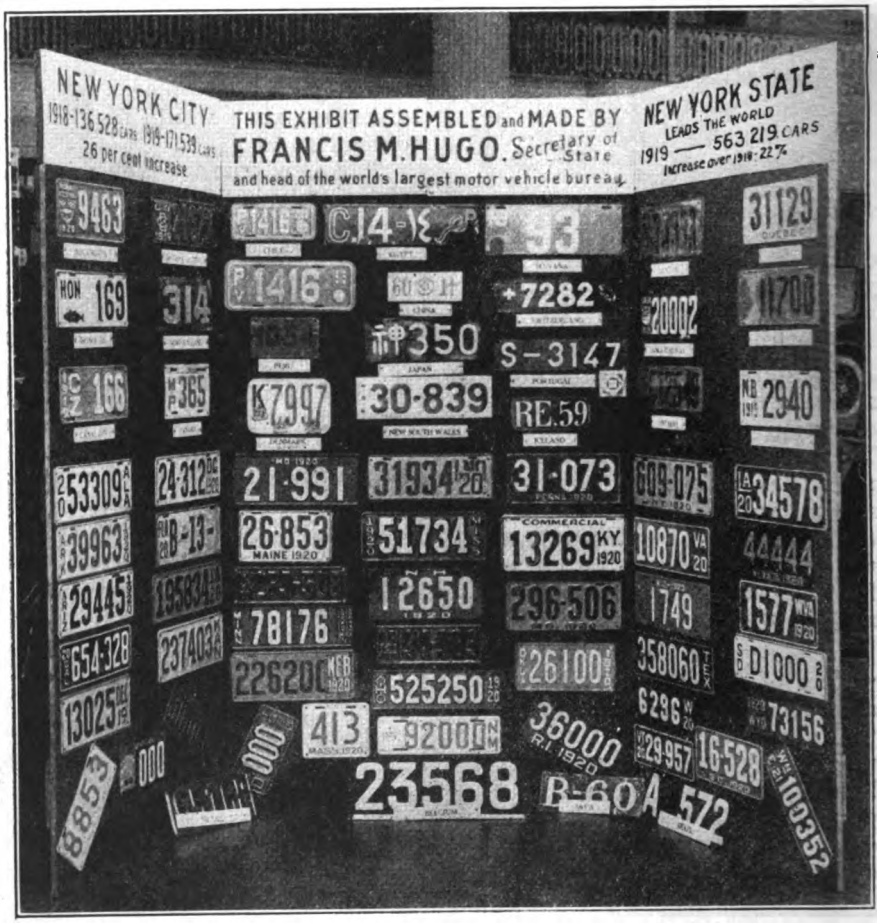
In March, 1897, in the New York Journal, a writer described his first motor car ride as follows:

"In search of a new sensation I went yesterday and rode in a horseless carriage.

"I dreamed once that I walked down Fifth avenue in my pajamas in the full tide of the afternoon promenade and almost died with shame before I awoke. Yesterday I had something of the same feeling as I sat there and felt myself pushed forward in to the very face of grinning, staring, and sometimes jeering New York."

The Automobile club of Bridgeport, Conn., formed in 1900, started its career by advocating the establishment of an "auto stable" where automobiles could be kept and cared for at a nominal cost.

THE SUN SEES 'EM ALL IN ONE DAY



NUMBER PLATES FROM POLE TO POLE. PHOTO SHOWS EXHIBITION OF AUTOMOBILE NUMBER PLATES ASSEMBLED AND ON DISPLAY IN ONE OF NEW YORK'S LARGEST AUTO SALES ROOMS. ON THE BOARD ARE TAGS FROM CHINA, ICELAND, CHILE, NEW FOUNDLAND, NOVA SCOTIA, HONOLULU, MANITOBA, NEW SOUTH WALES AND MANY OTHER COUNTRIES

SALES TAX MUST REPLACE EXCESS PROFITS TAX

Ralph H. Butz

THE excess profits tax is one of the most unjust, unsound and dangerous taxes which has ever been imposed upon our industries. Though probably justifiable as a means of raising revenue for the prosecution of the war, it is both unscientific in principle and unsound. Although this tax is in form of a direct tax on profits, it is, in effect, a most unsatisfactory commodity tax. A manufacturer, merchant, or other business concern subject to the tax, in most instances, estimates in advance, the amount which he is compelled to add to the selling price of the commodity in order to pass the same on to the ultimate consumer, so as to protect himself against the heavy imposition.

Because of the uncertainty of the determination of the tax, owing to the intricacies and complexities of the law, a business concern is apt to overestimate, rather than underestimate, its liability. In doing this, it often becomes an unintentional profiteer in safeguarding itself from an undue usurpation of its earnings. Thus prices are increased to the consumer by amounts more than sufficient to cover the tax. If we abolish the excess profits tax, we undoubtedly will have eliminated a potent factor in the existing high cost of living.

Gross Sales Tax More Equitable—As a matter of principle, consumption taxes are recognized as proper sources of Federal revenue and existing taxes must be superseded by an equally productive system which does not so seriously threaten the prosperity and even the existence of our industries. What is needed most at the present time is a tax law, which may be productive enough to raise a large amount of revenue and elastic enough to meet changing conditions, and at the same time, not be an impediment to increased production, and simple and economical in administration. It is generally admitted that a gross sales tax at a low rate will produce a large amount of revenue, depending upon the scope of its application, it having been estimated that a tax on general sales of one per cent will produce three and a half billions, and a similar tax on retail sales one and a quarter billions.

Possibilities of the Gross Sales Tax—Summing up the possibilities of the gross sales tax, we find that it gives the following advantages:

1. Either a cumulative tax or a tax limited to retail sales will be productive and flexible and probably offers the only available substitute for the excess profits tax.

2. The tax would be equitably distributed over a large mass of people and would be so light that it would not impose an undue burden.

3. As a substitute for the excess profits tax, it would impose a definite, certain, consumption tax, easily ascertainable in place of an indefinite, undeterminable tax which is now passed on to the consumer on a good deal higher basis than the actual imposition.

4. The tax is so low that in practice any attempt to abuse or defraud the consumer should be taken care of by competition.

Universality of incidence is the marked advantage of a gross sales tax. A consumption tax of this character will reach the great mass of farmers and wage earners into whose hands the greater portion of the natural income goes. These classes apparently are sharing fully in whatever prosperity the war has brought, but cannot be reached effectively through income taxes. Thus, a large number of people will contribute to the expense of the Government a large amount in the aggregate, in sums depending upon the amount of their expenditures. The man who lives carefully and conservatively would pay less than one with the same income who lives recklessly or extravagantly. For instance, a man with an income of $2,000, who spends all of it, would pay about $20 tax, and this amount would be so distributed and paid throughout the year in his purchases that he would not realize that he was paying a tax.

Cumulative Tax on Turnover—The best method would be to place the gross sales tax cumulatively on all commercial turnovers from the original purchaser to the final sale by the retailer to the consumer. It has been objected that this would be pyramiding the taxes, but a cumulative tax on gross sales would add less than one-half of one cent to an article selling for about forty cents.

A manufacturer whose gross receipts from sales are $100,000 a year would pay a tax of $1,000. This amount would be passed on to the consumer in a way that would be the easiest and most practicable by adding to the cost of the commodity sold or manufactured—not necessarily by adding a fixed amount to each sale.

For instance, on some products the manufacturer may be able to stand the amount of the tax because of the large margin of profit, whereas on others his margin may be very small and an increase in price to take care of the additional tax could be made. His purpose would be to recoup the amount of the tax by adding to the price of the articles to which the increase could be applied to the best advantage. Competition could be relied upon to prevent abouse and profitering, and the imposition of unreasonable charges on the consumer in the guise of consumption taxes. Further than that, the public will be awake to the amount which the merchant or manufacturer is required to pay to the Government, which is not the case under the present excess profits tax law.

PRODUCTION FIGURES SHOW GROWTH OF MOTOR INDUSTRY

PASSENGER CAR PRODUCTION

Year.	Number.	Wholesale value.
1899	3,700	$ 4,750,000
1904	21,281	23,634,364
1909	127,731	159,918,506
1914	543,679	413,859,379
1917	1,740,792	1,053,505,781
1918	926,388	801,937,925
1919	1,586,787	1,399,282,995

Average wholesale price for 1919, $882.

MOTOR TRUCK PRODUCTION

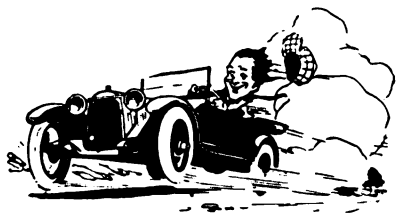
Year.	Number.	Wholesale value.
1904	411	$ 946,947
1911	10,655	22,292,321
1917	128,157	220,982,668
1918	227,250	434,168,998
1919	305,142	408,311,585

Average wholesale price for 1919, $1,138.

STARTING IN AN EMERGENCY

When the starter is not working and the crank handle cannot be found it is possible to start the engine by jacking up the rear wheels and shifting into high. The cylinders must be primed and the spark and throttle levers set. The engine is started by turning the rear wheel, taking hold of the tire rather than the spoke. Care should be taken to avoid getting caught when the wheels start to revolve.

High Spots



Religion and Business

Two brothers once ran a store in a small Western Town, where they had quite a large trade in wool on barter. One of the brothers became converted at a revival and urged the other to follow in his footsteps.

"You ought to join, Jake," said the converted one. "You don't know how helpful and comforting it is to be a member of the church."

"I know, Bill," admitted Jake, thoughtfully, "an' I would like to join, but I don't see how I can."

"Why not?" persisted the first. "What is to prevent you?"

"Well, it's jes' this way Bill," declared Jake. "There has got to be somebody in the firm to weight this here wool."

BEATS THE HEN

Two men were hotly discussing the merits of a book. Finally one of them, himself an author, said to the other: "No, John, you can't appreciate it. You never wrote a book yourself."

"No," retorted John, "and I never laid an egg, but I'm a better judge of an omelet than any hen."

ANYBODY HERE SEEN THOMAS?

Jim Foster bought a horse from Charley Thomas, of Berkman, last Tuesday.

James Foster is suffering from a knee out of joint, the result of being kicked by a horse.

James Foster went to Berkman Saturday. The stage carried him.

—Locals in Mercyville, Ia., Banner.

SOME HEADLIGHT THIS!
A MIRACULOUS CURE
MR. JACOB WENDEL IS STUNG BY 200 BEES AND LIVES TO TELL THE TALE

While visiting Mr. Gillman his son-in-law, the bees swarm and while assisting in hiving them they attack him. The stingers are removed with a hoe, after which his own make of liniment is applied.

SOME CONSOMME AND A BRUNETTE FOR US, PLEASE.

. . . . . .
. SOUP AND COQUETTES FREE. .
. . . . . .

—Sign at Atlantic City.

Demanding reinstatement of a miner who after six weeks of influenza, found his place filled, 500 hands at the Beaver Meadow colliery struck.

Pleading guilty to shooting in the leg his brother, who reproved him for drinking, David Casey, Freeland, was sentenced to five years in jail.

Some people never hurry unless they are coming to grief.

Experience is the best investment. A theory seldom pays dividends.

The fellow who is looking for snaps ought to have plenty of ginger.

No, Maude, dear; it wasn't because of Friday that Robinson Crusoe ate fish.

It's all right to be a good mixer, but the bartender is out of a job.

When you reach a certain age your hair quits trying to grow on your head and devotes all of its energy to growing in your ears.

What's in a name? Filthy lucre is never dirt cheap.

It's bad luck to walk under the ladder of fame. The thing to do is climb it.

The promoter must be something of an egotist if he would capitalize his capital I's.

MUSIC BY HENRY FORD

For Sale—One Ford car with piston rings;
Two rear wheels, one front spring.
Has no fenders, seat or tank;
Burns lot of gas. Is hard to crank.
Carburetor busted, half way through.
Engines misses, only hits on two.
Three years old, four in the Spring.
Has shock absorbers and everything.
Radiator busted, sure does leak.
Differential's dry, you can hear it squeak.
Ten spokes missing. Front all bent.
Tire blowed out ain't worth a cent.
Got lots of speed, runs like the duece;
Burns either gas or tobacco juice.
Tires all off, runs on the rim.
A damm good Ford for the shape it's in.

Homer S. Wilson, Winfield, Kan., Free Press.

MERCY!

Our attention is called to the fact that the prohibitionists have forgotten to prohibit the following things:

Eating of rye bread.
Visiting the bier of a dead friend.
Using cordial words.
Playing rhum.
Drinking pot liquor.
Eating stewed tomatoes.
Eating pickled beets.
Pitching a high ball.
Eating corned beef.
Eating soused pigs' feet.
Brewing tea.
Distilling water.
Making buns.

This will never do. We hereby request that the Anti-Saloon league demand an extra session of congress at once and see to it that each of the above items is tacked on to the end of an appropriation bill and prohibted for all time.

First Plutocrat—"The scarcity of servants is really remarkable. I actually am unable to find a butler." Second Plutocrat—"And my footman has left me to establish himself as a chiropodist."

Miss Antique—"Some people are dreadfully superstitious about Friday. Now, I was born on Friday. Do you think that is unlucky?" Miss Caustique—"That depends upon how long ago it was."

If money talks how can we say that talk is cheap?

The man who would rather lose a friend than a dollar may eventually lose both.

Dead men tell no tales. They leave that to the romancers who write their biographies.

There is plenty of room at the top. The trouble is that a high altitude makes most of us dizzy.

Just because people are at odds don't jump at the conclusion that they are not trying to get even.

Just because a girl thinks a fellow is a brick is no reason why he should throw himself at her head.

Wigg—"Bighedde says the doctor tells him he has to take more exercise." Wagg—"Huh! Bighedde gets plenty of exercise patting himself on the back."

The very best business in the world for a young man is to be engaged in is his own.

It is quite possible to live on tick, but that doesn't make things go like clockwork.

The dentist may put a dam in a man's mouth, but it won't stop his flow of profanity.

Often the apology is worse than the offense.

Love makes a young man sober and an old man giddy.

Busy men are seldom afflicted with fits of melancholy.

Wise people respect the man; fools respect good clothes.

Any man who does you an ill turn will never forgive you for it.

A man carries domestic economy to extremes when he stops the clock at night to save time.

Many a man works overtime trying to convince himself that he is honest.

Intuition is what some people claim to have when they succeed in making a good guess.

Nothing is more edifying to some people than to see a bowlegged man chasing his hat in a windstorm.

Don't look a gift horse in the mouth. Sell him for what you can get and let the other fellow look.

Don't take a bull by the horns; take him by the tail. Then you can let go without getting some one to help you.

The desire of some men to wabble around in a big place rather than fill a small one accounts for many of life's failures.

GOSH!

Ashland (Ky.) Independent.

He visited to a big tobacco house which he had never before seen anything like.

WHY?

Why is it that no matter how crowded the smoker on the train may be, the candy butcher occupies a double seat on the shady side?

If nature doesn't give a man a complexion he has to stand pat. But it is different with a woman.

We often wonder how undertakers managed to become wealthy before automobiles were invented.

A woman makes too much fuss over clothes. It isn't clothes that attract attention. It is what she wears them on.

Funny how the blisters that came for digging worms never hurt the way they would if they came from digging a ditch.

FLOODS WHICH SWEPT FRANCE AND GERMANY CAUSED GREAT DAMAGE

AMERICAN ARMY MOTOR TRUCKS ALMOST ENTIRELY SUBMERGED BY THE WATERS OF THE RHINE

A new element enters the field of Europe to add to its misery and destitution and cause untold suffering. The Rhine, the Rhone, the Seine and other Rivers both large and small, have swelled up and burst with terrific force through their water courses, overflowing banks and retaining walls and inundating for miles the surrounding country.

Many of the stream bed filled with the ruins of buildings, broken bridges and war debris halted the free progress of the gathering water. At many points along the river bed, first and second floors were covered with water. Railroad storage yards were submerged and in some places buildings were completely lost to view.

Coblenz, Cologne and towns along the Moselle as well as Paris and its environs and countless other points suffered from the icy deluge and accompanying wintry blasts.

Benton's Recipes

Glycerine Litharge Cement—A handy cement to have in the shop for stopping leaks, ets., and which can be used for cementing glass, brass, etc., is made by mixing equal parts of litharge, commercial glycerine and Portland cement. This cement will harden under water and will withstand hydrocarbon vapors.

To Recut Old Files—Brush the old files with a wire brush, put them in a tub, cover them with water and add 6 ounces of caustic soda per each 100 files. In about two hours brush them again. They will then be free of grease and metal. Then put them in a box, lined with sheet lead, on a wire stand made for the purpose, and in such a way that they will not touch one another. Cover them with a solution made of nitric acid and water, one pint of acid to each gallon of water. In 25 minutes remove them, wash them in water, brush them with a hair brush and put them back in the liquid to which one more pint of nitric acid to each gallon of water has been added. In about 50 minutes remove them again, brush them after washing them with water and put them back in the liquid to which has been added ½ pint of sulphate acid per each gallon of water. In 15 minutes remove them; wash them; wash them first in water, then in concentrated lime water till all trace of the acid has disappeared. When dry they will have the appearance and cutting quality of new files.

To Keep Steel Tools in Their Handles—Fill the handle with powdered rosin and a little rotten stone. Heat the tang of the tool hot, and then push it down hard into the handle; when it is cold it will be firmly set.

Liquid for Etching on Steel—The following solution will be found excellent and reliable either for very deep etching upon steel, or for the purpose of producing beautiful frosted effects upon the surface. Mix together 1 ounce sulphuric acid, ¼ ounce alum, ½ teaspoonful salt, ¼ pint acetic acid or vinegar, and 20 drops concentrated nitric acid. The etching effect produced by this solution depends upon the length of time it is allowed to act upon the metal. It is applied in the same way as ordinary etching acid.

Filling for Cast Iron—One-quarter tumbler full of Japan dryer, 1½ ounce finely ground dry white lead. Mix and add 1 quart of finishing Japan. Stir in dry rotten stone until mixture is a thick paste.

Brassing Iron—Iron ornaments are covered with copper or brass, by properly preparing the surface so as to remove all organic matter which would prevent adhesion, and then plunging them into melted brass, or copper. A thin coating is thus spread over the iron, and it admits of being polished, or burnished. The better the article is finished and cleaned before dipping, the better will be the final result.

Compound for Cleaning the Hands—To loosen the oil and grease, the hands should first be scrubbed with a stiff brush dipped in kerosene, and then they should be wiped dry with waste. Take a five-cent box of any kind of soap powder I prefer soapine, because it lathers freely add to it an equal quantity of sawdust and half the quantity of white sand. Mix thoroughly and rub over the wet hands in the form of a paste. This entire mess will rinse off in any kind of hard or soft, hot or cold water. Hands washed in this manner twice a day will be free from grime and clean all over.

Belt Dressing—The belt dressing recently recommended in ———; a mixture of 95 per cent resin and 5 per cent of machine oil—is the second best compound of which I know for ruining either a rubber or a leather belt. (The best is printer's ink.) Either of these will make a leather belt glazed and stiff, and will flake off the outer layer of any ordinary rubber ply belt. There is nothing better for leather belts than crude castor oil, applied hot. Nothing should be allowed to touch a rubber belt but hot soapsuds or warm dilute potash or soda lye.

TANKS MOVE BASE HOSPITAL AT FORT BLISS

THIS IS INDEED AN INOVATION IN THE MANNER OF MOVING BUILDINGS. THE TANKS WHICH EFFECTED THIS LONG DISTANCE HAUL SAW CONSIDERABLE SERVICE IN FRANCE

Queries-Answers-Notes

THIS department is the meeting place where you are free to ask for information, answer questions, discuss shop matters and business conditions and any other notes you feel would be of interest to a fellow mechanic. Make use of this Department as often as desired.

A Blacksmith who handles big jobs—I am sending you a picture of some work we are called on to do out here. It is a seven foot friction pulley that was worn out in the hub so that we had to put in a new brass bushing. It weighs 1200 lbs., the bronze bushing weighs 65 lbs. If you will notice I have made a boring machine out of an old shaper. There is a cutting head in the shaft and a feed screw is under the boring shaft with a star in the end which engages the gear wheels. It has been necessary for us to rig up some improvised machinery to handle the ever increasing demands of our Repair Shop. We cater particularly to modern farm machinery and are called on to frequently make some unusual repairs.

Wm. Exline, Kipp, Kans.

I was very much pleased to read the two letters in your December issue in answer to mine, and with your permission would like to make a few comments on them separately.

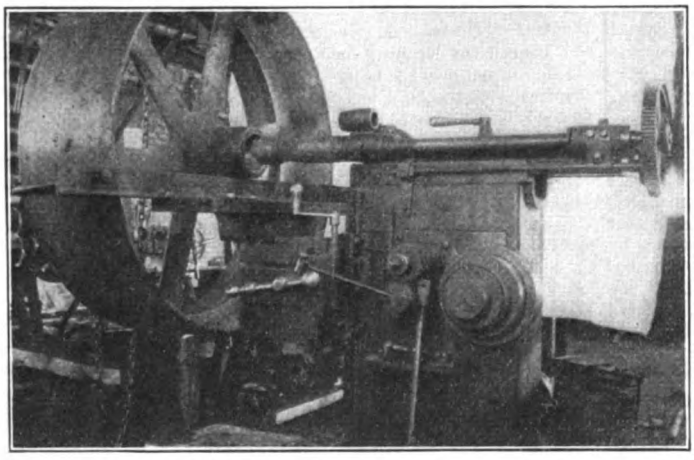
In the first letter the writer refers to the number of autos passing my place daily in the summer time, and he says it is a very peculiar thing that I have not stopped 50 of those cars. How am I to do that? Throw some broken glass on the road? Now it would be a poor compliment to any car owner, if they were to leave Toronto with their cars improperly equipped and unfit for the trip, they contemplated and seeing that there are at least five well equipped garages between my town and the city, a distance of 12 miles, I don't see how I could stop fifty of those cars. In the second place he says, "Don't rent your shop but 'Flop her over". What does he mean? I presume he means to rearrange and extend it so as to make it suitable for auto work and then he says to lay in a good stock. Any of those mentioned articles would cost a small fortune at the present prices. There is a lot of good advice in Brother Stoney's letter, but I am afraid it would take a lot of capital for a man to follow it.

We will be very much pleased to hear from him at the end of the year when he has tried the change himself. The second letter from Bro. Stewart, Kansas seems to coincide more with my own way of thinking. His idea seems to be to go slow in making any change, that as a man gets older and fatter the less crawling under autos he has to do the better it suits him. He seems to think that oxy-acetylene welding would be a good side line to take up and in this connection would like to ask what a good reliable outfit of this kind would cost and if it is hard to learn the business.

I thank both gentlemen very sincerely for their views, and I think it is a splendid thing to have a page in a paper like yours Mr. Editor where brother blacksmiths can exchange opinions and tell one another about conditions of the trade in their respective localities. I thought it would be of interest to some of your readers to know what we charge for different kinds of work in this part of Ontario.

New Shoes .....65c Resetting.....35c
Bar Shoes .....$1.00 Resetting.....50c

Never Slip and drive calk shoes 1.00 per shoe 5c per calk that is for extra calks. Tire setting 1.00 and 1.50. New tire according to size $10.00 to 20.00 per set. Sleigh shoes $8.00 to 2.00, coulter laid 75c sharped 25c. Those are the prevailing prices although I am sorry to say there is some price cutting. Others have never been advanced to them. We have tried for several years to get up a union amongst the smiths in this neighborhood but so far have met with very poor success.



SOME OF THE EQUIPMENT MR. EXLINE USES FOR HANDLING THE LARGER JOBS

I believe you smiths over in the States have the advantage over us fellows here in Canada as I believe you get your raw materials cheaper and I would very much like to see free trade established between the two countries as then we would be on an equal footing. I would be very much pleased to hear from Bros. Storey and Stewart again either through the columns of your paper or privately regarding prices of work and material. I have not given you the material price list as I am afraid I may be taking up too much of your valuable space but will do so in a future letter if you will permit me.

Geo. Cowie, Ont., Canada.

Building a Power Hammer—I have been a reader of your paper for a number of years and have found it contains much valuable information. In my shop, which is 24x64, I do blacksmith and wood working and run a band saw, rip saw, emery stand, drill press, planer and sander. I built all of these machines and they all work most satisfactorily.

I am thinking of adding a power hammer to my equipment and intend to make it myself and for that purpose would like a little information. If some brother smith would oblige me in that respect, I would be most willing to pay for it. I would like to make a hammer of the Helve type, using a hammer head weighing about 40 pounds. I have a crank shaft, which would give a stroke of 5 inches to the connecting rod. Would that be suitable? What sized spring is necessary and would it be necessary to temper these springs? What would be the most satisfactory dimensions for the anvil block? How heavy should it be? What should be the requisite thickness of the casting's walls? John Ragnauldson, Winnipegosis, Manitoba.

Editor's Note—It is quite obvious that the above inquiry involves some difficult engineering problems, which are further complicated by the fact, that it is not definitely decided just how much of a blow, the hammer is to deliver. For that reason it is difficult to estimate the size of the parts necessary to resist the shock and strain. We believe the idea practical, but it will necesitate a little experimenting with the various parts particularly the spring, which by all means should be heat treated or tempered slightly to impart the proper resiliency.

A 5 inch stroke is hardly sufficient for the reason, that it will not accommodate a large variety of work and then too, it should be borne in mind the longer the stroke the greater the velocity of the hammer will be and the resulting stroke will be more powerful. If the over head beam type, such as employed on some hammers, is used the stroke of the hammer can be adjusted to any desired length, merely by changing the position of the beam's fulcrum. The crank shaft should be one of heavy design and construction, in order to successfully resist the shocks and vibrations, to which it will be subjected. The tensile strength of close grained cast iron is approximately 20,000 pounds to the square inch. After the blow of the hammer has been calculated this can be used as a basis for determining the thickness of the castings which resist those shocks, bearing in mind that cast-iron is incapable of resisting sudden shocks, a large factor of safety should therefore be employed. We have never designed a power hammer and if any of our readers have had any experience along that line both Mr. Ragnauldson and our selves would appreciate their comment on the foregoing.

I will be pleased if you will give me information regarding the advisability of removing carbon in gas engines by burning, just whether it is harmful or not

and if the continuous use of this method has any effect on the cylinders or pistons. Would also desire the best method to use.
W. D.—New York.

Replying to your inquiry in regard to the practicability of removing Carbon from Gas Engines by the Oxygen process we know of no harmful effects to the cylinder wall or piston heads provided the flame is manipulated properly. A flame is placed in the cylinder and pure oxygen introduced through a metal pipe. The carbon burning freely in the presence of this gas and the flame automatically extinguishing itself when the carbon has been entirely consumed.

There is however, a slight soot or deposit left, which would not occur had the carbon been removed by a manual process. It is important that the piston shall be in firing position so that both intake and exhaust valves are closed. All gasoline should be drained from the carburetor.

This process eliminates the necessity of removing the head from the engine and where the valves need no attention we would advise this method in view of the saving which it affords. Its success, we might add, depends largely on the skill of the operator.

Making Solder I have some old lead pipe and would like to know if this lead could be used for making solder if it was mixed with block tin? What should the proportions be? I have also some old copper wash-boilers and am wondering whether these could be melted in the forge and made into soldering coppers.
W. S. B.—Oklahoma.

It is possible to make solder from the lead by melting it and removing the impurities. Block tin is then added to the lead. Half and half solder is what its name implies, half lead and half block tin. The tin may be added in various proportions. The more tin the mixture contains the softer the solder will be and the lower its melting point. It is possible to melt copper in a forge by placing it in a graphite crusible or an improvised retort may be made from fire brick. Scrap copper from old washboilers and the like do not make good soldering coppers for the reason that they are of a poor quality and usually are plated. Soldering coppers are made from rolled stock and may be heated and worked the same as iron.

A Far Sighted Blacksmith — Having read in the December number of your journal an article by Mr. Bert Story of Michigan and another by Mr. Stewart of Kansas regarding the auto business as a sideline; I have a few comments to make. I have been in business about 12 years at my present address. When I started in I had a $5.00 bill and a set of Carpenter's tools. I now own my own home and have about $1000 worth of tools and carry about $500 worth of stock. About three years ago I started in the automobile business breaking in very modestly by handling only spark plugs, oils, grease and few accessories. Ido all kinds of repairing except acetylene welding. Setting tires on automobile wheels is one of my specialties. You've got to show me that the automobile business doesn't pay. I find it much easier than shoeing horses and the returns more profitable. That is why I cater to this line of work. It is my belief that the blacksmith being the first on the job is the man entitled to get this work and who does if he goes after it properly. O. A. Welch, Bazile, Neb.

Oxy-actylene Spring Welding Impractical—I am very much interested in your paper and read with interest the different writings of the various Smiths, Auto and Tractor men. In your last number, I am reading how to weld autosprings by the oxy-actylene process. This is wasting space as well as paper to agitate anything of the kind. You can not under any condition make a spring stand by welding it by the oxy-acetylene flame or fire. First of all you are not getting the grains of steel in the right direction and then you will not have the chance of hammering your stretch together like you would in the old way of welding. As for getting over the objection to drilling another hole that's easy, if you use the right kind of drills. We weld all of our spring welds in the forge and are having good results. As for welding the main leaves of a spring, we mostly make them new, unless we happen to be without proper steel on hand. In grinding our spring, we are very careful not to let them go rough and no thicker over the welded part than at any other place on the leaf. If possible, we make them the same thickness as the leaves and polish them as smooth, as you would a plow share. That will give them the proper flexibility.

There was a fellow here who showed us how to weld spring leaves by the Oxy-acetylene process. After he had welded and finished off one, he took it to our shop to show us. I took it and put one end in the vise and pulled on the other end with my hands and it broke right off. It showed right in the break that the grains of steel were not set right to make a good weld.
J. F. Eklof, Kansas.

Editor's Note—Fine; that's the kind of pointed criticism, we like to get from our readers. It leaves no doubt in our mind as to just what the particular party's views are in regard to the efficacy of Oxy-acetylene process as applied to spring welding. It is true, there is a whole lot to be said both pro and con purporting to the merits and demerits of the process in question.

The success of the weld depends all most entirely upon the skill of the operator. It should also be borne in mind that in welding alloy or high grade steel, the weld occurs long after the critical point of the steel has been reached and as such, extreme care must be exercised both in the way the flame is manipulated and the proportion of oxygen and acetylene that is used. These are contributing factors for either success or failure and it behooves the operator to be well informed of the various causes and effects, in order to preclude the possibility of failure. Along with the above letter, we received another, expressing a different opinion of the subject. We would like to hear the opinions of some of our other readers, as well.

More on Oxy-Acetylene Welding—Copy of the January issue received last evening and permit me to say, that I am more than pleased with the Journal, in fact, I don't see how any one running a repair shop can do without it.

I am now doing Oxy-acetylene welding, only and the articles by David Baxter are certainly great, especially in the January number. I have been welding spring leaves with fair success, but where I was making a great mistake was in beveling both sides of the leaf, and not reheating it afterwards.

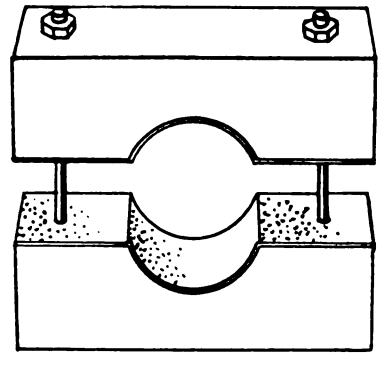
Keep those welding articles coming, but give the Horeshoer and General Blacksmith a treat too, they need them as bad as we do. Wm. N. Benoit, Quebeck.

Connecting the Storage Battery—Which pole of the storage battery leads to the starting motor, positive or negative and tell me the best way to determine same?
Philip Wand, New York.

In the case of a two unit starting and lighting system, it is a matter of no vital importance which lead is connected to the starting motor except where specificially designated. However, in the case of the single unit motor generator type, it is important that the proper connections be made for the reason that after the car starts the generator supplies or rather replenishes the storage battery.

The positive and negative terminals of either the battery or generator may be readily distinguished by emerging these leads in a saturated solution of salt water. It will be observed that one of the terminals will effervesce or bubble more than the other; the one around which this bubbling occurs, is the negative lead and should be in the case of the generator connected to the negative side of the battery.

Auto Work is for Younger Men—In the discussion of taking up Auto Repair Work I have read the letter of Mr. B. J. Storg of Michigan and also the one of Mr. J. H. Stewarts of Kansas. I agree with Mr. Stewart, that the Auto game is for men under the sunny side of 40 to take on. Some years ago I dropped the shoeing game to take on Auto work, but after squirming under an auto for an hour or so to take a part off, when one gets it apart, it only takes about 10 or 15 minutes to do the necessary work on it then it takes another hour or two to put it back. When you come to make the charge on it for your time and that of a helper, as one man cannot do much alone at it, the owner hollers his head off about holding him up etc., there is not much satisfaction in doing work that way. But I weld springs make new leaves, build Auto truck boxes and with the tractor work coming in more continuously I find I can do as well as crawling under an auto. Especially since I am on the shady side of 50 and have to wear glasses, which does not help to improve ones sight any too much. I am therefore not very enthusiastic about Auto work for older men.



The other day a gasoline engine crank shaft came in with the crank journal cut in grooves very badly, the way I smoothed it up was with a mill file first, then I made two wood blocks with grooves cut into them to fit over the crank Shaft putting emery cloth, which I tacked down on the inside of the wood blocks. I then tightened the two bolts as I needed them and working this device around, I smoothed and rounded the crank bearing very nicely. A. L. Ericson, Ladd, Ill.

WANTED AND FOR SALE

Want and For Sale advertisements, situations and help wanted, five cents a word. Send cash with order. No charge less than fifty cents. The small cost of these advertisements prevents our investigating and guaranteeing them. WE WILL NOT knowingly accept any but reliable ones.

FOR SALE:—Automobile. Marine and stationary engines 1 to 100 H. P. Best makes, good condition, very low prices. State your power needs. We take engines in trade. What have you? Magnetos, coils, carburetors, mechanical oilers, water pumps, etc. Also car parts of every nature sacrifice prices. Write about your requirements.
BADGER MOTOR COMPANY, Milwaukee, Wis.

BLACKSMITHS LISTEN: Save time and money by doing your own auto and tractor blacksmithing with Toy's modern methods doing hard jobs easy. Forging and making solid welds, hardening and tempering to a standard with colored tempering charts. All for one dollar. Samples free. W. M. TOY, Sidney, Ohio.

WANTED—Power hammer. **S. E. FRAZELL, Wauneta, Nebr.**

BLACKSMITH SHOP WANTED—Rented, partner or buy. Send description.
STATION H, Box 5, Buffalo, N. Y.

FOR SALE—Blacksmith shop well equipped with modern machinery. Good stock of materials, plenty work for two men; all in best shape; sale on account of health. Price very reasonable. **F. T. TOMANEK, Bruno, Neb.**

WRITE for new price list on Circular style Cutter Heads for wood frame Jointers 5-in to 12 in. Combined outfits Jointers and rounding heads and saw arbors. Prices from $20.00 to $50.00.
W L. SHERWOOD, Kirksville, Mo.

FOR SALE—All or half interest in good Blacksmith shop. Cheap. Write
N. S. ZIMMERMAN, Inman, Kansas.

WANTED—To hear from owner of good blacksmith shop for sale. State cash price, description. **D. F. BUSH, Minneapolis, Minn.**

CARRIAGE SHOP for sale Equipted with improvsed machines and tools and stock of materials apply to
THOMAS BALL, Sinton, Texas.

FOR SALE—Moyer Hub Boring Machine with 13 bits; Little Giant Hub Boring Machine; Diamond Rubber Co., Rubber Tiring Machine; House Cold Tire Setter; 1—24 in, 8 ft. Chamberlain Lathe; 1—16 in. 6 ft. Harrington Lathe; 1—24 in. Fairbanks Drill Press; 1—24 in. x 6 ft. Charles Smith Iron Planer; 2—20 in. Wood Turning Heads with Stocks; Buggy seats, bodies, axles, wheels, etc. **OXFORD TRUCK COMPANY, Oxord, Pa.**

POSITION WANTED—In Wisconsin by experienced wagon maker. Can also do general blacksmithing. Write **OTTO KRETLOW, Rhinelander, Wis., 821 Randall Ave.**

FOR SALE—My blacksmith shop and garage combined, equipped with all power tools, sawemery grinder—drill press—trip hammer—14x10 lathe—oxygen acetylene welding machine—,only shop in town on main line N. P. R. R. must understand gas engine and car work, work for two and three men. full particulars on request, good business, selling on account of poor health.
H. F. G. MICHAELS, Judson, N. Dak.

FOR SALE—1—Defew Disc Roller, 1—Crescent Band Saw, 1—Cold Tire Setter.
A. R. BAILEY, Bloomington, Neb.

FOR SALE—Power Treadcutter cut from ⅜ to 1", 2 sets of dies 1 new 1 old if sold, by or before April 1st, $80.00, weight about 1,000 lbs.
JOHN PAULSEN, Humboldt, Iowa.

FOR SALE—Monarch Disc Sharpener complete $18.00. One Barnes lathe 12 inch swing 4½ ft. bed, two chucks and thread cutting gears $50.00. **A. J. FIELDS, Washington, Iowa.**

WANTED—One Band Saw 32" or 34" wheels and one L. S. P. model 1918 or 1919 calking machine. Must be in good working condition and at sacrifice price.
C. A. BURKE & SON, Elgin, Texas.

FOR SALE—Blacksmith shop located in Berrien county Fruit Belt. Live business in thickly populated district 9 miles to nearest shop, work all year. Receipts between 350 and 500 monthly. Try County Association prices. Building 30 by 70, two story. Power machinery, stock, tools and equipment for $3,000 terms to right party. **LESLIE L. TIRRELL, Proprietor, New Troy, Mich.**

FOR SALE—One little giant trip hammer 50 lbs. head; 1 12 h. p. Sandow gasoline engine; 1 6 h. p. Sandow gasoline engine; 1 Stoddard Tire Shrinker; 1 three inch tire bender; 1 tire bolting machine; 1 House Spoke Auger machine with wood spoke auger in it. These tools have all been used, and are all in good shape.
LOUIS NEHRT, Coldwater, Kansas..
LOUIS NELIET, Coldwater, Kansas.

CARRIAGE SHOP FOR SALE—Equipped with improved machines and tools and stock of materials apply to **T. BALL, Sinton, Texas.**

AMERICAN BLACKSMITH AUTO & TRACTOR SHOP

VOLUME 19 APRIL, 1920 NUMBER 7

BUFFALO, N. Y., U. S. A

WILLIAM F. WENDT, *President.* L. J. WISCHERATH, *Editor.*

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"AMERICAN BLACKSMITH COMPANY"
BUFFALO N. Y

Cable Address: "Blacksmith, Buffalo"

Our Profligate Spending

Rodger W. Babson, who is conceded to be one of the foremost students of business futurities in this country, and whose opinions on weighty subjects of national importance, are sought by the captains of industry, with few exceptions, has expressed in an address, recently delivered before a large commercial organization, some grave warnings worthy of our serious consideration. Mr. Babson conveyed the idea that unless some sort of a check is placed on the present extravagant demands of the people as a whole, a period, nothing short of financial depression, will be the inevitable result. The speaker reasoned, that unless we equalize our present consumption, by returning to the source of supply, the equivalent of what we use, in the form of its equity in labor, we are bound to deplete our resources. We must return as much as we use, if our national prosperity is to be permanent. Mr. Babson's warnings comes in conjunction with similar opinions expressed by other authorities, all of whom urge us to produce more and spend less.

By the term "reckless spending" no specific reference is paid, alone, to the marked tendency of gratifying our extravagant desires. That is but one of the many forms. It is our wastefulness—our disregard for the law of supply and demand—our utter and astounding lack of efficiency.

We are reputed to be the most efficient people on earth, we quite generally admit the allegation. Our modesty in this respect is remarked all over Europe. Yet we, the master minds of all ages, waste enough through our inefficient management in one year to clothe the remainder of the world in riches and fine raiment for years to come.

We the lords of creation—if we are to believe our self imposed titled—wasted no less than two billion dollars in 1919 through strikes alone. That amount would almost pay our annual national deficit. A report issued by the department of agriculture contained the interesting little item that we spent 24 million dollars last year replacing rotting fence post while our forests are rapidly becoming as bare as the chorus of a modern revue. This is another form of our reckless spending.

But when we get hard pressed for facts to back up some of our hollow boasts, we point to the farmer—our immense source of wealth. Then we boast glibly of our million acre wheat fields and our tractors and our ranches of such vast expanse that they need be traversed by aeroplane.

It's great stuff only—only for the solemn fact that we cultivate about one-seventh of our actual arable farm land and waste six-sevenths of it. And by arable land no reference is paid to mountain ranges that might be leveled with a road scrapper, oceans that might be dry cleaned or deserts that might be made over into Italian gardens. We mean actual tillable soil.

Over in France they are not so prone to holler about their accomplishments, yet they cultivate about seventy-five per-cent of their tillable soil, and Germany, of rather recently extinguished fame, manages to reap a harvest from fully five-sixths of hers.

We do not fully realize the appalling magnitude of such inefficiency until some comparison is made. Our crops of last year amounted to over twenty-five billion dollars. Fine. But maybe you were not aware of the fact that all the silver mined since the memory of man amounts to scarcely over thirty billion dollars. In other words, if the crops of last year had merely encompassed the reasonable expectancy of our tillable soil, it would have exceeded in value the entire silver production for all ages.

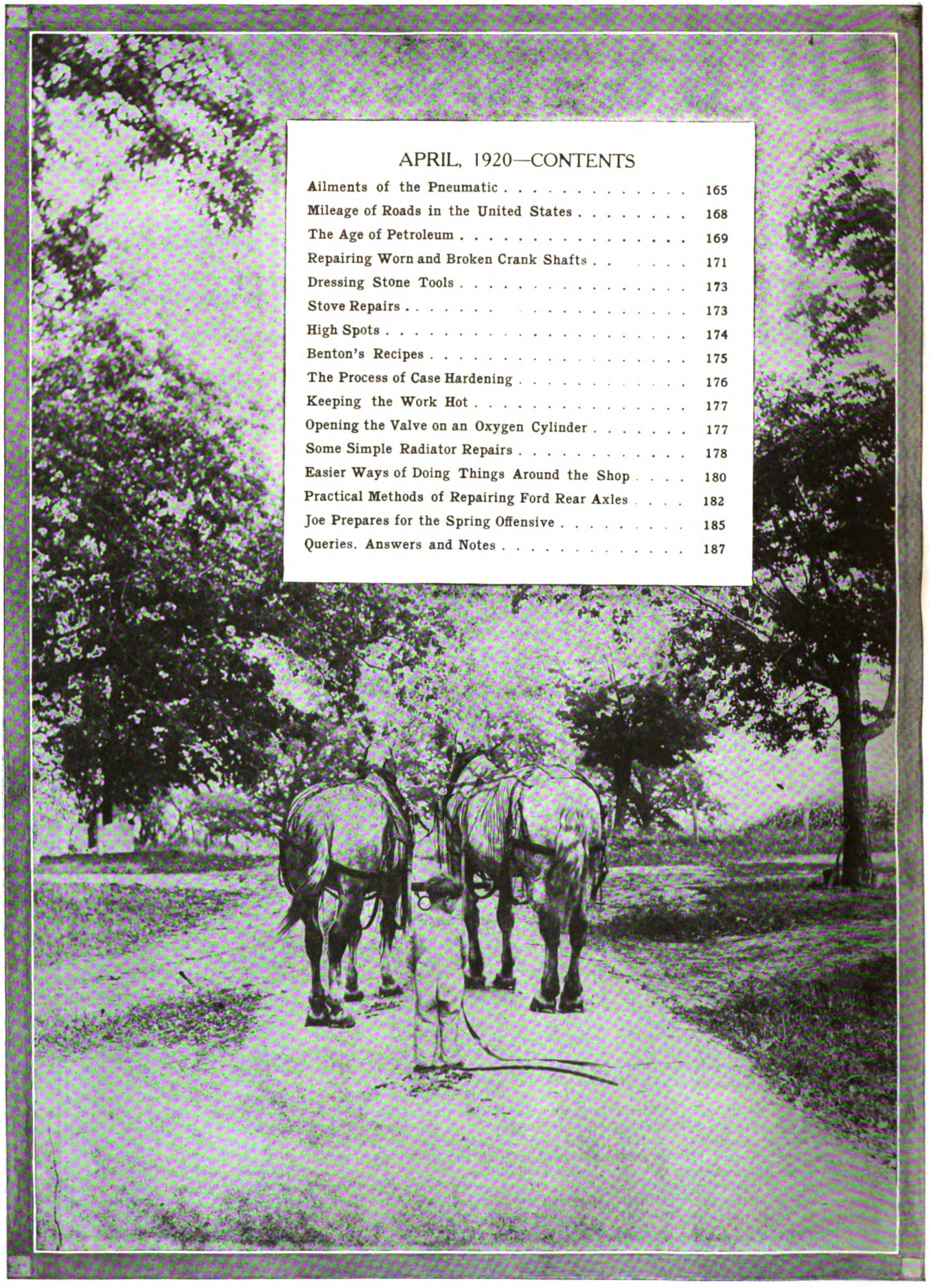
We wasted some fifty billion dollars through uncultivated acreage, we let three times as many people die from tuberculosis last year as were killed in the war. Tuberculosis is not only curable—it is preventable! We spent several millions of dollars to protect hogs from cholera and spent that many millions less in safe guarding our kiddies from preventable disease. Why the distinction in favor of the hog? And still we have the incomparable nerve of thinking of ourselves as a nation of efficiency experts.

Our inventive genius has been responsible for everything of any importance in the last hundred years, including the safety pin and non-refillable fountain pen. We have sent our best brains down into the mesquite and cactus to save the natives from all kinds of diseases both physical and political. But at home, we let ten times more children die than we lost in soldiers. We are too interested in foreign affairs and not attentive enough of our own.

Of course we'll muddle through, you say—the youth of our country can be counted on. Ah, the youth! Youth the greatest and most fleeting of all resources. They'll hear the call and save us from our just deserts. Yes, perhaps they will. But according to the records of the surgeon general's office over 33 percent of our youths are physically unfit to assume the responsibility of leadership.

Despite their inflated prices, we are buying luxuries as though they were lottery tickets and still we are facing a three billion dollar annual deficit in the running expense of our Government—and these facts mean nothing. But what about the other facts—the millions of acres of unplanted country side, the 480,000 kiddies who died during the war, the 163,000 who died of T. B. last year, the million and over who are suffering from the same disease today, the thousands of cases of imperfect manhood? These figures are a blot on our national efficiency that make the latest and most abitious sun spot look about as large as a typhus germ plastered on the south side of a circus elephant.

It is holy high time we looked conditions in the face and sought a remedy. It it time to put the brakes on our profligate spending and do something practical in the way of overcoming conditions, which if allowed to run, will eventually mean our undoing.



APRIL, 1920—CONTENTS

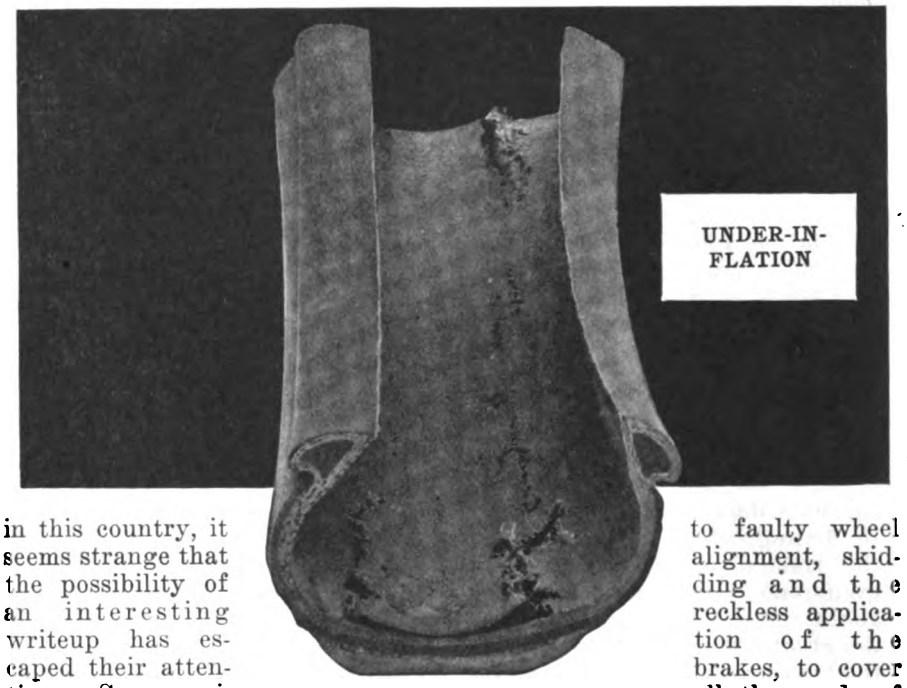
Ailments of the Pneumatic

WHAT is claimed to be the largest shipment of crude rubber in the world recently arrived at Akron, Ohio at the plant of one of the large tire manufacturers. The total valuation of this unparalleled shipment was approximately 4½ million dollars. The shipment consisted of 39,580 200 pound cases, and filled a train of 53 freight cars, stretching nearly a half a mile. Each freight car contained 200 of these cases, and the total weight aggregated 7,916,000 pounds. It took 48 men six days to unload this shipment, and more than a half million feet of space is required to store it.

This shipment came 10,000 miles and is equal to a year's production from 1,600,000 trees, or from a yield of 16,000 acres of plantation. Although it may be used for various purposes, it would be sufficient for 700,000 tires if used for that purpose alone.

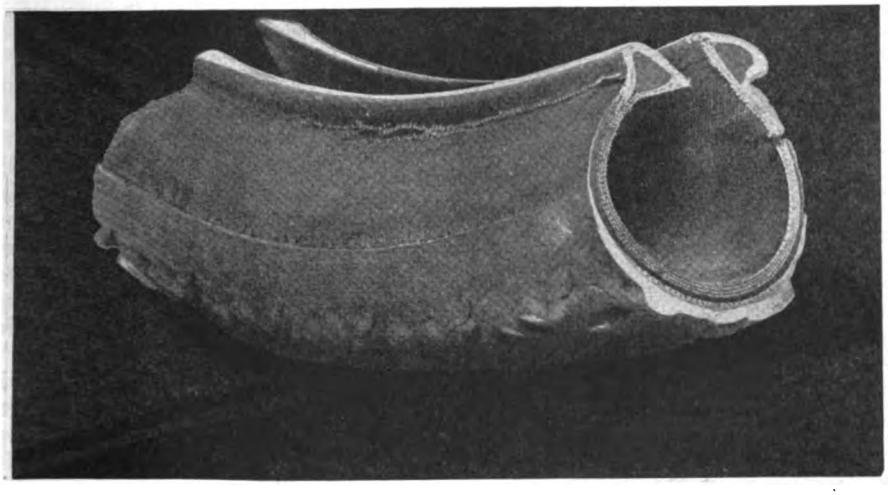
Despite the unparalled proportion of this enormous shipment of rubber, it contained scarcely enough raw material to supply the world's demand for three days. We have to pause a moment to grasp the significance of that statement. The entire yearly production of over one and a half million rubber trees is required to supply the world with crude rubber for three days. It is almost unbelievable nevertheless it is a fact.

In view of the number of statistic mongers who are plying their trade in this country, it seems strange that the possibility of an interesting writeup has escaped their attention. Some aspirant with the ambition of writing a best seller, could certainly realize his hopes by directing his attention to the possibilities, thus afforded. For would it not be interesting to know that more tires blow out on Thursday afternoon, than are put out of the running, by broken milk bottles, on a Friday night. Or they might draw another analogy, showing that enough material is daily ground from the treads of all the tires in operation in the United States, due to faulty wheel alignment, skidding and the reckless application of the brakes, to cover all the roads of Nevada, California and Rhode Island, with a rubber carpet 3/64 of an inch thick. Poor little Rhode Island never escapes the statistian.



Think of the solid comfort the world would draw from knowing that 31% of the tires in use are ruined, when they have delivered but 67% of the possible mileage merely because 29% of the people carry only 42% of the requisite amount of air in their tires, and another 39% of the tires are worn out before they have delivered 61%, because motorists persist in jamming on the brakes the moment they read that familiar sign, "Incorporated village of Busti, Slow down to 90 miles an hour." Then too, a big percentage of tire failures might be attributed to the inconsiderate traffic cop, who has no consideration on the tread of our tires, when he holds up that forbidding hand.

Unfortunately we have no available statistics to substantiate these assertions. We merely know that tires have recently taken another jump in price to sort of keep up their honor and not have to blush for shame when compared to other commodities. For it would never do to have tires be so backward in that respect—to be so old fashioned



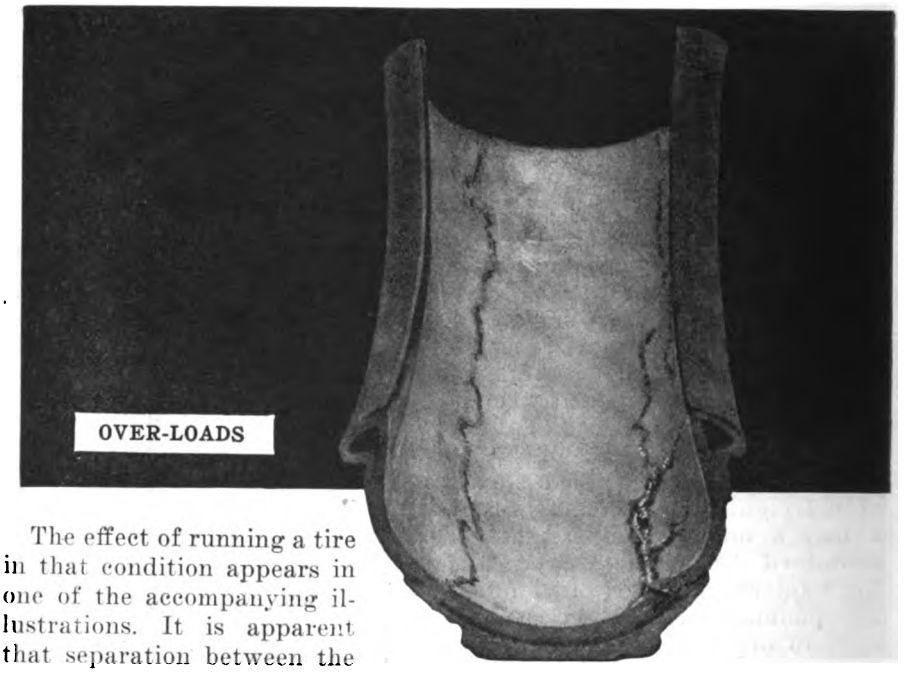
MIS-APPLICATION—A DAMAGED CASING AS THE RESULT OF NOT BEING APPLIED TO THE RIM PROPERLY

as not to keep abreast of the times.

With tire prices up and more cars than ever in use, it looks as though for economic reasons, we might give the matter of tire trouble a little consideration. Lacking as we are the statistics to make up a nice breezy story, we will have to treat the article in a cold, analytical manner.

For the purpose of securing maximum resiliency and easy riding qualities, many car owners, will allow the pressure of their tires to fall below the pressure for which they were built. There is the man, who believes that the pressure should be carried way below normal on a hot day, the falsity of this idea was pretty thoroughly discussed in a previous issue, so that we will merely mention it in passing. The normal pressure for the front tire should be between 15 to 18 pounds per inch of the tire section and the rear tires from 15 to 20 pounds. To allow the air pressure to fall below this mark causes a deflection or flattening of the casing, which tends to separate the tread from the carcass, and even one layer of fabric from another. The greater the deflection the greater is the heat generated by the friction and a hot tire is subject to many more injuries than a cool one; well inflated.

Air expansion, caused by the heating of a tire, is seldom sufficient to cause a blow out in a well inflated tire. The expansion seldom being more than 5% of the initial air pressure. For example, a tire inflated to 60 pounds would seldom increase to over 63 pounds. Do not guess at the inflation of a tire from its appearance. Tires often appear round and well inflated and when tested are found to be far below the proper pressure. Determine pressure at least once a week with a pressure gauge.



OVER-LOADS

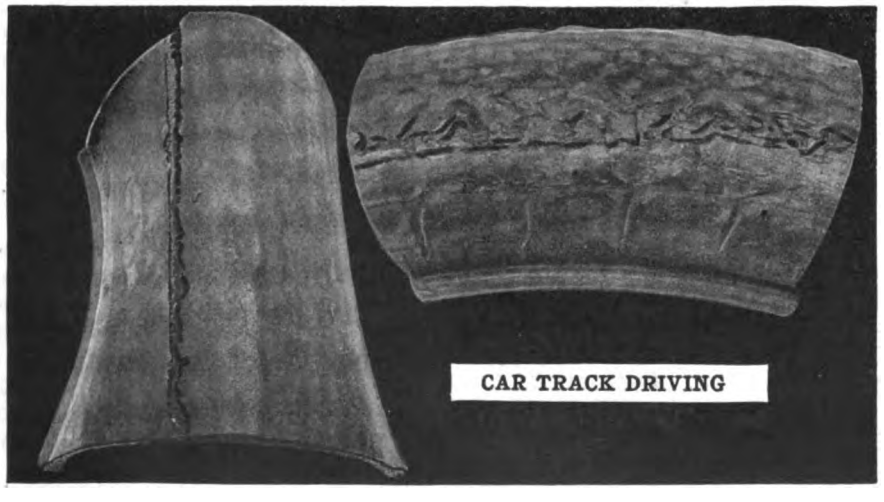
The effect of running a tire in that condition appears in one of the accompanying illustrations. It is apparent that separation between the plies of fabric, has occurred. They have chafed through until breaks have appeared on the inside. The hinging action of a soft tire is nearest the rim and at a sharp angle. It will be observed how the edges of the flap have chafed the fabric. Another symptom of having run with the tire partly deflated, is from the chafed condition of the beads—broken side walls, and broken condition of the fabric.

We now come to the other common cause of tire failure—Carelessness and mis-application. The importance of using flaps is greater than is generally supposed. Their proper application is essential for satisfactory results. It is generally conceded that flaps are not needed in a clincher tire, they are, however, essential in all straight side tires, and should be evenly placed between the two beads in a way, that will protect the tube from touching the rim. If this is not done pinches are bound to result and the tube will soon be ruined. The illustration shows the possible injury resulting from improper application. Chafing of the inner layers of fabric weakens that portion of the case and a blow out is the result.

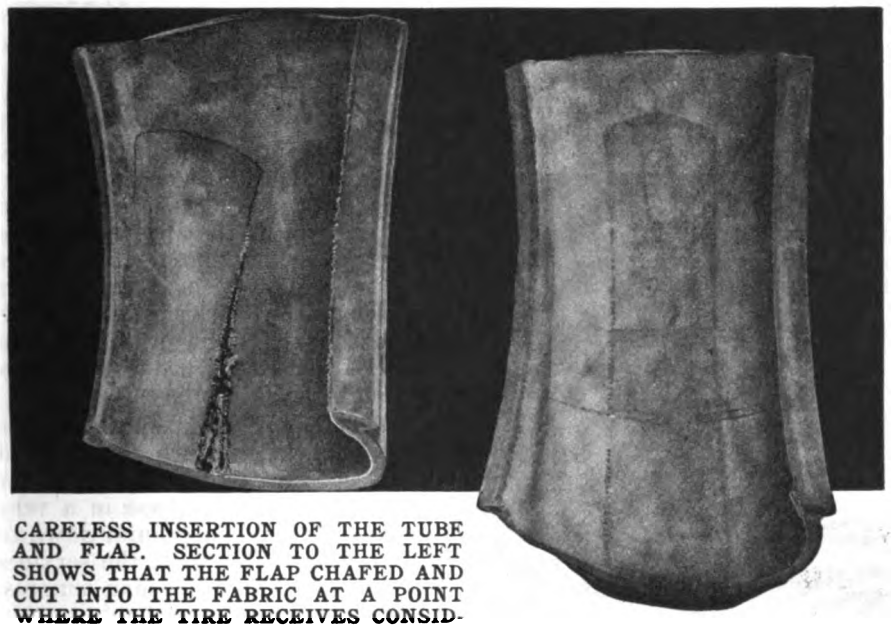
Best results from straight side tires are secured from using them with straight side rims. When used on Q. D. clincher rims, it is essential that a bead filler be used in the rim, which allows a straight side wall for the proper support of the casing. Q. D. clincher tires are more often used on straight side rims, in which case a filler bead should be used on the tire. However, in both cases results are never as intended by the manufacturer of the tire.

Casing are built the strongest, where the most strain is most likely to occur. To use any other tire bead, than is meant for the rim, is to shift the strain to a weaker portion of the case and a shortened life of the tire is the inevitable result. The illustration shows a tire, which was applied to a rim having reversible rings. The ring on one side of the rim was not reversed, therefore the bead had to adjust itself to the straight side of the ring. The strain ruined the tire. The effect of this injury might be better shown by a view of the inside of the tire, it could be then seen quite plainly that the tire is virtually damaged beyond repair.

Driving in car tracks is another popular way of ruining tires. The



CAR TRACK DRIVING



CARELESS INSERTION OF THE TUBE AND FLAP. SECTION TO THE LEFT SHOWS THAT THE FLAP CHAFED AND CUT INTO THE FABRIC AT A POINT WHERE THE TIRE RECEIVES CONSIDERABLE HINGING ACTION

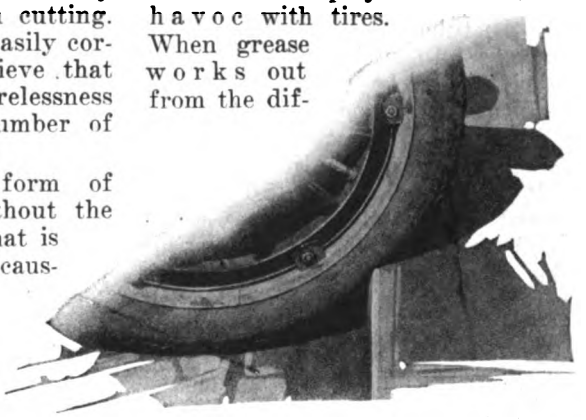
inadvisability of such conduct must be left to the driver. It should be avoided when possible, for when continued, the rail will soon wear away the tread rubber, causing a bending action of the fabric, with the result that the fabric eventually breaks. Occasional driving in the car track to avoid a very rough road, may protect the car from sufficient vibration to warrant the act, but care should be exercised at all times to avoid the frogs at switches. These frogs are generally pointed and have sharp edges, which very frequently cut the tire, resulting in a blow-out. Rails having a flush inside flange are less apt to injure the tires than are the old style rails, which allow the tire to slip over and down into the lower level. Wet, slippery rails and rails on hills are dangerous and should be avoided. The effect of continued car-track driving is illustrated in the accompanying cut. It will be observed that in this particular case the damage is more apparent on the inside of the tire than elsewhere.

The effect of overloading tires is not wholly different than the deleterious effect of under-inflation. Both have a number of symptoms in common. Many cars are taxed beyond the load for which they were intended. Such cases require a tire larger than the one with which the car was originally equipped. In such cases the oversized tire offer the user an outlet, whereby an additional inch in its overall diameter may be had. That is sufficient to carry the additional load and eliminates the possibility of breaking the fabric. Other favorable features of a larger tire are increased traction and less vibration. Overloading causes breaks in the fabric from the severe strain and driving conditions to which the tire is subjected. The appearance of a tire after having been subjected to that abuse is portrayed in one of the accompanying illustrations.

Rim cutting puts a great many tires out of the running long before they have delivered their proper mileage. The chief cause for this is under-inflation, dented and irregular rims, excessive loads, tire fillers and stiff retainers. Careful application when mounting a tire, to see that the rim runs smooth and evenly will obviate one of the principal causes of rim cutting. A coat of aluminum or graphite and oil should be applied to all rusty surfaces before applying the tire. Rust, like oil has a very deleterious effect on the life of rubber. One of the pictures shows quite clearly the damage done by rim cutting. Since it is a condition so easily corrected it is hard to believe that anything short of sheer carelessness is responsible for the number of tires thus damaged.

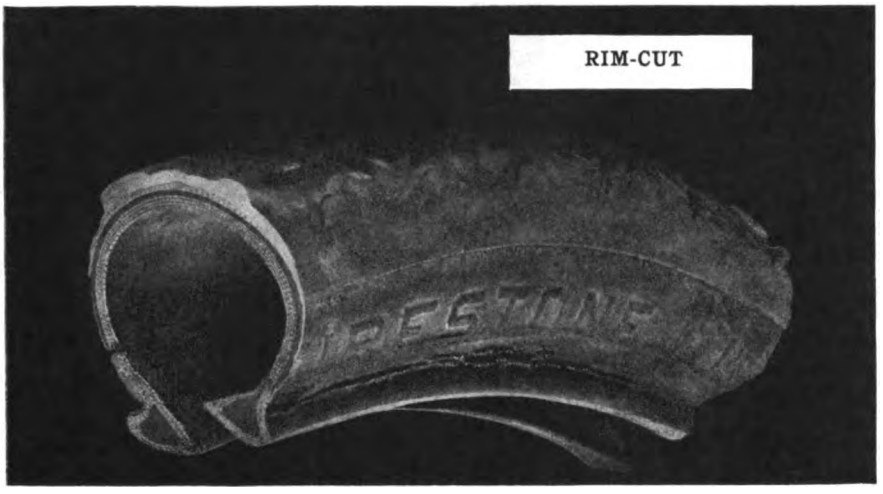
Fender-damage—This form of damage often occurs without the driver's knowledge of what is causing it. The most likely causes are: an unseen nut beneath the fender; a fender accidentally bent and not properly reshaped to hold its proper relation to the front wheels, or gouging on sharp turns, of a tire into the end of the bumper or the guard. It is important to see that there is ample clearance at all times for the front wheels, especially when making sharp turns. Such an injury as the illustration shows, is very easily classified, as the cutting is confined to a certain portion of the tire, which may be either on the side or on the tread, but in any event the damage will occur in a plane parallel to the axis in which the tire revolves. This injury sometimes results from an extended bolt bumping the tire, when the car, if heavily loaded, passes over a rough place in the road. When using an oversized tire care should be taken to see that there is ample clearance between the tire and the fenders.

Oil and grease is another contributing factor in shortening the life of tires. The effect of oil on rubber is quite generally known, although in many instances it is disregarded by the car owner until some serious trouble results. When oil or grease is allowed to remain on the side walls of a tire, a general stretching of the tread rubber at that point will occur. This allows a certain amount of oil to be absorbed into the fabric of the tire, and will preclude the possibility of proper vulcanizing and repairing. While gasoline is a solvent of rubber it should be used frequently to remove all grease, oil and foreign matter from the tires. It is highly advisable, when cars are to be left standing in a garage for any length of time, to jack them up. The tires are protected in two ways; in the first place, they are not apt to suffer deterioration from their contact with the oily floor, and secondly, they are relieved from the strain and weight during a long period of idleness. Grease working out from the differential plays havoc with tires. When grease works out from the dif-



STRIKING CURBSTONES—A COMMON CAUSE OF FABRIC RUPTURE AND EVENTUAL BLOW-OUTS

ferential and spatters on the side wall of the tire it should be removed immediately with a rag soaked in gasoline, or better still, remove the cause and you will not have to contend with the



effect—Do not use so much grease in the differential or else see that the rear wheels are fitted with felt washers that will confine the grease where it will be a benefit rather than a detriment.

While on the subject we might say a few words in regard to fabric ruptures. Fabric like any other material when taxed beyond its strength, will break. A square inch of high quality building fabric usually has a breaking strength of 275 to 300 pounds. Therefore a break through several plies of fabric must invariably result from a severe cut, or bruise causing the initial damage to the tire. A break, once started in the fabric will continue to lengthen, until a blow-out is the result. These ruptures are seldom noticeable from the surface of the tread. Many punctures are caused from fabric ruptures. The inner tube wedges itself into the rupture and the two edges, acting like knives will soon cut the tube the full length of the rupture. In such case a layer of fabric, securely cemented to the casing will temporarily eliminate the trouble, however, once the fabric is broken, the inevitable result is a blow-out. Therefore guard against those abuses which are bound to ruin the tire. Possibly the most common cause for fabric rupture, is backing against curbstones. While the curb is not always sharp enough to cut the soft yielding tread it is sufficiently pointed to cut the fabric, or if the tire is under-inflated it will cut it against the rim. Other causes are driving at high speed over rocky roads, dropping into deep holes and hitting ruts.

Wheel irregularities play their part in the early destruction of tires. Strict attention should always be given to proper wheel alignment. Many tire troubles result from this cause with out the detection of either the car owner or the service station. A toe-in of about ¼" should be allowed on the front wheels as this will neutralize their tendency to spread while in motion. In most cases proper adjustment can be made by means of the adjusting rod. Where damage to the tire is the result of a bent axle, bent knuckles or other serious causes, it should be given immediate attention. To check front wheel alignment, measurement between the wood felloes in front of the axle should equal a similar measurement made behind the axle.

The true running quality of each separate wheel can be made when ever a tire is changed, by placing a stationary point close to the wood felloe of the wheel. Th distance between the point and the felloes should be uniform when the wheel is revolved, otherwise the wheel is not true or the felloe is uneven. The allowance for cambering of wheels is from 15/16" to ¾" and is governed by the height of the wheel.

A tire which has been damaged through wheel irregularities, appears sloughed and ground off. About the same appearance might have been produced had the tire been rubbed with a coarse rasp. Ordinarily the wear is most pronounced at one or two places on the tread. These are places where the wheel shifts and wabbles the most. In the case where the tire has been damaged through the improper alignment of the wheel, the tread is ground down evenly and in severe case the breaker strip of fabric is exposed. This particular damage to the tread causes no particular strain or injury to the fabric body of the tire. The tire can be put in practically as good shape as when new, merely by the application of a new tread. The danger to the tire lies in the fact, that the tread is worn down to a very thin layer, until a sharp stone or the sudden application of the brakes will tear through the fabric base.

Severe application of the brakes will frequently injure the car and is sure to wear the tread rubber down to the fabric base in a very short time. When ground down to the fabric in this way, the services of an experienced tire man is necessary to prevent the probable separation of the tread in other places, due to the working in of pebbles, dirt and other foreign matter.

The service brake should be inspected regularly so that the adjustment permits an equal pull on each drum, in this way equalizing the wear on both rear tires instead of confining all the wear to the one wheel. Then there are other reasons as well. Uneven application of the brakes cause a very decided tendency to skid, the skid occurring towards the side of the car having the least braking action.

MILEAGE OF ROADS IN THE UNITED STATES.

A bulletin recently issued by the U. S. Bureau of Public Roads, the mileage of public rural roads in the United States was given as, 2,478,552 miles. 12%, approximately, of the entire amount are surfaced, giving a mileage of 299,175. A large portion of the roads, however, are sand, clay, gravel or water bound macadam. The various state highway departments report that during 1919, 11,944 miles of road were improved, of which 7,000 miles consisted of grading, prepartory to the final surfacing. In addition to this construction, these departments report the maintenance and supervision of 203,556 miles, most of which were main and trunk line highways.

With the good roads programme well under way, and with an unprecedented appropriation for the construction of more roads, it should be a banner year for those engaged in any of the branches of the automobile industry.

The Age of Petroleum

FOR a full century now we have been passing through different phases of industrial and commercial life which have been characterized by some form of power. First the age of steam, then the age of electricity. We have passed out of neither and yet we have come into another age-that of petroleum. As a lubricant, it has become of such universal use that it has been called the barometer of industry, and no doubt after it has ceased to be a popular illuminant or a source of power it will live invaluable as the thing which lets the wheels go round. Its greatest popularity now arises out of the use in the internal-combustion engine, and of the making of these there is no end. It draws railroad trains and drives street cars. It pumps water, lifts heavy loads, has taken the place of millions of horses, and in 20 years has become a farming, industrial, business, and social necessity. The naval and the merchant ships of this country and of England are fitted and being fitted to use it either under steam boilers as fuel or directly in the Diesel engine. The airplane has been made possible by it. It propels that modern juggernaut, the tank. In the air it has no rival, while on land and sea it threatens the supremacy of its rivals whenever it appears. There has been no such magician since the day of Aladdin as this drop of mineral oil. Medicines and dyes and high explosives are distilled from it. No one knows whence it cometh or whither it goeth. Men search for it with the passion of the early Argonouts, and the promise now is that nations will yet fight to gain the fitful bed in which it lies.

In Persia and in Palestine, in Java and in China, in southern Russia and in Roumania we know that petroleum is, for it has been found there. How great their fields or others in Europe, Asia or Africa may be no one would dare to say. As yet, however, the petroleum of the world has come from this hemisphere.

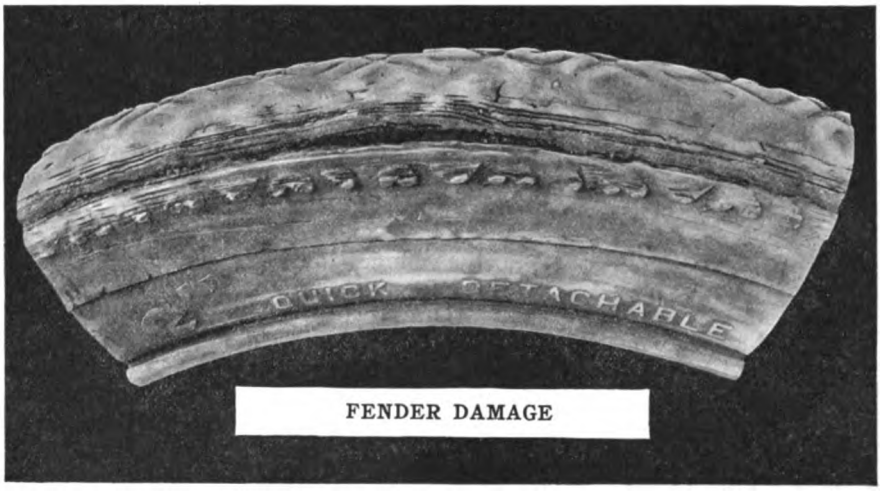
The "oil spring" which George Washington found in Western Virginia and by his last will called to the especial consideration of his trustees was the promise of a continental well which last year yielded 356,000,000 barrels. Each year has seen the prophecy unfulfilled that the peak of the possible yield had been reached.

From the mountains of Western Pennsylvania into the very ocean bed of the Pacific and even beyond and into the broken strata of upturned Alaska, the oil prospector bored with his sharp tooth of steel and found oil. Hardly has one field fallen into a decline when another has come rushing into service. Only three years ago and all hopes were centered in Oklahoma, and then came Kansas, and then the turn went south again to Texas, and now it looks toward Louisiana. Geologists have estimated and estimated, and they do not differ widely, for few give more than thirty years of life to the petroleum sands of this country if the present yield is insisted upon. And yet there is so much of mystery in the hiding of this strange subterranean liquid that honest men will not say but that it will become a permanent factor in the world of light, heat and power. If this is not so we are a fatuous people, for with every fifth man in the country the owner of an automobile and the expenditure of hundreds of millions of dollars for roads fit only for their use, and with ships by the hundred specially constructed to burn oil, we have surely given a large fortune in pledge of our faith that our pools of petroleum will not soon be drained dry, or that others elsewhere will come to our help.

In 1908 the country's production of oil was 178,500,000 barrels, and there was a surplus above consumption of more than 20,000,000 barrels available to go into storage. In 1918, 10 years later, the oil wells of the United States yielded 356,000,000 barrels-nearly twice the yield of 1908-but to meet the demands of the increased consumption more than 24,000,000 barrels had to be drawn from storage. The annual fuel-oil consumption of the railroads alone has increased from 16 2-3 to 36 3-4 million barrels; the annual gasoline production from 540,000,000 gallons in 1909 to 3,500,000,000 gallons in 1918. This reference to the record of the past may be taken not only as justifying the earlier appeal for Federal action, but as warranting deliberate attention to the oil problem of today.

Fuel oil, gasoline, lubricating oil-for these three essentials are there no practical substitutes or other adequate sources? The obvious answer is in terms of cost; the real answer is in terms of man power. Whether on land or sea, fuel oil is preferred to coal because it requires fewer firemen, and back of that, in the man power required in its mining, preparation, and transportation the advantage on the side of oil is even greater. So, too, the substitute for gasoline in internal-combustion engines, whether alcohol or benzol, means higher cost and larger expenditure of labor in its production.

There are large bodies of public land now withdrawn, which, under the new leasing bill which seems so near to final passage after seven years of struggle and baffled hope, will in all likelihood make a further rich contribution to the American supply.



FENDER DAMAGE

OIL SHALE

And beyond these in point of time lie the vast deposits of oil shale which by a comparatively cheap refining process can be made to yield vastly more oil than has yet been found in pools or sands. The value of this oil shale will depend upon the cheapness of its reduction, and this must be greatly lessened by the value of by-products before it can compete with coal or the oil from wells. There is every reason to believe, however, that some day the production of oil from shale will be a great and a permanent industry. And the country could make no better investment than to give a large appropriation for the development of an economical shale-reducing plant.

So conservative an authority as the Geological Survey estimates that the oil shales of the Western States alone contain many times over the quantity of oil that will be recovered from our wells. The retorting of oil from oil shale has been a commercial industry for many years in Scotland and France; in fact, oil was obtained from oil shale here in the United States before the first oil well was drilled. The industry is in process of redevelopment to-day and if successful will assure us of a future supply, but at the best it will take years of time and a vast investment of capital to build up the industry to such a point that it can supply any considerable proportion of our needs. It is imperative, however, that the development of this latent resource be furthered and brought to a state of commercial development as soon as possible.

SAVE OIL.

Yet with all the optimism that can be justified I would urge a policy of saving as to petroleum that should be rigid in the extreme. If we are to long enjoy the benefits of a petroleum age, which we must frankly admit fits into the comfort-loving and the speed-loving side of the Americans nature, we must save this oil.

We must save it before it leaves the well; keep it from being lost; keep it from being flooded out, driven away by water. Through the cementing of wells in the Cushing field, Oklahoma, the daily volume of water lifted from the wells are decreased from 7,520 barrels, to 628 barrels, while the daily volume of oil produced was increased from 412 barrels to 4,716. These instances show what can and should be done in our known oil fields.

We must save the oil after it leaves the well, save it from draining off and sinking into the soil, save it from leaking away at pipe joinings, save it from the wastes of imperfect storage.

Then we come to the refining of the oil. How welcome now would be the knowledge that we could recover what was thrown away when kerosene was petroleum's one great fraction. (The loss in refineries is still startling, some 14,556,000 barrels last year-4½ per cent of the crude run into the refineries.

The self-interest of the American refiner, notably the Standard Oil Co., has done a work that probably no mere scientific or noncommercial impulse could have equaled, in torturing out of petroleum the secrets of its inmost nature. And yet the thought will not altogether give place that in that residue which goes to the making of roads or to be burned in some crude way there may be things chemical that will work largely for man's betterment. This is the fact, too, that where the oil is produced by some small companies which have not the financial ability to make it yield its full riches there is a greater danger of loss of this kind. It would be well indeed if there could be such a regulation as would require that all petroleum must be refined. That this is done generally is not denied. It should be universal. And all the skill and study and knowledge of the ablest of chemists and mechanicians should find themselves challenged by the problem of petroleum.

Coming to the use of petroleum in its various forms we find a field of promise. The engine that doubles the number of miles that can be made on a gallon of gasoline doubles our supply. There is where we can apply the principle of true conservation-find how little you need, use what you must, but treat your resource with respect. Has the last word been said as to the carburetor, mechanical engineers do not think so. Have all possible mixtures which will save oil and substitute cheaper and less rare combustibles therefor been tried? Men by the hundred are making these experiments, and almost daily the quack or the stock promoter comes forward with the announcement of a discovery which proves to be a revelation of human stupidity or criminal cupidity. On this line the men of science do not sing a song of the richest hope, they shrug their shoulders, exclaiming with uplifted hands: "Well, may be, may be."

There are possible substitutes for some petroleum products, but not for the whole barrel of oil; furthermore, petroleum is the cheapest material, speaking quantitatively, from which liquid fuels and lubricants can be made; therefore any substitutes obtained in quantity must cost more. Alcohol can be substituted for gasoline, but only in limited quantity and at increased cost. Benzol from by-product coking ovens also can be used, but quantitatively it is totally inadequate. For kerosene no quantitative substitute is known. Lubricants can be obtained from animal and vegetable fats, but mostly are inferior in quality and there seems no hope of obtaining them in quantity. Fuel oil can be largely supplanted by coal, but for the internal-combustion engine there is no quantitative substitute.

HERE'S A NEW ONE—SNOW SHOES FOR THE HORSES

DURING THE PAST WINTER, THE DEEP SNOW IN THE CASCADE MOUNTAINS NECESSITATED THIS UNUSUAL PROCEDURE. PIECES OF BOARDS WERE WIRED TO THE HORSES' FEET TO ENABLE THEM TO GET THROUGH THE SNOW

Repairing Worn and Broken Crankshafts with the Oxy-Acetylene Flame

by DAVID BAXTER

THIS is one class of oxy-acetylene welding, that is probably not as easy as it looks. The beginner, especially, is warned not to be deceived by the innocent appearance of a broken crank shaft. The fundamentals are simple enough, perhaps, but the welder must have a fair understanding of how to handle the work to make a successful weld, or to build on a worn part.

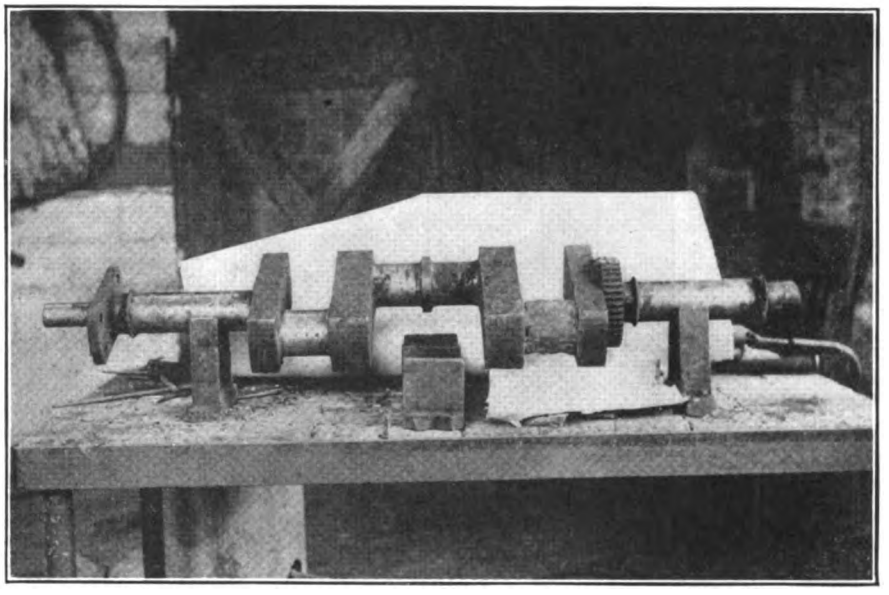
Crank shafts are all so nearly alike, however, that when the oxy-acetylene welder has mastered one, he should have no trouble in repairing any or all of them. This refers principally to the modern cars. The crank shaft of an old make of automobile is usually made of different metal. However this metal is easier to weld, so that one should experience no difficulty in that respect.

Then, about the only thing is to make due allowance for size and weight in the different jobs. Of course, there may be a little difference or variation in the nature of the metal used in the manufacture of the modern automobile crank shafts, but they are so nearly alike, in so far as welding is concerned that this is not liable to bother the torch operator, except during his first attempt. Because the individual welder may make such little changes in methods or material, when he finds variations, it is safe to assume, that crank shafts are alike in essential particulars. This supposition will do much to simplify the instructions embodied in this discussion.

First, let us see how to make several different welds on a small crank shaft, such as is quite common in all parts of the country.

By several different welds is meant, that each weld is located in a different part of the shaft. The most common break is one which occurs in the bend, or next to a shoulder of a journal. The next is one occurring in the square part of the shaft between journals. The least common fracture being located in the center of a journal.

The process of repairing each of the different fractures may be divided into four general topics. First; the beveling of the broken ends, or the cutting away of sufficient metal to enable the welder to make a solid bond; second: securing a fairly correct alignment of the cranks and tacking the beveled ends together; third: filling in, adding new metal; fourth: securing a good alignment after the weld is finished.



THE V BLOCK ARRANGEMENT USED WHEN BUILDING UP A WORN CRANK SHAFT

The first is done most handily, perhaps, by grinding it on an emery wheel. Although, this may be somewhat slow on heavy jobs, so that some welders make the bevel with the cutting torch. At any rate, the metal of the shaft must be cut out, until half the width at the top of the groove formed by the beveling, approximately equals the depth of the groove. In other words: where two bevels are fitted together, the "V" thus formed should be about twice as wide at the top as it is deep.

The grooving of shafts differs from the ordinary run of castings, in that it is better to cut a groove on two opposite sides of break, instead of on only one side. Therefore the broken ends are cut or ground wedge-shape, so that when two broken ends are fitted together their grooving or wedges meet to form an "X"; one "V" on one side of the shaft and one on the other, meeting in the middle. This double grooving is used where the break occurs in a square part of the crank, as well as in the center of a journal, where the fracture occurs at the end of a journal, close to the shoulder only a double half-groove is cut; in other words: the round part is cut wedge shape so that the groove formed when the wedge is fitted to the shoulder, will slope on one side only.

The different methods of grooving is illustrated in the sketches accompanying this article; each of which are self-explanatory. Care should be taken to have the grooves about this proportion, because too narrow a groove makes it hard to fuse the heart of the shaft; and a groove too wide necessitates the melting of large quantities of filler metal with the resulting danger of producing a weakened bond.

The second division of the repairing process, the alignment, is accomplished in several ways by different welders. Some use the bearings of a discarded crank case; Others use the vise; others a piece of angle iron. One is probably just as good as another, except that it is more convenient for the individual operator. So we'll leave that part as a matter of choice. Which ever method is selected, the break must be placed together with the crank shaft as near

its original shape as possible. One of the "V"-grooves should be upward, when this is accomplished.

The welder should be careful when beveling, so that the grooves will be located the handiest when lining up the job.

As soon as the alignment is correct, a spot or two in the bottom of the groove on the upper side of the crank shaft is melted in order to fuse the parts together. The welding should be enough to hold the broken parts together; this part of the process is termed the tacking. When this primary weld is cold enough so that there is no danger of bending the tacking; it is ready for welding.

The third, or welding part of the repair process is conveniently done with the crank shaft resting in a number of "V" blocks, such as are shown in Fig. 1, of the photos illustrating this article. The crank shaft may then be turned from side to side easily, with little danger of spoiling the alignment. Although the welder must be careful that the shaft does not sag when it gets hot. Other "V" blocks or wedges should be at hand to support the weight of the shaft, especially when starting and when a considerable part of the weld is red hot. With the "V" block arrangement, the welder can turn the crank over without assistance by merely pushing one of the cranks; and the device is still rigid enough, so that there is little danger of the shaft turning of its own weight while being welded.

The "V" block permits the crank shaft welding to be done on a leveling table, on the floor, a bench, or other convenient place.

The fourth, and last division of the process which consists of securing a correct running alignment of the shaft is probably the most difficult for the welder. This part of the process should be done in a lathe, which is not always in the possession of the average welding shop. If the welder has no lathe, he will have to send the welded shaft to a machine shop to be aligned.

Now let us go back to the first three divisions and see how the work is done in detail on each of the three breaks of different location. First, where the break is located in the round part, next to a shoulder, or in a corner. Figure 3 shows the location and amount of beveling, also the surplus metal added to insure a clean weld. The beveling was ground on an emery wheel, then the parts were tacked together as recommended, by resting the shoulder on the leveling table and wedging up the broken parts to secure an alignment as nearly correct as the eye, assisted by measurements, would permit.

When the tacking had cooled sufficiently, so that it would hold the shaft together it was placed in position on the "V" blocks. The crank was then revolved, until one of the grooves stood upward. In which position. it was welded, by first melting together the entire length of the groove bottom and also a little of the sloping sides of the groove. Then a layer of filler metal was fused to the welded bot-

THE GENERAL ARRANGEMENT OF V BLOCKS AND ASBESTOS REFLECTOR USED IN WELDING A BROKEN CRANK SHAFT

tom. On top of this was melted another layer, with several succeeding layers on top of each other. These layers were carefully fused to the ones beneath it. As the layers were piled up, they grew wider one way and narrower the other, requiring more skillful manipulation of the flame and filler; the flame was handled in such way as to keep the spot where the filler was being fed into it, in a molten state, and at the same time to prepare a new spot. The wider layers were made in what might be termed a succession of pools that all joined in one. Upon the last level layer was added a sufficient quantity of filler metal to provide machining stock. This surplus was also for the purpose of eliminating blow holes, which usually occur near the surface of the weld.

Each layer was approximately a quarter of an inch thick and was carefuly "soaked" into the preceding one. This was accomplished by revolving the flame in small circles over the spot to be fused with filler, until it was white and fluid. The welder soon learns to tell whether he is welding deep or merely making a surface joint. This is probably why many steel welds fail: the lower metal is not melted deep enough before the filler metal is added; or while it is added.

During the welding, the filler was kept in touch with the melting weld and given enough movement to churn or feed into the batch. The flame also was kept continually in motion both to prevent burning the steel in the shaft and filler and to melt as large a portion as could be handled conveniently. No flux was used.

When the weld was smoothed over, the crank shaft was revolved in the blocks in order to bring the lower half of the groove upward. Due care being exercised to prevent sagging. Then the joint along the bottom of the groove was opened up by melting and prodding. This was necessary because of the metal in the opposite groove had seeped through. This groove was melted full, a layer at a time, the same as the first groove with a surplus on top, the same as on the opposite side. During this weld, and with the first one too, the welder was especially careful where each layer joined the steep side of the groove. The steep side must be fused well, since it is bound to be the weakest part of the weld.

When the second weld had been accomplished, the crank shaft was permitted to stand until cold. It was then taken to the lathe, lined up and machined to size.

Some welders find it better to vary the process described above by welding only about a third of the groove at a time, turning the crank over and working on the opposite groove in a like manner. In this way both sides of the weld are built up at practically the same time. There is scarcely any advantage, unless the shaft is a heavy one.

Some welders use a preheater, when welding crank shafts: again this is more for heavy jobs. Whereon it undoubtedly saves lots of welding gas; and it also helps to make a more rapid weld, if the portion of the shaft around the fracture is heated red hot by means other than the welding flame. At any rate, the welder should place a

piece of asbestos paper directly beneath the weld to act as a heat reflector. The asbestos, being a non-conductor of heat, tends to gather and throw the heat back to the weld and thus helps to hasten the welding. An improvised reflector of this sort is shown in Fig 2, beneath the completed shoulder weld.

The filler rod for use on crank shafts should be purchased expressly for the purpose. Especially for shafts belonging to modern cars. It is usually some form of nickel steel. A responsible manufacturer will furnish the desired product, if it is specified when ordering.

On old cars the welder can often make good welds by using Swedish iron or mild steel for the bonding material. We will take the matter of filler rods up in more detail later on.

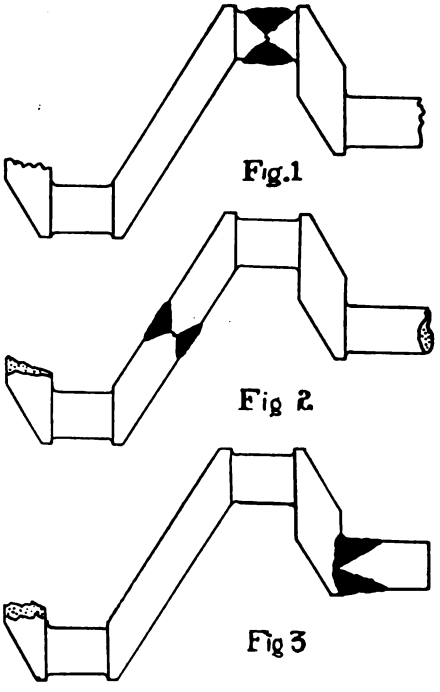
The welding of the next most common fracture in crank shafts, is one which occurs in the square part as indicated by Fig. 2. This sketch shows the location and extent of the grooving, also the filler metal represented by the black. The grooving and tacking of this break was made in the same manner, as the first one. The kind of the filler rod was the same as in the first example. It was melted into the grooves layer upon layer. The chief difference being the treatment of the sides of the weld, here the filler was stacked up as near straight as possible and then smoothed down afterwards by pointing the flame down along the sides, to melt and blow them smooth. Some scraping with the filler rod was also necessary.

The crank was revolved to weld the lower groove the same as was done on the other part.

It is scarcely necessary to discuss the weld shown in Sketch 1 since it is probably the simplest of all because the groove is full width and because it is much easier to weld on the round part of the crank shaft than on the square part or shoulder; the gradual rounding permits an easier piling of the new metal. And the "V" groove is sloping on both sides making it easier to fuse the whole weld. The "V" block arrangement and equipment are the same as used for the other welds.

Another important repair for the torch welder is the building up of worn crank shafts. He may build on almost any amount of new metal on any part of the shaft and make a worn out shaft as good as new. The principle is the same as for welding; the special filler is added a layer at a time until the worn journal is built up to the desired size. The operator must be careful to weld deep enough to make a strong bond, at the same time being careful not to burn the metals. The shaft is revolved, as each layer is placed. The "V" block idea is convenient for this process too, since it permits a free rolling of the shaft, as the filler is fused on. The reflector idea is good too. Or the welder may employ a preheating torch to assist him.

Some welders use a preheater and to confine the heat to the welded section, wet burlap is wrapped



around exposed portions of the shaft. This wrapping is moistened with cold water from time to time during the welding, to keep the heat from being conducted to the rest of the shaft and thus effecting a loss of heat from the weld. The idea being to utilize all of the heat of the weld to assist in fusing the metals. Such preparation are scarcely necessary, however, unless the crank shaft is a very heavy one.

When building on material, the welder should work as rapidly as is consistent with good practice, using a torch the size of which is in accordance with the size of the job. The same being true for welding. The filler rod diameter being governed by the size of the weld. And the flame, which is probably the most important of all should be strictly neutral all the time; a flame consisting of equal portions of oxygen and acetylene.

EDITOR'S NOTE. There are cases in which necessity demands a repair. With that idea in view, this article was written. It is intended for the guidance of those, who are compelled to make such a repair, rather than to encourage the welding of all broken crank shafts, on each and every occasion.

DRESSING STONE TOOLS.

An examination of all stone tools before dressing often saves the annoyance of finding they are too soft after having been tempered. The presence of low carbon steel is frequently indicated by the condition of the head. If it is badly battered up and turned over it is fairly safe to assume that it is low in carbon and will therefore require a little harder temper, between a straw and a purple. If on the contrary, it has crumbled off after battering up, it would indicate that the temper should not be so hard. Where chunks have split off of the head and run down the sides, the presence of a greater amount of carbon is revealed and the temper should be correspondingly lower. A dark purple will work favorably. High carbon steel used on stone work, will not stand as high a temperature as steel containing less carbon.

One is well repaid for taking a little extra care in dressing tools as they will not require sharpening so frequently. Once they have been worked down sufficiently do not strike the edge to get the desired width. Such treatment opens up the steel and it will fail when applied to its work. Much better result can be obtained by grinding or filing the edge.

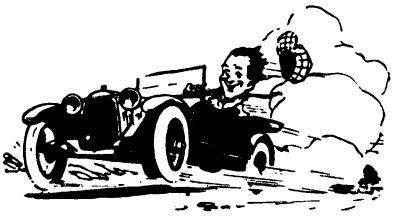
STOVE REPAIRS

As a rule it is a hard job to fix the nickle or brighten trimmings on a heating stove or range.

If one has a welding plant this is easy, but the following plan is also a good one.

We will suppose that the casting to be slightly curved, drill three holes on each side of the break, drive in wooden pins then put a dam about two inches on each side the break, now join the two pieces together so that they will stay while you pour into the space about 3/8" of babbitt as soon as cool bore out the plugs and through the babbitt and put in stove bolts, the job is then complete.

High Spots



It's a poor rule that won't work both ways if they are both our ways.

Some people never believe in putting off till tomorrow the trouble they can make today.

We are too apt to judge by comparisons. For instance, most things seem tame to the fellow who is sowing his wild oats.

What has become of the old-timer who used to say he could take a drink or let it alone?

Don't look for any reductions in the high cost of living. It's the unexpected that happens.

Don't carry all your eggs in one basket if you would count your chickens before they are hatched.

The man who is at war with himself generally has some difficulty in getting the better of the enemy.

One of the easiest things in the world is to flatter a man who flatters himself that he can't be flattered.

Tell a flea he is going to the dogs and he will thank you for the assurance that he is on the right track.

Blobbs—"In my business I meet many a man of promise." Slobbs—"What is your business?" Blobbs—"I'm a bill collector."

Wigg—"That Chicago woman who has divorced five husbands seems to be very popular. She has a great many admirers." Wagg—"I'll venture to say she has five less than she used to have."

No matter how poor a man may be, there comes a time in his life when he wants to share his poverty with some woman.

When a man is too old for a girl to marry and too rich for her not to it isn't hard to guess what she will do.

NAMES IS NAMES

Gunn Holder lives in Denver, Colo.

G. W. T. wants to know if a crowd of chickens were gossiping on the sidewalk could they be arrested for using fowl language.

A woman is as old as she looks before she gets her coffee in the morning.

Many a married man wonders why his wife puts in all her time trying to be disagreeable.

You can't always get a loan out of a fellow because he looks lonesome.

It's all right to extend the glad hand to a man in a wet town. But in a dry town a man would rather be offered about three fingers.

Tommy—"Pop, what is the difference between firmness and obstinacy? Tommy's Pop—"Merely the difference between will power and won't power, my son."

"It's a poor rule that won't work both ways," quoted the Wise Guy. "Yes," agreed the Simple Mug, "even a clock will stand up for itself, and still run itself down."

The very best thing about a man is his own opinion of himself.

Necessity knows no law, but that doesn't make the Bolshevist a necessity.

Giving a man a frozen look doesn't cut much ice, especially in midsummer.

When a girl asks a fellow to be her beau she may merely be trying to string him.

You never can tell. The orator who electrifies one audience may merely shock another.

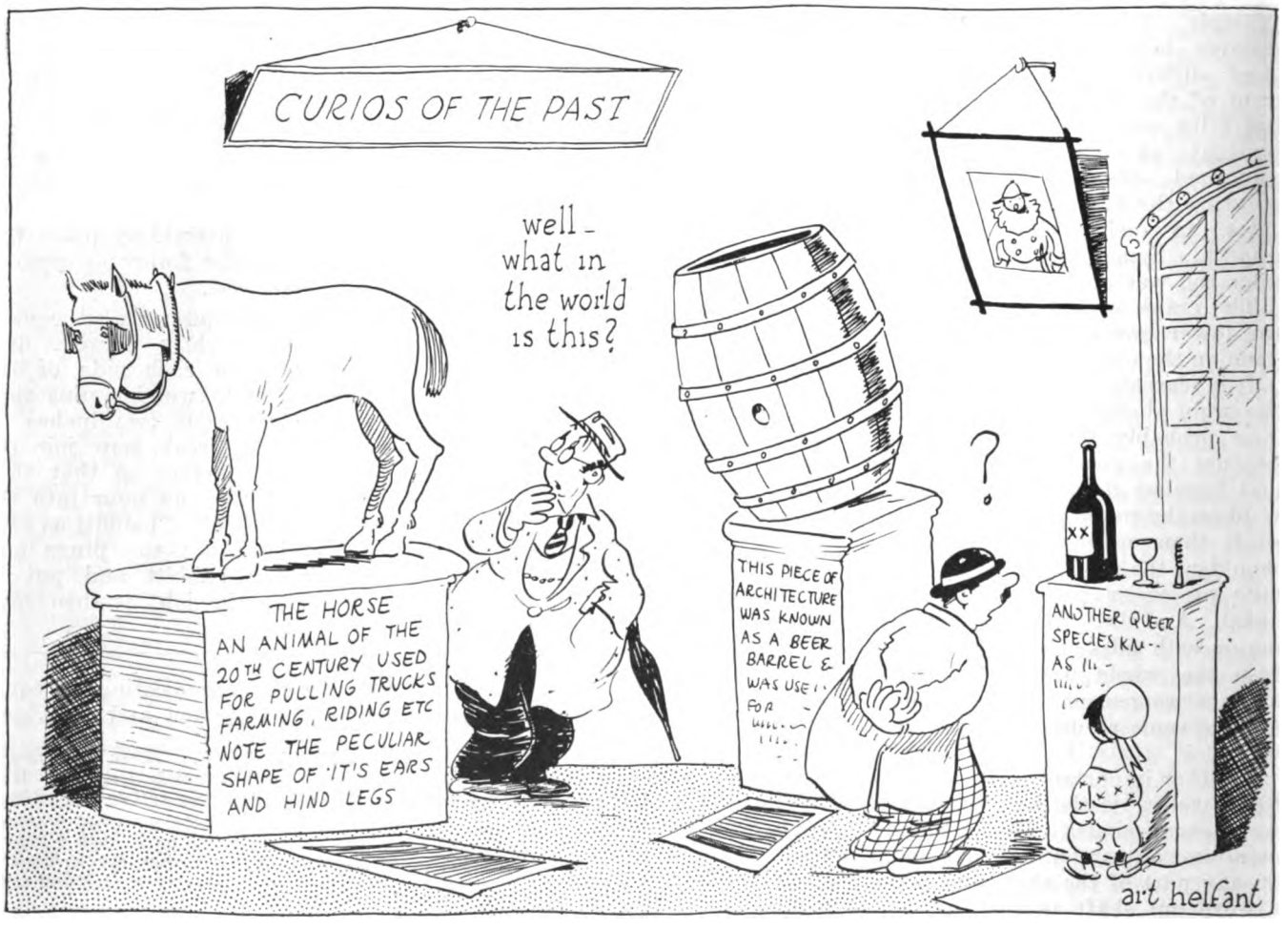
The popular game of trying to make both ends meet is apt to make us a cross-eyed nation.

The advocates of home rule for Ireland should remember that even an Irishman may be henpecked.

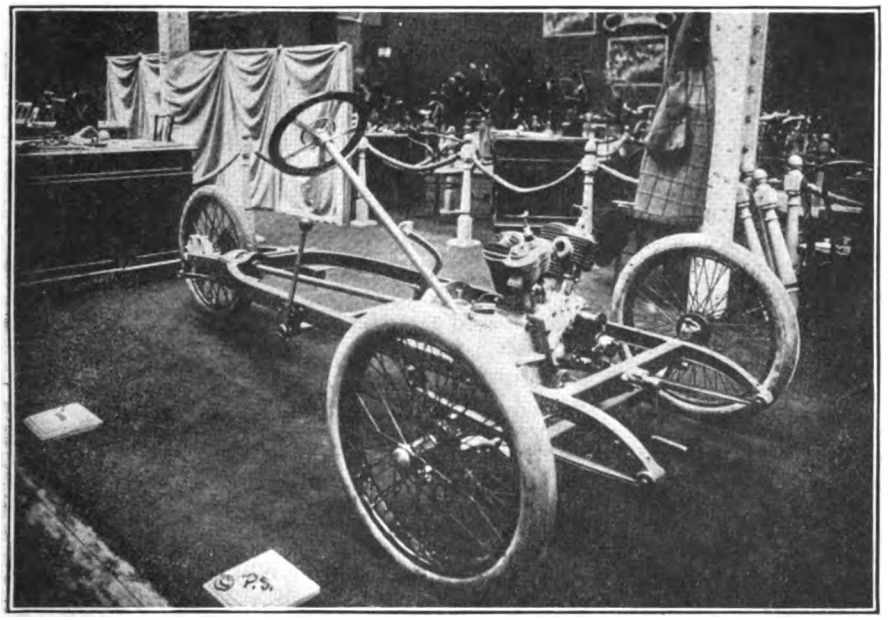
An argument may be heated, but there's a difference between indulging in hot air and being esteemed.

One of the most obliging things in the world is an elastic conscience. It is always willing to stretch a point.

Blobbs—"Why did Scribbler give up writing humor?" Slobbs—"He says the public refused to take him seriously."



FIRST AUTO SHOW HELD IN PARIS SINCE THE WAR



AMONG THE CARS OF UNUSUAL DESIGN, A TWO SEATED CYCLE CAR, THE "DIABLE", WITH A SINGLE WHEEL IN THE REAR, MADE ITS DEBUT

Packing for Gasoline Pumps—For packing pumps on gasoline engines, use asbestos wick-packing rubbed full of regular laundry soap; it will work without undue friction and will pack tightly. Common rubber-packing is not as good, as the gasoline cuts it out.

To delay the Setting of Plaster-Paris—Citric acid will delay the setting of plaster-of-paris for several hours. One ounce of acid, at a cost of about five cents, will be sufficient to delay the setting of one hundred pounds of plaster-of-paris for two or three hours. Dissolve the acid in the water before mixing the plaster.

To Remove Burnt Oil from Hardened Steel—To remove excess oil from parts that have been hardened in oil, place the article in a small tank of gasoline, which, when exposed to the air, will dry off immediately, allowing the part to be polished and tempered without the confusion and unsightly marks of burnt oil.

Bath for Hardening High Speed Steel—An excellent bath for hardening high speed steel consists of a mixture of table salt and paraffin oil, in the proportion of one pound of table salt to each gallon of pure oil. The steel is heated to a lemon color, and plunged into the bath, being kept in motion until it has thoroughly cooled. The steel should come out of this bath gray in color, and nearly free from black spots. The bath referred to can be used for almost all brands of high speed steel, with good results. It has been used to great advantage for the Midvale steel, and also on a large number of tools made of Novo, Simeteora, Rex, Jessop High-speed, and Blue Chip steel. On all these, good results have been obtained, but it may be added that this bath seems to give the best results with the Midvale steel.

To Harden Drills for Cutting Glass—To harden drills for cutting glass, dissolve zinc in muriatic acid to saturation, then reduce the solution by adding an equal volume of water. Dip and use without tempering.

To Keep Machinery From Rusting—A formula for an anti-rust compound is made as follows: Dissolve 1 ounce of camphor in 1 pound of melted lard; take off the scum, and mix in as much fine black lead as will give it color. Clean the machinery, and smear it with the mixture.

Mixture for Cleaning Grimy Hands—A good mixture for cleaning grimy hands is made by pounding a cake of "Sapolio" or "Bon Ami" up quite fine, and stirring it into a cupful of pure leaf lard, heated very hot. Stir until well mixed and when it is partly cool pour into a tin or tins of convenient size to get the fingers into.

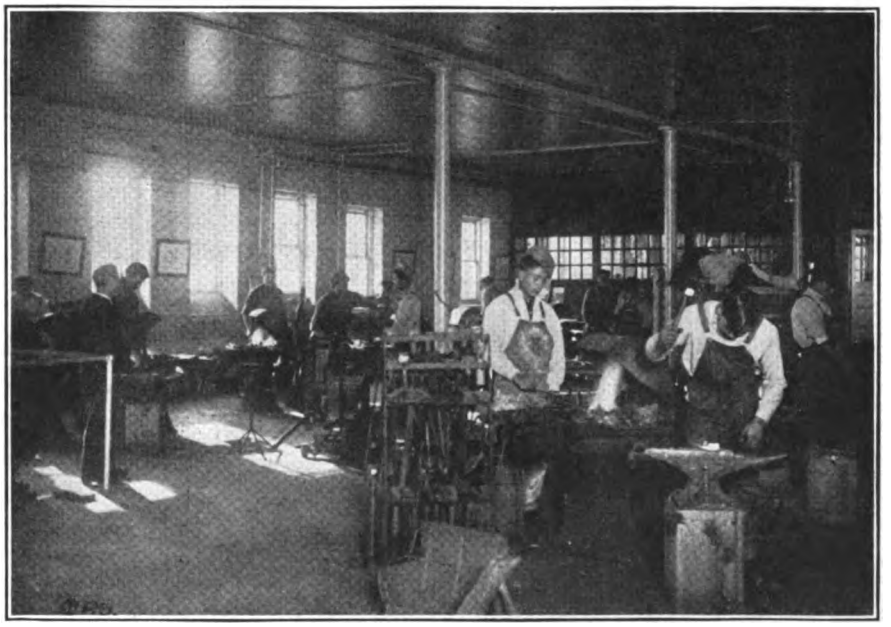
Benton's Recipes

To Prepare Fine Abrasive—To quickly prepare fine abrasive use FFF emery or "15-minute" carborundum with benzine or naphtha for a liquid, mixing them in a square bottle. Use about two ounces of the abrasive to one quart of liquid; shake well and then lay the bottle flat on its side for the number of minutes wanted to settle; then pull the cork and let the liquid flow out until level with the cork hole bottom. The liquid just drawn off can be used at once with a brush, but by allowing it to stand for a time, the top portion can be poured off leaving the abrasive with a little benzine which will evaporate quickly, and leave the clear powder.

In explanation of the term 15-minute carborundum, would say that this is a term applied to fine abrasive obtained by the process just explained (manufacturers, of course, using watertanks instead of bottles), the time the liquid is allowed to stand, in minutes, being used to distinguish it. Thus, if it stands 15 minutes it will be known as 15-minute abrasive, etc.

Mixture for Plugging Holes in Cast Iron—A good mixture for plugging blow-holes in cast iron is made of sulphur, cast-iron borings, sifted very fine, and graphite. Melt the sulphur in an iron ladle and stir in as much of the sifted borings as the sulphur will allow, not making it too thick to pour readily. Add a small quantity of graphite, say a tablespoonful to a quart of the mixture. Pour into the holes while hot, and after it is cool, smooth off with a file. When holes are filled with this mixture on surfaces to be machined, a finishing cut can be taken over it which will obliterate the holes.

INDIANS RECEIVING INSTRUCTIONS IN BLACKSMITHING



INDIANS MAKE GOOD BLACKSMITHS AND LIKE THE TRADE. IN ONE OF THE LARGE INDIAN SCHOOLS THEY ARE GIVEN INSTRUCTIONS IN ALL THE BRANCHES OF THE WORK, INCLUDING TOOL WORK, WAGON WORK, GENERAL BLACKSMITHING AND HORSE SHOEING

The Process of Case Hardening

BY

N. WARD GUTHRIE

THE process of case-hardening is exactly what its name implies. It is the process of forming a hard skin or casing on the outer surface of a mild piece of steel. It differs from the process of tempering or heat treating, in that the hardness is confined to the outer surface, while the interior still retains much of its original softness. This feature is an important one in many respects. For example a shaft that would be temper sufficiently to resist wear would in all probability be so brittle, that it would be most apt to break under the strain. Whereas case hardening gives the advantage of a surface sufficiently hard to resist wear without sacrificing any of the shaft's strength.

There are several methods of case hardening in common use. The use of cyanide of potassium, yellow prussiate of potash, sal ammoniac and salt and the more modern method of packing in various carbonaceous material by which the depth of the hardening can be more definitely controlled. The former methods are most generally understood by even those of meager experience, so that it is scarcely necessary to more than mention them in passing and describe briefly their use.

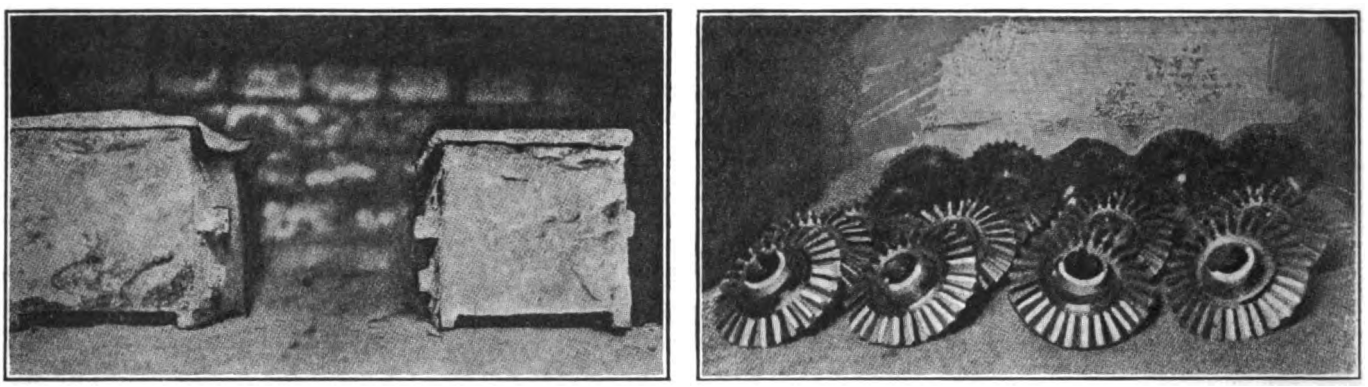
If cyanide of potassium is used it is advisable to procure the chemically pure, as much better results may be obtained. The reader should bear in mind that this is a violent poison and it should be treated accordingly. The article to be hardened is heated in a forge, in a gas flame or any place where a red heat may be obtained. The heated part is then sprinkled with any of the aforementioned chemicals and then plunged in cold water.

The process of case-hardening is founded on the fact, that when a piece of steel or iron is heated to a certain temperature while it is in direct contact with a material containing a large amount of carbon, the piece of steel will absorb a certain amount of carbon with the result that the surface of the piece thus treated will become hard.

Carbon is the determining element in making a piece of steel hard or in other words, iron and carbon combined make steel. Carbon has a great affinity for steel and will combine with it at all temperatures above a faint red. All steel contains carbon in a greater or lesser degree depending on the quality of the steel. Its presence is governed by definite laws; known as the law of chemical combination. When iron has absorbed approximately 90 percent carbon, then it has become saturated—it has reached the point where it has absorbed all the carbon possible for it to contain, and it is then glass hard. Metallurgists are of the opinion that the carbon is not absorbed directly by the iron, but that a chemical action takes place. The pot in which the pieces are packed in the carbonaceous material contains a certain amount of air or oxygen. When this container and its contents reach a certain temperature, oxygen combines with the carbon and forms carbon monoxide. From this gas the heated iron draws away the carbon, again liberating the oxygen, which in turn combines with more carbon and thus the process goes on.

The object of case hardening, as previously stated, is to get a surface sufficiently hard to resist wear, while at the same time the mechanical strength of the part treated is not sacrificed. Wear is largely produced by pressure, and to overcome wear and still resist pressure, strength is required. For such parts as crank pins, cones, ball races, gears and etc., strength is as an essential factor, as hardness. Because without either quality, the part will be short lived. The ordinary piece of low carbon steel contains about 15 percent carbon. The case or skin, as we might call, of that same piece of steel, after it has been properly case hardened will show a carbon content of 90 percent and its surface will be glass hard. Unless the packing material will give those results it is virtually worthless for most purposes.

So much for the theoretical side of the argument, now let us regard the practical side. The articles to be hardened are packed in a mixture of granulated raw bone and granulated charcoal and some times charred leather is added. The parts are so arranged that they are separated from the edge of the box as well as the bottom by this material. Care should be used to prevent the article from coming closely together. The material is added



THERE IS A CORRECT AND ALSO AN INCORRECT WAY TO REHEAT CASEHARDENED WORK. THE ILLUSTRATION ON THE LEFT SHOWS THE PROPER WAY TO REHEAT, WHILE THE OTHER ILLUSTRATION SHOWS THE WAY NOT TO DO IT

a layer at a time and is thoroughly tramped down, the operation is continued until the box is filled within one inch of the top. The remaining space is filled with the refuse packing material left over from previous hardenings, if you have it. If not, fill with charcoal, tramp well and put on the cover, and lute the edges with fire clay to prevent as much as possible the escape of gases. This is very essential as the carbon is given off in the form of gas. Then again, if there are any openings, the direct heat will penetrate these and act on the work in a manner that will give unsatisfactory results.

From the few available statistics and from practice the best case-hardening results seem to be between 1500° to 1800° Fahrenheit. It being safe to assume that little case hardening occurs below a temperature of 1500° F, and that above the temperature of 2000°, it is impractical to use a cast iron pot as the pot is incapable of withstanding that temperature. A graphite crusible in that case being necessary.

The depth to which the hardness penetrates depends on the length of time that the articles are subjected to the fire. In the case of small screws and the like, which are hardened merely so that the head will not tear up when the screw drivers is applied, we can use some packing material that has been used before. The heat will seldom have to be continued more than two hours. If we wish to harden deeper, about 5 hours run, after the work has become hot, will produce favorable results.

When it is necessary to harden very deep, it is advisable to pack the work with coarse bone, letting it run from 15 to 20 hours in the fire, then taking it out and packing it with fresh material. In this way, it is possible to harden to a depth of an ⅛ of an inch. Work that is allowed to run for a long time in the same packing material is very liable not only to be insufficiently carbonized, but in a measure to be decarbonized and highly charged with phosphorus, which is very injurious to the material we are using.

There are several ways in which the depth of the hardness may be determined. One is to include in the batch several sample pieces of the same kind of material as that which is being hardened. These pieces may be broken and a glance at the fractures will reveal a decided difference in the granular structure. The harder parts near the surface will appear smooth and even, while towards the center it will be observed that the grains are much coarser. Another method is to grind a cross section of one of the speciments, smooth and then apply nitric acid to it. A black circle will appear at the base of the case.

For small articles, where but a few pieces are to be hardened at a time, a piece of gas pipe may be used to good advantage. Screw a cap solidly on one end or plug the end with a piece of iron using a pin to hold it in place. The outer end may be closed by means of a piece made in the form of a cap, to go over the end, or it may be a loose fitting plug held in place with a pin. The pieces are placed in

THE CROSS SECTION OF A PIECE OF CASE HARDENED STEEL PLAINLY SHOWS THE EFFECT OF THE PROCESS ON ITS GRANULAR STRUCTURE

equal parts of granulated raw bone and graunlated charcoal.

In hardening cutting tools or tool steel they should never be packed in any form of bone, as bone contains phosphorus and this is the most injurious of any impurity that tool steel can contain. The steel maker uses every effort possible to reduce the percentage of this impurity to the lowest possible point, for while it is a hardening agent, its presence makes steel brittle, so that it is folly to pay a good price for steel on which the manufacturer has spent much time and money to rid it of this undesirable element, and then use some method whereby the steel is again charged with this impurity.

In reheating work after case hardening it is equally important to do it properly. The illustration shows some gears being reheated in an open furnace. This is decidedly a bad practice. It simply counteracts the effect of the case-hardening. The gears will scale oxidize and decarbonize and will have a soft case. They should be kept from the air while reheating. The most satisfactory way of doing this is to pack them in boxes using either charcoal or charred leather or the same material as was used to case harden them. But by all means do not reheat them in an open fire.

KEEPING THE WORK HOT

SHRINKING bands on cracked hubs, or similar work, where the work has to be kept red hot, while taking it some distance from the fire, has always been more or less of a problem. Or you may have a patch or forging to fit on some machine and the nature of the work necessitates that the piece be hot.

One of the easiest ways to overcome this difficulty is to take a pail of fine, air slacked lime. Heat up the lime by putting a large piece of red hot iron in the center. Then heat the band or the piece of work to the desired temperature. Take the piece of iron out of the lime and place the work in it, being certain to cover the heated portion with the lime. It is surprising how long a piece of iron will stay hot if treated in this manner.

In straightening a shaft a similar difficulty is experienced in retaining the heat for a sufficient length of time to enable the work to be completed. If the shaft is wrapped with asbestos around the heat part and bound with a wire to hold it in place, as the shaft is withdrawn from the fire, the heat can be retained much longer than if the part was exposed. It is not always necessary to take the asbestos off when performing the straigtening operation. A small piece can be torn away from the center to see how the shaft runs.

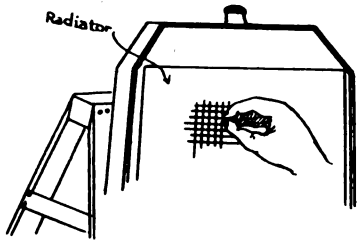
OPENING THE VALVE ON AN OXYGEN CYLINDER.

Care should be exercised when opening an oxygen cylinder valve. There are several reasons for this precaution. First, it is injurious to suddenly admit into the Bourdon tube a pressure of 1800 pounds. Secondly, the rapid compression of air or gas in the various passages is attended by heat. Under certain conditions, the heat may be great enough to destroy the seat of the regulator, in that way allowing the high pressure oxygen into the regulator diaphram and destroying the regulator.

Some Simple Radiator Repairs

F. H. SWEET

THERE are two general systems of engine cooling in common use, that in which water is heated by the absorption of heat from the engine and then cooled by air; and the other method, now most generally used on motorcycle engines, in which the air is directed onto the cylinder and absorbs the heat directly instead of through the



CLEANING THE METAL PREPARATORY TO SOLDERING

medium of water. When the liquid is employed in cooling it is circulated through jackets which surround the cylinder casting, and the water may be kept in motion by two methods. The one generally favored is to use a positive circulating pump of some form which is driven by the engine to keep the water in motion. The other system is to utilize a natural principle that heated water is lighter than cold and that the hot water will rise to the top of the cylinder when it becomes heated to the proper temperature and cooled water takes its place at the bottom of the water jacket.

The thermo-siphon cooling system is one that has demonstrated its worth conclusively in practice, and is somewhat simpler than the forms in which a pump is used to maintain circulation. With this method, the fact that water becomes lighter as its temperature becomes higher is taken advantage of in securing circulation around the cylinders. The top of the water jacket of the block cast cylinders is attached to the center of the radiator, while the pipe leading from the bottom of that member is connected to a manifold, which supplies cool water to the bottom of the cylinder jackets. With such a system it is imperative that the radiator be carried to such a height that the cool water will flow to the water spaces around the cylinder by gravity.

As the water becomes heated by contact with the hot cylinder and combustion chamber walls, it rises to the top of the water jackets, flows to the cooler, where enough of the heat is absorbed to cause it to become sensibly greater in weight. As the water becomes cooler, it reaches the lower tank of the radiator and has been cooled sufficiently so that it may be again passed around the cylinders of the motor. In most cooling systems, especially those employing cellular type coolers, it is necessary to use a cooling fan to draw currents of air through the interstices of the cooler.

The radiator is carried at the front end of the car in most cases. and serves as a combined water tank and cooler. It is emposed of an upper and lower portion joined together by a series of pipes which may be round and provided with a series of fins to radiate the heat, or which may be flat in order to have

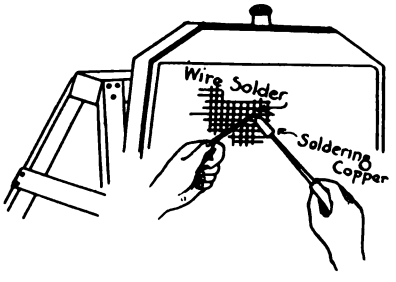


Fig. 3. SOLDERING THE LEAK

the water pass through in thin sheets and cool it more easily. Cellular or honeycomb coolers are composed of a large number of bent tubes which will expose a large area of surface to the cooling influence of the air draught forced through the radiator either by the forward movement of the vehicle or by some type of fan. Modern radiators are composed of a core and a shell as illustrated, and the core may be removed for repairs in event any of the tubes leak due to freezing or other causes. The radiator tube forms ordinarily used are shown at Fig. 4, and are built up into cores or radiators of various sizes and forms to suit the requirements of the automobile's design.

With the simple thermo-siphon form of cooling system there is very little that can happen to the radiator or water jackets except cracks due to freezing, a not too remote possibility in cold weather, especially if the anti-freezing solution proportions are not carefully maintained. The radiator is easily removed for repairs in case of damage, there being but two hose connections to release by unclamping, one at the top, the other at the bottom. In most cases, the radiator is held to the frame by hold-down bolts, which are readily released.

Radiator repairing is an operation that requires more skill than the average motorist or repairman possesses, unless the leakage is at a point where it may easily be reached. It is not difficult to solder open seams or cracked joints in the upper or lower radiator tank portions, but it is extremely difficult to seal a leak in the radiator's interior, especially if that member is of the honeycomb or cellular construction. When the radiators are built, all the joints are treated at the same time by a process of dip soldering, in which the entire section is coated with soldering flux and placed into a bath of molten solder which penetrates all joints. In attempting to make repairs in the interior of a cellular radiator by using the usual form of soldering copper, the inexpert repairman is very apt to start more joints leaking, unless the iron is very carefully handled, and in many cases the radiator is worse than it was before the repair was attempted.

A number of compounds are offered for placing in the radiator to seal leaks. These are usually of a glutinous character and soluble in hot water, the theory being that the solution will solidify on striking the air and seal the crack. Com-

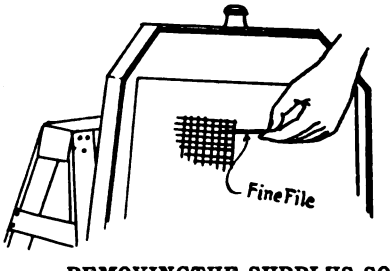
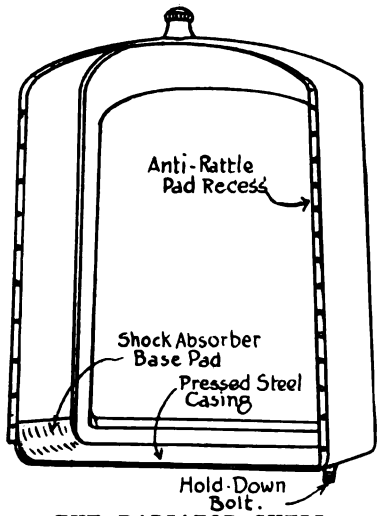


Fig. 5. REMOVINGTHE SURPLUS SOLDER WITH A FILE

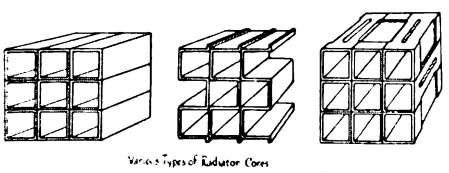
pounds of this nature are questionable for use in a radiator that can be repaired by any other means, and are a desperate last resort that the



THE RADIATOR SHELL

owner or repairman has resource to in making temporary repairs.

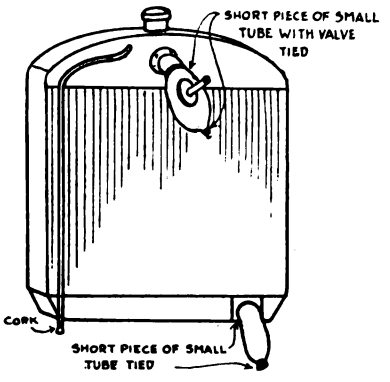
If the leak is not a bad one, and is at a point where it can be reached without trouble, it may be sealed as shown at Fig. 3. The first step is to empty all water out of the radiator, and remove that member from the frame so it may be tilted as desired to insure that the solder will penetrate to all points of the leaky joints. The first operation is to clean the metal adjacent to the leak, carefully with a very fine file or scraper, as shown. After the soldering flux has been applied to all points where it is intended to place solder, a very small soldering copper is used to melt enough metal from a piece of wire solder to fill the opening. The reason the small soldering copper is recommended is because the large one holds so much heat that other joints may be started before the leaky one is properly sealed. The soldering copper used should have a fine point so it can penetrate into the interior of the tube to some extent, if necessary. The final operation indicated in Fig. 5—remove the surplus metal from the sides of the tube with a fine file.



VARIOUS TYPES OF HONEYCOMB CORES

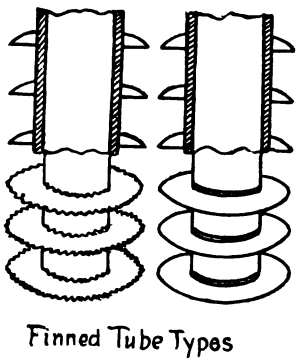
If the leak is some way inside of the tube where it cannot be reached handily, it is possible to fill that tube up with some quick drying iron cement and prevent the leak. This cannot be done very often, as if a number of the tubes are blocked up in this way, as is very probable in repairing an old radiator, the available cooling surface will be greatly reduced, as there will be no opportunity for the air currents to pass through the sealed opening. The safest plan is to return the radiator to the manufacturer for repairs, as few repair shops have the skilled workmen or facilities for doing work of this kind.

When cooling solutions employing calcium-chloride or other salts have been used, radiation may become defective by salt crystals deposited in water passages. Rust will also clog up the fine water spaces and retard circulation. The following receipt is given for cleaning cellular radiators. It is a process that will not harm the delicate radiator structure.



SEALING THE RADIATOR SO THAT IT CAN BE TESTED FOR LEAKS BY USING COMPRESSED AIR AND THEN SUBMERGING IT IN WATER

First: Plug up the 3/8 inch overflow pipe at the bottom by putting a small piece of waste in the same. Second: Solder on to the outlet of the radiator a small piece of tin (funnel shaped) leaving an opening of about 1/8 inch in diameter at the end for the water to come out of. Third: Put a piece of waste in the end of this funnel so as to stop the water from coming out while cleaning. Fourth: Solder up the inlet of the radiator or close it by a cork, which will do just as well. Fifth: Place about ten pounds of washing soda, or, better still, caustic soda, in a bucket of boiling hot water. Use enough of the boiling water to fill the radiator, and let the soda dissolve until the water takes up the same, after which pour this solution into the radiator, filling it up to the top. Allow this to remain in the radiator for five or ten minutes. Sixth: Take about one quart of raw muriatic acid and pour about a fourth of this into the filler neck top of the radiator. In order to get this in, allow a half-pint of soda solution to run out by removing the piece of waste from the outlet. Keep your eyes away from the top of the radiator when you pour the raw muriatic acid into the soda solution. Repeat this operation about four times; each time you add the acid, do so by lowering the level of the water in the radiator by removing the plug at the bottom of the outlet. Seventh: After you have allowed this solution to remain in the radiator for about five minutes, slowly allow the solution to run out of the radiator through the outlet. After this has been done, knock the tin spout off the outlet, and attach a hose to the water faucet, permitting the water to run for a matter of ten or fifteen minutes, so as to be absolutely certain that the acid has been washed out of the radiator. Your radiator will then be clean.



Finned Tube Types

Fig. 4

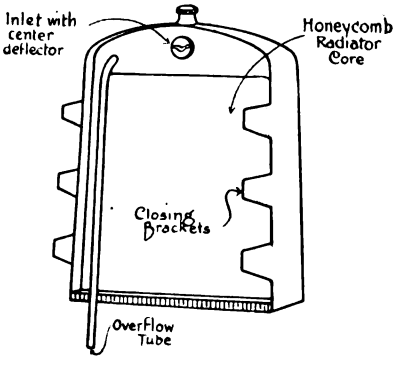
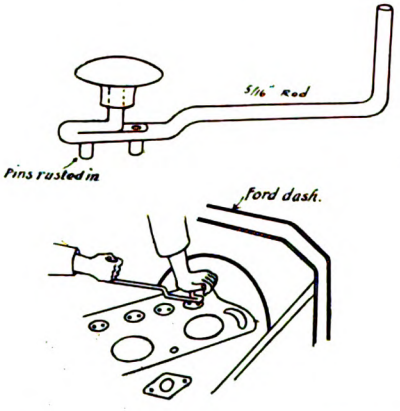


Fig. 2

Easier Ways of Doing Things Around the Shop

SPECIAL VALVE TOOL

This valve grinding tool was designed to make easy the work of grinding the rear valve of Ford automobile engines. This valve comes just under the hood in such



a place that with the ordinary tool it is hard work doing a good job. The sketches show the special tool which is easy to make from 3/8 or 5/16 inch round stock.

The shape of the tool must conform to that shown in the sketch if success in its use is to be obtained. A slight offset at A makes it easier to work the tool; a door knob is excellent for a grip piece. The section where the pins are put in is flattened and the pins are riveted.

NEW MOTOR DRIVEN VALVE GRINDER A TIME SAVER IN GARAGES

Facing a set of eight automobile engine valves, in from ten to fifteen minutes, that ordinarily requires from two to three hours to "grind in"; with an electrically-driven grinder lately placed on the market embodies features of economy that should interest every automobile owner and garage man.

Equipped with a ½ H. P. high speed Westinghouse motor of standard construction, mounted upon a neat and rigid base, it may be quickly made ready for use by connection to any lamp socket through the medium of the drop cord and plug with which it is furnished. A single snap of the switch sets the motor in motion.

It is always "set up" for service and a ball and socket equipment on the adjusting screw makes it possible to conveniently grind valves whose centers have been mutilated or which have no centers.

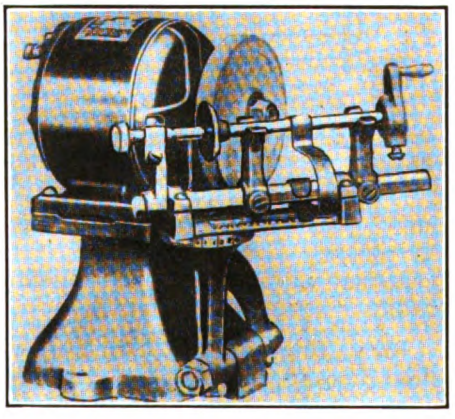
Simple adjustment features adapt the machine for use with valves of various sizes and shapes. The valve is moved back and forth across the wheel, the valve being rotated by the hand crank in the meantime.

The machine was designed primarily for valve facing, but with an extra hub and wheel, it can be used for grinding small tools such as drills and chisels.

A QUICK REPAIR ON HUDSON "6"

The owner had a good deal of trouble with the pumps, as the oil could not be forced through the pipes.

The garage men in two towns



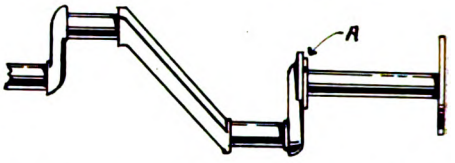
REFACING WARPED OR PITTED VALVES IS AN EASY JOB WITH THIS DEVICE

worked on it at different times and it was no better.

We finally took a shot at it, the oil pump worked fine in the shop and about ten miles out on the road it quit, back came the car and off came the pump. We took off the plunger that works on the cam shaft, taking the welder, we put about ⅛" of steel on the cone and then machined it off good and smooth, when it was assembled and the car started, it worked as good as a new one and has for the last four months. F. W. H.

TAKING UP FORD CRANK SHAFT END PLAY.

An easier way of taking up the end play of a Ford crank shaft other than fitting a new rear bearing cap is to insert a washer between the inner flange of the crank shaft and the end of the rear bearing. First, it will be observed that the flange on the crank shaft at point A is worn most on it's inner surface where it rubs against the

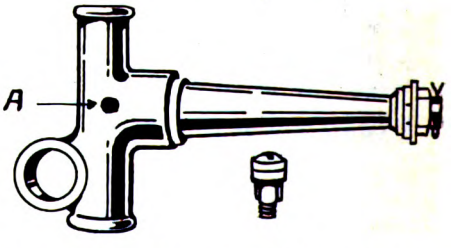


bearing cap, thus leaving a ridge. This ridge is filed off level and smooth, then a 2510-A, rear axle outer roller bearing steel washer is inserted between th flange and the bearing to take up the play. This washer is usually about the right thickness. The hole however must be enlarged. It can easily be done with a half round file and a rather loose fit on the crank shaft should be made. The washer is then sawed half way through giving it the appearance of a lock washer. It is then sprung over the shaft and hammered straight with a light hammer. It is important that some of the end play should be allowed to remain. If the washer is too thick, it may be ground down to a suitable thickness or if the reverse condition is met more material may be added. The edges of the cut through the washer should be rounded off so as to lessen the possibility of the washer catching or scoring the flange. I have never known any of these washers to get out of place.

C. N. Witherup.

OILING THE LOWER SPINDLE BOLT BUSHING

In replacing Ford spindle body bushing it will be noticed that the lower bushing is always worn more



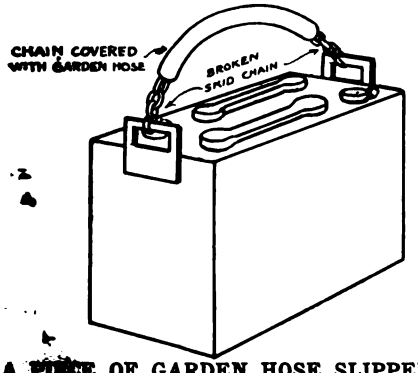
than the upper one. This condition is caused by a lack of lubrication. The oiler being located on the top of the spindle bolt affords ample

lubrication to the upper bushing, while little of the oil ever reaches the lower one. This condition may be overcome by drilling a hole in the spindle body at point "A". The hole is tapped for a ⅛ pipe thread and is fitted with a spring hanger oiler No. 2715. Then by using the oil can frequently a set of bushings and bolts will last at least twice as long.

AUTO TURN-TABLE MAKES CAR HANLDING EASY

George F. Paul

No longer is it necessary for the man with two or three cars to spend his time figuring out how he can juggle them in a cramped space in his garage, for the automobile turntable comes to his assistance and helps him use every foot of his space to the best advantage. A well-perfected mechanism makes it an easy matter to turn even heavy cars. The large, massive center casting is from five to six feet in diameter and contains 84 2-inch balls. The ball race course is wavy; the top casting of the table rests on only seven balls at the highest points of the track. The other balls revolve in pockets fitted with oil. As the table revolves, the balls on the summits roll on and are replaced by others. This special race course reduces friction to a minimum.



A PIECE OF GARDEN HOSE SLIPPED OVER A CHAIN MAKES A CONVENIENT AND STRONG BATTERY STRAP

The twelve steel plates forming the top rest on structural steel trusses. The table has a removable center of iron, with the steel top plates running from it to the outer rim. A concrete supporting band is firmly bolted to the outer rim. Twelve small castors placed at the outer rim of the table make it impossible to tilt the table. When the car strikes the tables these casters are thrown down to the outer rim track and when the entire car is on the table the castors are raised—the load is carried on the race course. The fact that a pit only 12 inches deep is required makes it practicable to install this turntable on any floor of the garage or in front of it.

TEMPER COLORS AND TEMPERATURES

The following table gives a few of the ordinary tools made from cast steel, giving the color of temper, the carbon content of the steel that should be used, and the temperature (Fahr.) at which the colors appear.

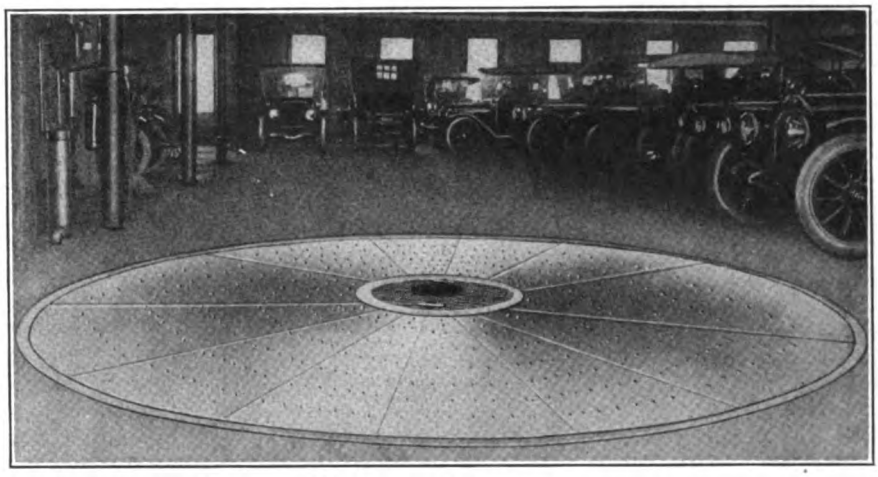
Tool	Color of Temper	Temperature	Carbon Content
Axes	Dark Purple	550	0.75
Augers	Light Purple	530	0.65
Canthooks	Light Purple	530	0.75
Chisel for Steel	Light Purple	530	0.75
Chisel for Cast Iron	Dark Purple	550	0.75
Chisel (wood)	Dark Blue	550	0.75
Dies	Dark Straw	500	0.90
Drifts	Brown Yellow	500	0.75
Drill	Purple	530	0.75
Hammers	Pale Yellow	430	0.75
Vise Jaws	Dark Purple	550	0.75
Rock Drills	Straw Yellow	460	0.75
Twist Drills	Brown Yellow	500	0.90
Taps	Light Purple	530	0.90
Stone Cutting Tools	Brown Yellow	500	0.75
Shear Blades	Dark Yellow	490	0.75
Springs	Very Dark Blue	601	1.10
Wire Pliers	Light Blue	530	0.75
Clinch Cutters	Light Blue	530	0.75

CUTTING LURICANTS

For a cooling medium in doing machine work, such as drilling or turning, the following solution is claimed to be excellent. Half a pound of soft soap to a gallon of rain water, with an addition of 3 per cent. caustic soda. The amount of soap should be lessened in cold weather. Plain water splashes too much, the addition of the soft soap beside its lubricating qualities increases the skin tension of the fluid, and causes more intimate adhesion of the fluid to work, chip and tool. To get the best results from soft soap, distilled or condensed steam water is by far the best.

TEMPERING PLOW SHARES

Heat the share only on the edge so as not to spring it. Have a box two feet square and six inches deep filled with wet sand and after the share has been sharpened and straightened, heat the edge of the share and press the edge of the share about two inches deep into the wet sand and let it cool.



IN THE SMALL OR CROWDED GARAGE A TURN-TABLE IS THE LOGICAL SOLUTION

Practical Methods of Repairing Ford Rear Axles

THE rear axle assembly comprises the rear axle housing, drive shaft housing together with all parts contained therein, the radius rod, brake rods, universal joint housing and the universal joint. As most of the work consists in removing the axle from the car, it is usually advisable to overhaul the entire axle while it is on the bench.

The first thing to do when removing the rear axle, is to raise the weight of the rear end of the car. This is best done by placing the car under an I beam to which a chain fall is attached, having inserted the special fixture for that purpose as shown in Figure 1.

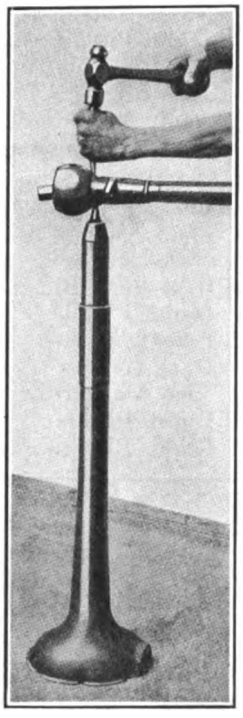


Fig. 11

A great saving in time can be effected through the use of this fixture which any Blacksmith or Garage man who has a forge among his equipment will find quite easy to make. All the dimensions necessary for its construction are shown in Figure 2.

Next remove the floor boards and withdraw the cotter pins from the two bolts which hold the universal ball cap to the transmission cover. It is now necessary for one man to work under the car. The speed wrench may be used from beneath the car to run off these two bolts. Next, break and withdraw the wire from the cap screws in the lower side of the collar and run out the cap screws. Disconnect the break rods at the control shaft arms by withdrawing the cotter pins and tapping the end of the yokes. This clears the front end of the axle assembly.

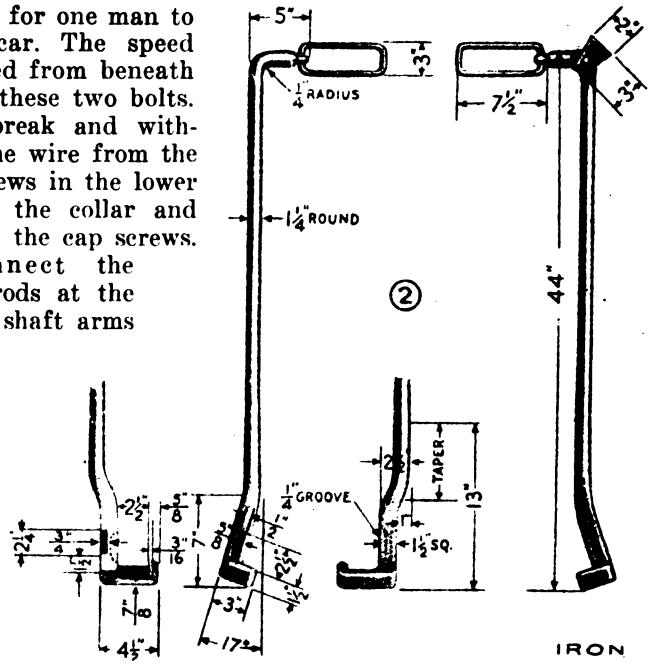


Fig. 2

There are two ways to disconnect the spring from the axle: First, remove the wheels, taking the nuts off the spring perch; and the other is to leave the wheels on and removing the spring hangers. Since there is nothing that can be done to the spring perches, unless they are rebushed, it is advisable to remove the spring hangers. By raising the body with the chain fall the strain may be taken off of the hangers. In the absences of the aforementioned equipment, it is possible to support the car by placing blocking of suitable heighth under the rear end of the running board where it fastens to the support. While this is an inefficient method and not advisable for general practice, it is quoted for the guidance of those lacking the proper equipment.

Withdraw the cotter pins and run off the nuts on the hangers. The hangers may then be drawn out of the perch and spring. The axle may now be drawn backwards by grasping it near the center and giving it a sharp pull. The drive shaft will drop down upon the truss rod, which will hold it until the repair man gets between the wheels and the car from which position he may raise the drive shaft housing and with this acting as a handle he may push the assembly to any convenient place.

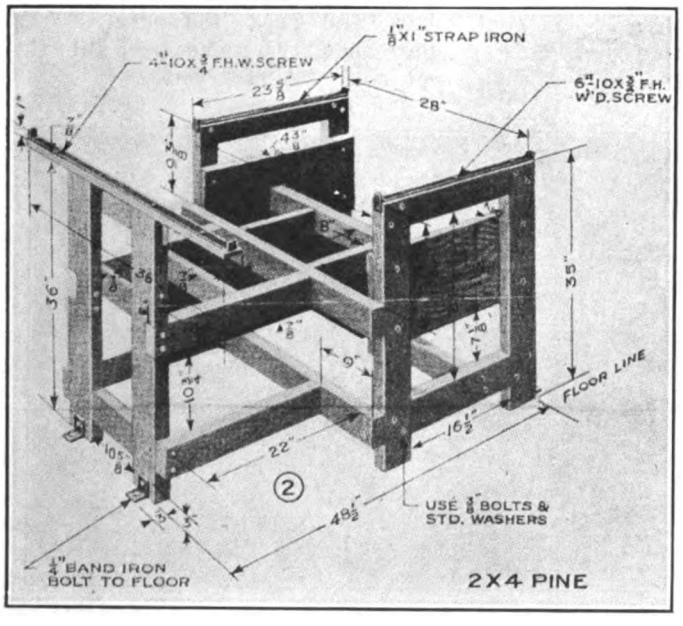
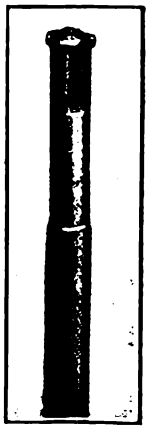


Fig. 3

REAR AXLE REPAIR EQUIPMENT

Besides the wrenches and small tools, it is necessary to have an assembly stand, repair bench, a wash tank, straightening and arbor press to do a thorough and quick job. It is impossible to complete the work successfully without all the



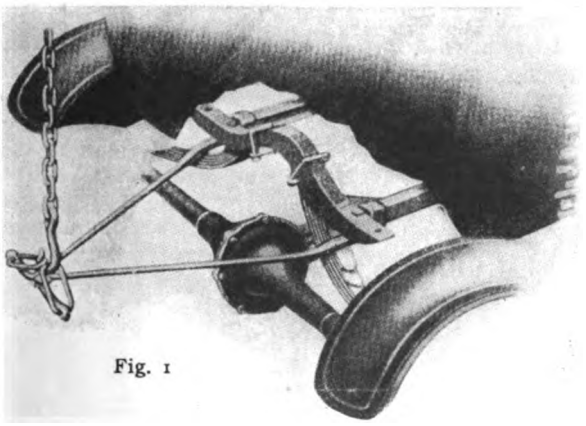


Fig. 1

foregoing equipment. Being time savers their use will be found to pay excellent returns on the money so invested. Perhaps the most important of any, or rather the one that would be most useful and cost the least is the assembly stand. Figure 3 shows how it is constructed and gives complete dimensions. Its merits will appeal instantly to the man who has experienced the laborious method of attempting such repairs on the floor or else where. As stated in the caption the stand may be built in your shop or by a local mechanic.

Figure 5 shows a convenient ar-

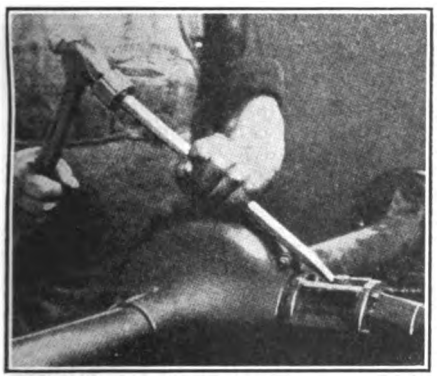


Fig. 6

rangement for the benches and presses. The minor assemblies are taken from the assembly stand to the work bench, where they are laid within easy reach of the wash tank. A scrap drive plate and sleeve, attached to a block at the end of the bench provides a means of holding the universal joint while the drive pinion nut is being run off. It also holds the housing at a convenient height for driving out the pin through the universal joint. The drive shaft is then withdrawn from the tube housing, where it is in position above the wash tank. A scrap box is provided beneath the bench, while to the rear a rack provides space for the tools, keeping them from being mixed with the parts on the bench.

DISASSEMBLING THE REAR AXLE

The rear axle having been removed from the car, it is wheeled to the rear of the assembly rack, where two men may lift it into position as shown in Figure 4. Remove the hub cap from the right wheel. If it sticks, tapping it around the threaded end will break it loose so that it may be easily turned off. The wheel is held on the taper axle shaft by means of a nut. Remove the cotter pin and run this nut off. As the nut forces the wheel well on to the taper, it is usually necessary to force the wheel off by means of a wheel puller, which may be obtained from either a Ford Branch or at an accessory store. In the same way remove the left wheel. Next, remove the nuts from the front end of the radius rod. These nuts are cotter keyed in position. Remove the nuts from the studs at the base of the drive shaft and withdraw the drive shaft and housing assembly from the rear end. If it sticks, drive it off as shown in Fig 6, using a brass bar, which is held against the drive shaft roller bearing housing stud. This assembly is then removed to the work bench where it is further dismantled. Drive the keys out of the ends of shaft and remove the retainer from the end of the housing. The felt washer and roller bearing should next be withdrawn. Next, remove the bolts which hold the rear axle housing together. The housing may then be pulled off of the shaft. Upon removal, the housings are placed in the wash tank where they are thoroughly cleaned and inspected before replacing.

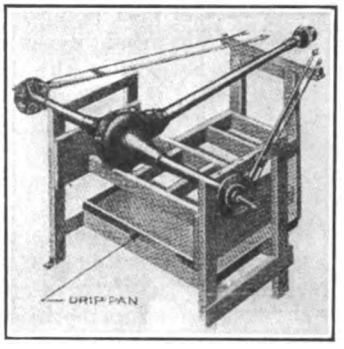
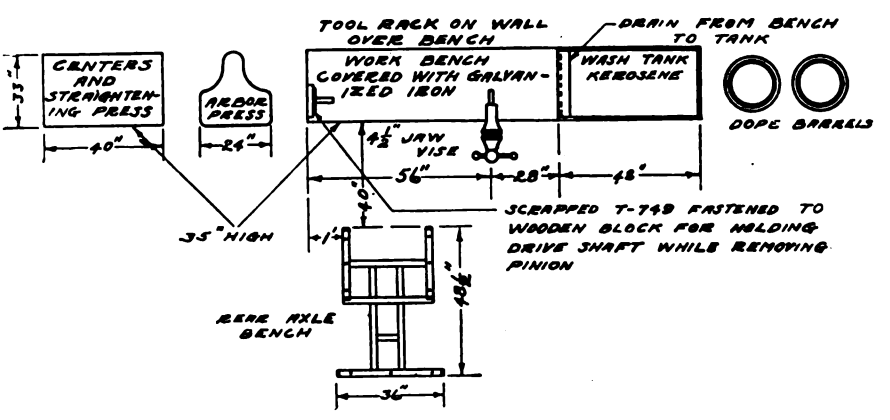


Fig. 4

DISASSEMBLING THE DRIVE SHAFT AND HOUSING ASSEMBLY

This assembly is held together by a pin which holds the universal joint to the drive shaft. Lay the assembly on the bench and run out the two opposite cap screws, which are located in the universal joint housing at the base of the ball. Turn the universal around until the pin lines up with these holes, set the joint in place in the drive plate shown at the left of the bench in Figure 4, and after putting a block under the housing to act as a support, drive the rivet out with a drift. Before removing the universal joint, withdraw the cotter pin and run off the nut, which holds the drive pinion on to the shaft. This is done at this time, as the universal being engaged in the drive plate holds the shaft from turning.

The universal may now be forced off the shaft by inserting a piece of bar stock in the dope hole, and prying it out, as shown in Figure 9. If the joint sticks on the shaft it is advisable to separate the drive shaft housing from the roller bearing housing, and force the joint off



as shown in Figure 8, as the universal ball may be sprung out of shape if too great an exertion is put upon it. If the flange of the housing is sprung in this operation it may be straightened with a hammer before assembling, while any slight burr which may have been raised on the ball, may be removed with a file. When the universal joint has been removed, the drive shaft, together with the roller bearing housing, may be withdrawn from the drive shaft housing. To remove the gear from the drive shaft, it is necessary only to let the assembly drop on a block of lead, the jar causing the gear to spring off the taper. Next, take out the roller bearing. Turning the housing on the shaft will

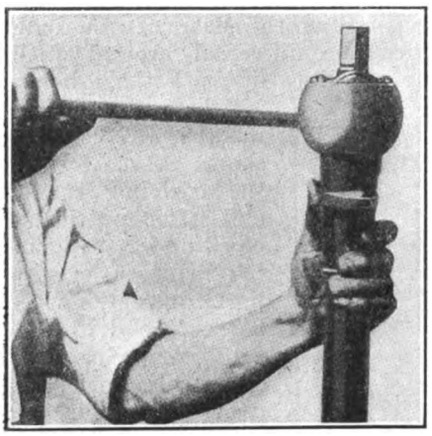


Fig. 9

usually run the roller bearing out, so that one may grasp it with his fingers and withdraw it. This is as far as the drive shaft assembly need be taken down for the average overhaul. Inspect the sleeve on the drive shaft to see that it is not cracked, and the distance plate on the ball bearing assembly, to see that it is in good condition. If there is any trouble in the ball bearing, it will be noted here. The assembly should be washed thoroughly in kerosene or a solution of soda after which it may be assembled.

Should it be necessary to remove the sleeve from the shaft, drop the assembly on the lead block, as was done in removing the gear. This will drive the housing off the ball bearing assembly. The shaft may next be placed on the arbor press, and the sleeve together with the ball bearing may be forced off. On the new style shaft which is practically the same diameter throughout its length, the housing together with the ball bearing assembly, may be withdrawn from the other end of the shaft.

Should it be necessary to remove the sleeve from the housing, run out the set screw which locates the sleeve in the housing and force the sleeve out on an arbor press. In pressing in the new sleeve, it is important that the holes line up with the set screw hole in the housing. This sleeve is a tight fit and it will be impossible to draw it into place with the set screw. The notch in the end of the sleeve has no particular relation to the assembly. It is simply used at the home plant as a locating point in assembling the sleeve to the housing. However, this notch should be towards the gear end in assembling when the set screw has been run it, feel on the inside and see that it does not protrude. If it does, it should be removed and filed off, otherwise it will hold the roller bearing stationary. Next, force the ball bearing into position in the housing. This assembly is then slipped over the end of the drive shaft, after which the sleeve is pressed on. In putting the sleeve on the shaft, be sure that the keyway in the shaft is in line with the notch in the sleeve as the key holds both the gear and the sleeve in position on the shaft. In forcing the sleeve on to the drive shaft it is advisable to put a .010″ shim between the sleeve and the gear as a means of locating the depth to which the sleeve is forced This extra clearance ensures the gear resting fully on the taper. Now remove the gear and the shim, insert the distance plate and the roller bearing, tap the key into the keyway and draw the key into position again by means of the nut. Turn the assembly to see that it turns freely on the shaft, then insert the cotter pin. The greatest wear on the drive shaft and housing assembly is on the babbitt bushing in the ball end of the drive shaft tube. It is usually advisable to replace this bushing when overhauling. To remove the bushing, insert an old drive shaft into the lower end of the tube, and while holding it against the bushing, drop it on a babbitt block, thus driving out the bushing. It is necessary with an ordinary drive shaft, to hit first on one side and then on the other. A very handy tool may be made by flattening the end of a scrap drive shaft as shown in Figure 10. It will be noticed that the sides have been filed back to allow clearance for the rivet heads. This is very important, as the rivet heads would otherwise be sheared off and the rivets would work loose if this was not done. The new bushing may then be driven into position and reamed.

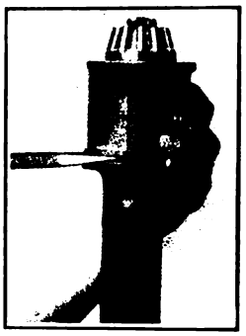
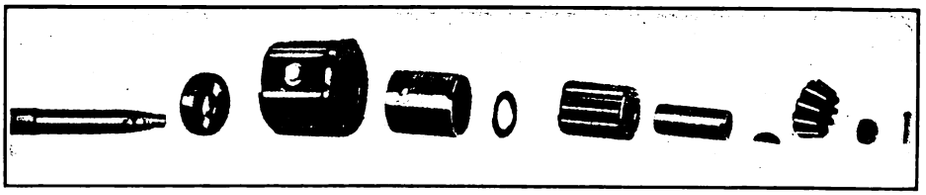


Fig. 8

The end play in the drive shaft is taken up through the ball bearing and thrust shoulder of the babbit bearing. To find the depth to which the babbit bearing should be faced, assemble the universal joint to the drive shaft in the tube, driving it on with a rawhide mallet and note the distance the hole in the universal joint is off from the hole in the drive shaft. Take care that the sleeve on the gear end of the drive shaft is against the ball bearing and not riding on the distance plate, as too much of the bushing will be faced off, allowing too much play in the shaft. It is advisable to have the assembly rather tight. The universal joint pin will draw the universal joint on to the shaft from .003″ to .004″. Do not remove too much of the bushing. It is better to repeat the operation than to have the shaft fit loosely. Before assembling the shaft in the new bushing, drill a hole through the dope plug hole in the housing. This may be done before the bushing is reamed in which case the burr will be turned off into the dope hole instead of the bearing. Drive the pin through the universal joint and shaft and peen it over on both sides with a set of rivet sets. Figure 11, shows a rivet set built into a scrap housing. This makes a very good tool for this operation.



Joe Prepares for the Spring Offensive

By D. G. BAIRD

I'M in no wise dogmatic, and I'm willin' to admit right off—before some wise guy calls my attention to the matter in a embassin' manner—that I may be wrong, but it seems to me like the world woulda been a lot better off if my late friend Ike Newton hada been doin' something else when he laid down his now well-known and exceedingly popular law in which he legislated that everybody should have a tendency to remain in his position of rest unless something or somebody else made him move.

W'y just think what mighta happannede durin' the past year if Ike hada left off makin' that law. There maybe wouldn'ta been no coal strike, f'rinstance, 'cause the miners wouldn'ta had that said tendency to remain in their position o' rest and woulda therefore gone on minin' coal, and chances are my old pal Jessie Willard woulda conducted hisself in a far different manner on the occasion of his last public appearance and I woulda been some odd iron men to the good instead o' bein' a equal number to the bad.

But what mighta happened durin' the past year ain't nothin' to compare with what we could dope out for the new year. W'y if it just weren't for the aforementioned law,

JOE GREETS ME REAL CORDIALLY

the U. S. senate might take some action on the league this year or settle some one of its ninety-six investigations of the H. C. of L!

But what's the use? The law's the law, and the fact is everybody does have the said tendency to remain settin' down unless something or somebody makes him get up and hustle. That's the way it was with my friend and sometime boon companion, Joe Hamilton — but that's what I was goin' to tell you.

You see, Joe was a very close friend o' mine, so much so in fact that I didn't hesitate to purchase food and adornments for my tin lizzie from him at such time or times as the old gal seemed to be in urgent need of the same.

But Joe was badly addicted to obeyin' Ike's popular law and remainin' in his position of ease and comfort, so when I drift down to Humphrey for my Christmas vacation one year and find him settin' with his feet propped up on the heater and chewin' Star Navy and bein' real busy tryin' to devastate the white pine forests, I'm some suspicious right off that things ain't goin' as well as they should go with a sales-and-service business in a prosperous country hamlet such as Joe infests.

Well Joe salutes me real cordial and gives me a invite to pull a chair up close to the stove and break a piece 'uv board off'n a box that's standin' by real handy and join in the interestin' game of time-killin'.

But I ain't never been overly enthusiastic about murder considered as a fine art—specially when one of the chief characters is a feeble old fellow like Father Time—so I get right down to business by offerin' one of my highly suggestive remarks. "Well, Joe," says I innocent-like, "How's business these days?"

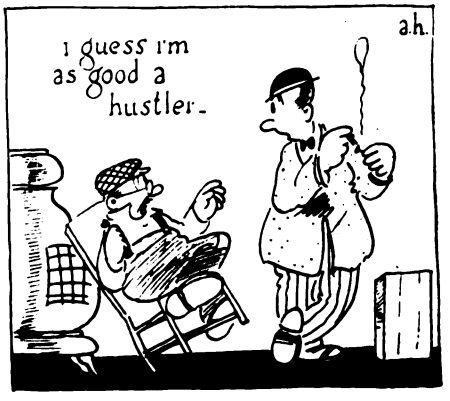
Joe owns up that it ain't nothin' to brag about just at the time, and I go on pressin' my advantage. "Guess you're makin' hay while the snow flies though, eh?" says I.

"Well that depends," Joe comes back in his lazy way. "If you mean by 'makin' hay' that I'm sellin' automobiles and tractors and repairin' the same, my answer will necessarily be in the negative, seein' as how I'n not overly burdened with business just at this time.

"But I take it that you're—"

Just here the door opens and a farmer lad edges hesitatin'ly inside. Joe just barely glances up and says, "Come up to the stove, Johnnie," without missin' a lick with his whittlin' and without deignin' to further notice the presence of his youthful caller and possible customer.

But I can't stand by and see a friend neglect his business in such a flagrant manner, so I speak up real cheerful and put the bashful lad at his ease. "Well' son," says I," in what way can we be of service to you this fine mornin'? We have automobiles, cars, machines, flivvers, and tractors for sale; also the usual appurtenances thereto. But maybe it's some repair work that you would like to have done?



JOE COMES BACK SARCASTIC

We have the only original, up-to-the-last-minute repair department in this neck o' the woods and're prepared to render the best o' service on short notice or even less in an emergency."

The lad stands twistin' his cap in his hands a while tryin' to remember what it is he's came for, then he says real hesitatin': "My pa said come here and see if you folks 've got any literachure about ther tracters."

"Literature about tractors?" says I, "well I guess yes! We've got more literature about tractors than Bill Shakespeare and Harold Bell Wright together ever wrote. Just stir up a few pastoral sonnets for the lad, Joe." Then I goes on talkin' to the lad: "Live far about here, Jimmie?"

But he's some bashful in the matter 'uv conversation and just stands and grins foolish like without sayin' anything atall, and I go on encouragin'ly: "Don't mind divulgin' the secret of your place of abode, do you? That is, where do you reside, lodge, dwell, roost, perch, sojourn, or tarry permanently?" I hasten to add as he begins to edge off toward the door without his literature.

"Oh, I live up the river' about six mile from here," he says grinnin' like he thinks I'm jokin with him. "My pa 'lowed maybe he'd buy a tractor next spring if he could get a good price for old spot and her calf and sell a few hogs and things, maybe."

"Sure!" says I real enthusiastic. "You just tell your pa to make his plans to do his spring plowin' by the acre instead o' by the single furrow like he's been used to doin'. What's his name and address?"

Well, I get the desired information after some little elucidation, and Joe gives the lad a bunch 'uv advertisin' matter relative to the habits and inclinashuns of tractors and their superior qualities and he goes on his way.

But I'm some peeved to think that here's a prospective customer livin' within half-a-dozen miles of Joe's place and hasn't even been favored with a supply of readin' matter for the long winter evenin's, so I enquire of my friend real polite: "I persume, Joseph," says I, "that now's the time 'uv year when you justify the use of the second term in the name of your business, is it not?"

"Second term?" Joe-stalls-like he don't get the drift 'uv my insinuation.

"You repeated my exact words, I came back real patient. "I understand that the appellation of this enterprise is 'Sales and Service station, and my innocent inquiry was made for the purpose of discovering' if possible just what activity you are engagin' in durin' the winter months to justify, warrant, defend, support, or prove the truth of your right to assume such a title, name, cognomen, or denomination for the said industry.

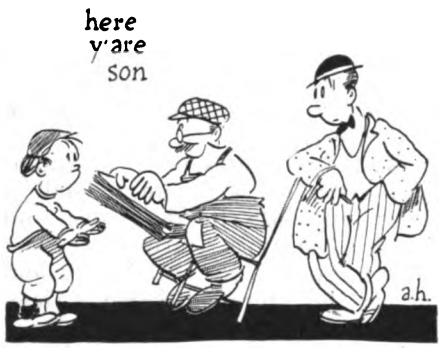
"W'y I guess I'm doin' about what other such businesses're doin'," Joe says. "Most folks've got their cars in cold storage now and there ain't no repair business to speak of; and as for sellin' cars or tractors at this time o' year, it's just about outa the question. I sell a few accessories along—

"Of course!" I interrupt real gently, "but what're you doin' for your fellow man in the matter of acquaintin' him with the superior advantages of cornfield locomotives?"

"W'y I'm doin' all that could be expected at this time o' year," Joe says beginnin' to show a little exasperation at my persistent examination. "There ain't nothin' much a fellow can do right now, but when spring comes I'll put on a big offensive and go right after the business."

"Quite so, Joseph, but how about a little preparation for said offensive in the meantime? And how about your duty to your prospective customers in the matter 'uv helpin' them to pass the winter evenin's in pleasant literary pursuits and dreamin' of tillin' and harvestin' and pullin' stumps mechanically instead of equinely, as formerly? Has Uncle Samuel's mail business broke down or is it, as I surmise, that you're too badly afflicted with the well-known human disease commonly known as sloth, indolence, idleness, remissness, dawdling, and indilligence?"

"I guess I'm about as good a hustler as some I know what do a lot more talkin' about it than I do,"



JOE GIVES THE LAD A BUNCH OF ADVERTISING

Joe comes back some sarcastic. "I'm runnin' this here business—"

"Oh, no you're not, Josephus," I interrupt affectionately, "you're settin' on the back o' your spine and waitin' for somebody to run in and beg you to sell him a gasoline steed. W'y as a salesman, friend Joe, you're about as good a substitute as a certain highly-advertised beverage is o' beer."

"I guess you mean to hint that you could give me some lessons in in the fine art o' salesmanship," says Joe as if the truth hurts pretty bad. "Now," he goes on, "it's worth the handsome sum of $25 to me to sell a tractor or automobile, and I'll take pleasure in payin' any person such a sum who will bring about such a sale for me."

"Well I got business o' my own, little as you might think it," says I in reply, "but I don't mind sayin' that I could take this here business and make such preparation for a spring offensive as would result in every farmer in the county what owns his own land bein' irresistibly impressed that it's his supreme duty to own and possess a tractor and do everything about his premises, except milk the cows, with the same."

"You heard my proposition," Joe reiterates.

Now I don't like for nobody to think I'm bluffin' and I'm always willin' to back my hand as long as there's any chips on the table before me, so the first thing I know I've made a trade with Joe to put in my vacation in gettin' out a lot 'uv advertisin' matter and writin' a lot o' letters and the like; I'm to get $25 on every sale that is directly traceable to my activities in the matter; the next spring and summer.

Well sir, I made Joe utterly disregard Ike's law about stayin' in a position of ease and comfort, and we got right down to work. First we got out a lot 'uv nice friendly letters to all the farmers in the county, tellin' them some few things about the advantages of the tractor and enclosin' some nice advertisin' matter for their persual. There's no greater day in most country folks lives than the time when the postman brings a letter, and we took care to see that every landowner within twenty-five miles got some highly important mail.

Then when a heavy snow fell and it turned real cold, we followed up the first letter with another one about the discomforts of havin' to tend stock in such weather and the like and enclosin' a nice picture of a tractor standin' under a shed all covered over nicely and havin' a suitable inscription about the well-known habit of tractors not eatin' when they don't work; written underneath.

I got the campaign well started then I sent Joe out to make personal calls on the worthy farmers. And they were real calls too; business was not necessarily mentioned. Joe showed a interest in the horny handed agriculturist's work, and in his family, and his babies and pigs, and chickens, and troubles, and talked about the presidential election of sixteen years ago, and the like, and he comes in one day pretty soon and owns up that he's beginning' to like it.

Well, to make a long story a little shorter, I spent a real active vacation in a intensive advertisin' campaign and put Joe up to some real fundamental practices such as offerin' the milk o' human kindness to prospective customers, and when summer come cheeks began to come along with it.

Queries-Answers-Notes

THIS department is the meeting place where you are free to ask for information, answer questions, discuss shop matters and business conditions and any other notes you feel would be of interest to a fellow mechanic. Make use of this Department as often as desired.

Wagon Tread Too Narrow—Replying to an article, which appeared in a recent issue of the American Blacksmith, regarding the tread of automobiles and wagons, I wish to say that the man who brought forth these ideas; that the farm wagon of today should be made 56 inches instead of 60 inches in the center of the track, never lived in the West Virginia hills. If he had, and used a wagon there, he would never advocate narrowing the tread. On the contrary, he would say, make the automobile wide enough for the 60 inch wagon or better still make both wider. For our 60 inch track wagon makes ruts, which are so close together that horses weighing 1200 to 1600 lbs., cannot walk without slipping into the rut, when hitched to a wagon. Narrowing the tread makes matters worse as there is not room for any of our horses to walk beside the tongue and still keep out of the rut. I have never talked to a man since wagon treads have been standardized, who would have one of the new 56 inch tread wagons as a gift and I am very sure I would not, for I have been reared up, working horses. I love the animals and I want to do something to help make their burden lighter. Take all of your autos and tractors, etc., what would the world do, but for these sensible and much abused animals. If horses could only talk, they wouldn't say make a wagon narrower, so that it would turn over at every little breaker in the road not to mention the field. Perhaps I shouldn't say stamp out the 56 inch wagon and hang the man that brought them about. Let the people in the level countries have their narrow wagons and let the manufacturing concerns remember us, out here in West Virginia, where it is so hilly that we plant potatoes on one side of the hill and dig them out on the other side and if they want to do something and do not know what it is, let them make their wagons 66 inches wide or even more.

Thomas M. Poland, West Virginia.

Welding A Broken Crank Shaft—I have been a reader of your valuable paper for about six years and I don't believe, I could get along without it, as I get some most valuable hints out of it. I have been in the blacksmith business for about 14 years and 4 years ago, I added Oxy-acetylene welding to the work, we do.

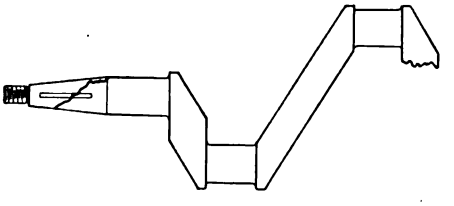
Recently we had a crank shaft out of a 14 H. P. gas engine to weld and we accomplished it so successfuly, that I thought it would interest your readers; this is how it was done.

The shaft in question was about 5 feet in length and 2¼ inches in diameter and designed for a four cylinder engine. The break occurred where the shaft fits into the fly wheel. This portion of the shaft tapering from its normal size down to 1¾ inches which made it rather difficult to weld.

First, I took some fire clay, which I worked up to the consistency of putty and after having fitted the two broken parts together, took an impression of the break. The mould thus formed was placed in a scoop shovel and then taken to the forge, where it was baked until it was hard.

The both ends of the break were then ground down, so as to form a wide groove. The shaft was then placed in the clay form and the ends of the break were securely spot welded together. Common soft steel welding rod ¼" in diameter being used for the purpose. The shaft was placed in the forge and brought to a good heat and without removing, it the weld was made.

When the welding was completed, the shaft was placed in cinders and allowed to cool, after which the weld was dressed up by hand, for the reason that I have no lathe. First, I ground it down on the



coarse emery wheel and then on the carborundum wheel, using a 12 inch bastard file and emery cloth for the finishing touches. The key was recut and a new key supplied.

The shaft has been installed in the engine and has been running for the last three weeks. It never caused a murmur. I don't claim it is practical to weld all broken crank shafts although in this case it was successful. I will give you a little drawing, so that you will understand where the break occured.

F. L. Sturgeon, Missouri.

Making a Preheater: In your February issue Mr. Simmons of Kansas, writes for advise on the kind of burner best suited for preheating. He states that he desires to use gasoline for fuel. The equipment used for that purpose in my shop, consists of four burners made by the National Rubber & Specialty Co., Cincinnati, Ohio. These burners can be purchased from the Feath Iron Co., Kansas City, Mo. I have these burners fastened on the end of a 6' piece of ¼" pipe, for the purpose of handling them while they are in operation. I have a 12 gauge, welded, galvanized tank in which the gasoline is kept under 45 lbs. pressure. The gasoline is carried up to the wall of the building at about the height of one's waist, from there it connects to four lead pipes each of which connect to one of the burners. The lead pipes are connected to the end of the 6' piece of pipe with 15' of 5 ply armored hose. My outfit has four outlet pipes arranged parallel to one another. However, I believe an improvement can be made by burying the lead pipe in the ground and bringing it up alongside of the heating table. My reason for changing is to eliminate the danger of fire due to molten metal falling on the pipes. Such an arrangement will afford both comfort and safety. I have devised a tripod for holding the torch, while preheating a job. It is so arranged as to prevent the torch from turning sideways.

Another means I have found for holding the torch, which has the advantage of not raising the torch as high as the tripod, is to take a piece of ¼"x1¼" x6" flat iron, to the flat side of which is fastened, in an upright position, another piece of metal having a hole through it large enough to accommodate the hose. The hose is slipped through the hole and held rigidly in position by means of a set screw. In this manner the torch can be adjusted to the most advantageous position. The hand hole is made from a piece of scrap iron welded to the torch 3' from the pipe, and the asbestos card is slipped on the pipe between the hand hole and the fire. This affords protection to the hands. The controlling valve is installed in the line just back of the hand hole. The table can be so constructed as to suit the individual needs. Excellent results may be obtained from the above at a very small out lay.

Ira Surrite, Kansas.

Shrinking Bands on a Concrete Mixer—In replying to the brother who wishes to put a band on a mixer, will say that I have put on a good many, and have always made them of iron and used practically no draft. If there is a draw something has to give, either the band or the body. If he is careful about his measurement, the rule I have followed will give good results.

H. N. Pope, Connecticut.

When the Blacksmith Business Falls Off—A brother smith asks, "What shall I do with my forge, as business has fallen off?" I would say keep it. There are, and always will be horses and wagons, which will need attention. Have a place to take care of this work and get fair prices for doing it.

Now, if autos have driven out this kind of work, which you were accustomed to do, then go after the auto work. Have the forge in a convenient place where there will be room enough to get an axle or frame in the fire, or any other part of the car. Get a good leveling plate, vise and bending forks and specialize in straightening axles and frames. This is the kind of repair work that few garages do, and they have to depend on the smith. Fit up the shop to do auto repair work and if you do not feel competent to do the work yourself, hire a man who does know how. Keep your eyes open, read good books on the subject and fit yourself to do the work.

If you will give the matter your serious attention, you will not be at the mercy of your hired help and further more you will not have to ask "What will I do with my forge?" more than likely, you will ask, "Where can I put an additional forge?"

H. N. Pope, Connecticut.

Prices on Fishing and Drill Work—Could some of your readers tell me

through your columns, the price that blacksmiths are getting for finishing and drill work, both new and repair jobs. It has been 15 years since I have been engaged in that kind of work and at that time, we received $3.00 to $3.75 a day.

Michael Belecz, Ryegate, Montana.

Editor's Note—If any of our readers know the scale of wages paid for this kind of work in different localities, we would be very grateful to them for the information.

Shoeing Prices in West Virginia—In some of your papers, I find prices from some of the blacksmiths in the different States and thought I would send you some of the prices I charge for my work.

For horse shoeing, I charge as follows: No. 2, 4 new shoes, plain, $1.40; No. 3, 4 new shoes, plain, $1.60; No. 4, 4 new shoes, plain, $1.60; No. 5, 4 new shoes, plain, $1.80; No. 6, 4 new shoes, plain, $2.00. For toeing new shoes additional each 10c, for resetting old shoes, per shoe 15c.

C. M. L., Cox's Mills, West Virginia.

Ammeter Installation—Kindly tell me through your columns the manner of connecting an ammeter on an early model Dort car.

C. G. Coffin, Okla.

One side of the ammeter is connected with the terminal of the starting switch. The terminal which is in direct connection with the battery should be used because if the other terminal is used a circuit is formed through the ammeter only when the starting switch is closed. The lead from the generator should be connected to the opposite terminal on the ammeter. The lighting and ignition circuits should be likewise connected on the same terminal as the generator lead. All connections are made so that all circuits both ignition and lighting with the exception of the starter pass through the ammeter. This exception is made because the starter draws so much current that it is most apt to damage the instrument. After all connections have been established should the ammeter read charge when it is obvious that the reverse condition exist, it is necessary only to reverse the connections on the ammeter and the instrument will read correctly.

Favors Handling Auto Accessories—As it has been some time since I have contributed anything to your paper, I will send you a few lines. I run a general blacksmith shop and get $2.00 for shoeing, repair work being extra. In 1919, I put on 1757 shoes, and while that is not half the amount of shoeing as there was to be done ten years ago, still I have no reason for complaint about that, as I fill in all my spare time at auto repair work.

I have been running a shop for about 19 years and would not advise a man to quit his blacksmithing business and go into the auto repair work, entirely. Yet on the other hand I do not think there is a blacksmith who can not do some auto work to advantage. I do automobile repairing as a side line. I will not leave off shoeing or necessary repair work to work on an auto, but I will take all kinds of auto work, if they will only give me a little time to do it.

I am considering putting in an electric light plant and would like to hear from some one who is using one, as to whether it pays and what kind they would recommend. I want a small plant that would be suitable for lighting the shop, charging storage batteries and possibly lighting three or four dwellings.

I will just drop a word or two of advise to the blacksmith, who wants to begin auto work, if he is in a neighborhood where there are a few Fords. A list of the following parts will work out very satisfactorily, especially where you are just starting in, and you don't know how things will work out. 2 Timers; 2 Timer cables; 8 Spark plugs; 2, 30x3 Inner tubes; 2, 30x3½ Inner tubes; 1 Tire each of the same size; 6 Spindle bolts; 6 Spindle bolt bushings; 6 Steering arm connecting rod bolts and bushings; 1 Radius rod; I Radius rod support; 12 set K. W. coils points: A small assortment of tire repairs and accessories; 2 Drive shaft pinions 6 Rear wheel keys; 6 each, Right and left adjusting cones, 6 stationary cones; 6 Ball races; 3 doz. each, ½" and ⅜" Balls.

If there is a good garage near you make arrangements with them for repair parts. They will allow you a discount.

An addition to the shop, built with a smooth tight floor and large enough to accommodate one or more cars, is a very profitable asset. Keep the accessories where they will be as conspicuous as possible. Get a barrel of cylinder oil and a gasoline tank. Have your gas tank in a convenient place where it can be seen from the road.

E. E. Smith, Kentucky.

Repairing Stop Cocks—I am with an oil company and they use a great many 2" iron stop cocks. Many of these have become worn with the result that they leak quite badly. We have tried grinding with different compounds but so far have met with no success. We would like to know if they can be repaired and how they were ground originally. What machinery is used for the purpose.

Chas. Koons, Ohio.

Assuming that the valves in question have a tapered core, there are several things which may be done. If the core or body is not grooved, the two parts may be ground to a close fit much after the same fashion as an automobile valve. If you have sufficient stock and the parts are not worn too badly it is possible to re-machine them. In an emergency, the core of the valve may be built up with additional metal by the oxy-acetylene process after which the core may be remachined. This practice is advisable more for emergencies than for general practice, because the cost of doing the work frequently equals the cost of a new valve, and then too, the results are always more or less speculative. The bodies of new valves are rough bored and then reamed. The core is most usually turned, but in some cases ground, in which case a universal grinder, equipped with a fixture for holding the valve, is used. The cores and bodies of small bronze or brass valves are most usually made on an automatic.

Automobile Increases H. C. L.—After reading the article "Yes the Horse is coming back" taken from the Kankakee Democrat, on page 125 of the Journal, I want to write a few lines for publication on conditions around Hornell, N. Y. Up to date of this writing, the Auto Bus lines out of Hornell, have not turned a wheel in 8 weeks and it will be some time yet before they will be running. The snow here in the city has not been over 12 or 14 inches deep at any time this winter. The auto could get around on the streets, but when they came to make a trip outside of the city they failed and failed badly. Six or seven weeks ago between the Canisteo Valley and Cohocton Valley, a distance of 16 miles and state road at that, there was at one time 8 autos abandoned by the road side besides 2 or 3 autos that were towed to farmers' barns and stored. Later some were loaded on bob sleighs and hauled in by horse power. It is a common thing now days to see an auto hauled in by horses. A few weeks ago a busines man suffering with the auto fever got stalled in the snow three miles outside the city on the state road. The traffic was blocked for over an hour, as the horses that came along were all harnessed light and could not haul the auto out. However, a heavy harnessed team came along and it did not take long to get the auto out.

One of the city undertakers had a funeral at Howard a distance of 12 miles, and state road all the way, was almost impassable with snow. A hearse was mounted on a sleigh and hauled by four horses. The trip consumed 7 hours. This was too much for the auto hearse which was compelled to stay in the garage as they always are when the going is bad. Old Dobbin has to make the trips. Every spring, the grocerman, merchant and M. D. have to have a new model auto and then you hear the public crying about the high cost of living.

The writer is in receipt of a letter from a business firm in New York City in which it is said that a horse is 50 per cent cheaper for delivery than an Auto Truck. The Auto Truck therefore increases the high cost of living. The auto is all right in it's place but it is not right in all places, which has been proven in our vicinity this winter.

Harry Babcock, Hornell, N. Y.

HERE'S HOW A LIVE WIRE TRACTOR DEALER IN ILLINOIS GOES AFTER BUSINESS

AMERICAN BLACKSMITH AUTO & TRACTOR SHOP

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WRITING FOR YOUR TRADE JOURNAL

How often after having read an article in your trade journal, has the thought occurred to you, "I have a better idea than that?" No doubt you have. But unfortunately, as long as you are the sole possessor of the idea, it is not going to help the other fellow.

There is no reason why a man, who is observant of the conditions about him, can not write for his paper. Every Editor regrets the fact, that so many practical men with excellent ideas, which would help a host of others, are either too busy or indisposed to write. One does not have to be a born Editor in order to write successfully. Just write as though you were talking—be natural. Before you start have a clear idea of what you are going to say and then express it in plain, simple language. Many people explain their hesitancy in this respect by the fact that they are, as they say, not a literary genius. That is an erroneous idea. Such qualifications are entirely unnecessary. One has but to bear these points in mind—Have something to say—understand it clearly yourself and then put your thoughts down in as few and simple words as possible.

Any person of intelligence can find something of importance and interest, in his every day work that others will be glad to know. Don't be afraid to express your thoughts, but when writing make your sentences short, remembering that a short sentence is more easily understood by the reader.

While photographs add greatly to the value of an article, they are not absolutely essential. A rough sketch will suffice. We will do the rest.

A BLOW AT THE MOTOR CAR THIEVES

A comprehensive effort to make motor car theft less attractive is embodied in the "National Motor Vehicle Theft Act" recently passed by Congress.

In the past many automobile pirates have stolen cars in one state and then have easily disposed of them in neighboring states after making more or less complete alterations in the appearance of the vehicles. When New York machines have been stolen they have been disposed of in New Jersey towns, in Philadelphia or elsewhere.

As a result of the new act this illegal interstate traffic, which has grown to large proportions, become considerably more hazardous than formerly. The law holds that "whoever shall transport or cause to be transported in interstate or foreign commerce a motor vehicle, knowing the same to have been stolen, shall be punished by a fine of not more than $5,000 or by imprisonment of not more than five years, or both.

"That whoever shall receive, conceal, store, barter, sell, or dispose of any motor vehicle, moving as,. . . or which constitutes interstate or foreign commerce, knowing the same to have been stolen, shall be punished by a fine of not more than $5,000, or by imprisonment of not more than five years, or both.

"That any person violating this act may be punished in any district in or through which such motor vehicle has been transported or removed by such offender."

GOOD WILL

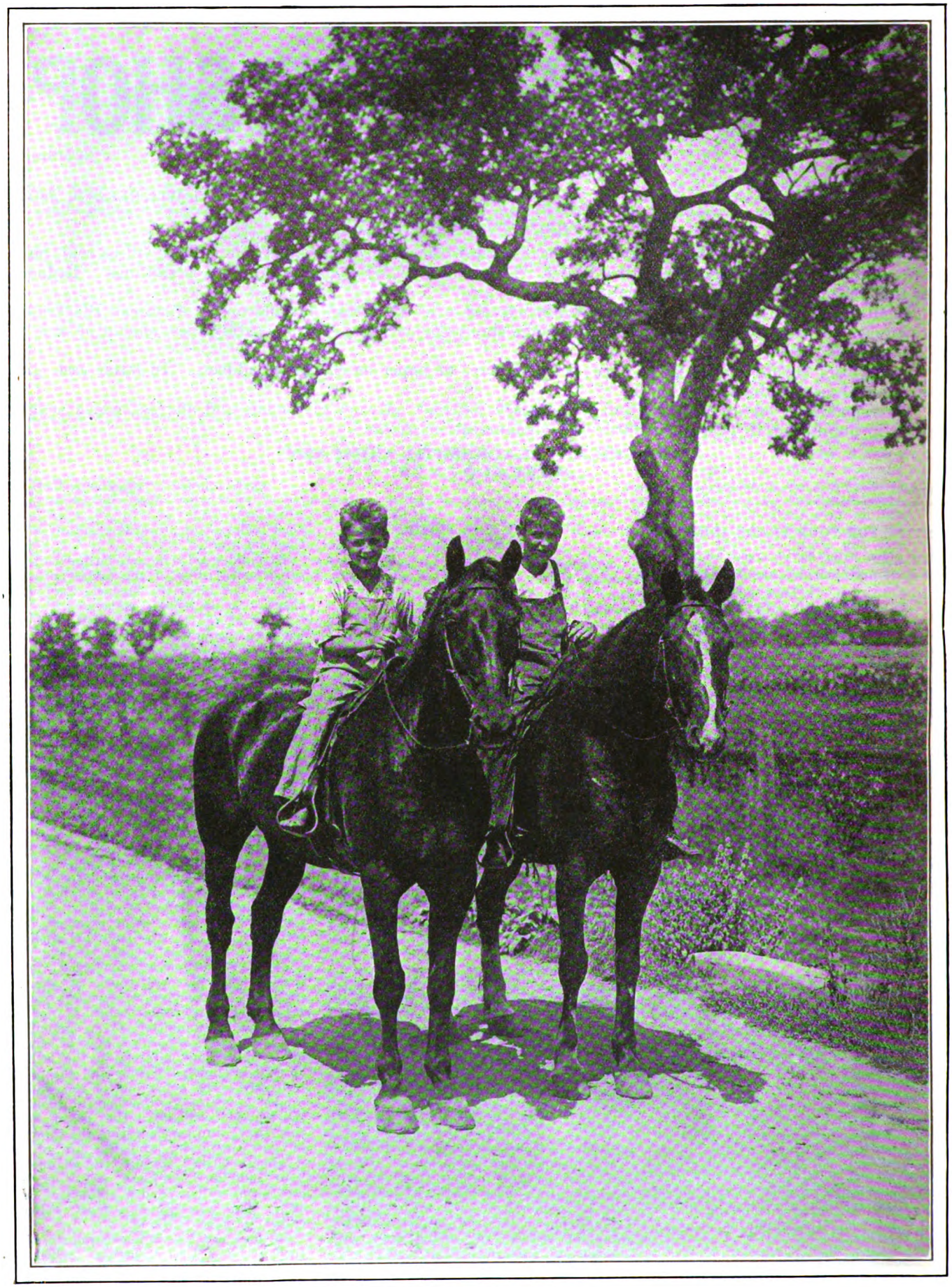
Good will is one of the most valuable assets a business man can acquire. It matters not how large or how small his particular business may be, the ultimate success is measured by the good will the business has maintained. It is one of the intangible assets that should grow with a business. Some men have been in business for a half of century, apparently successful and still unable to create any great amount of good will. Other men after having been in business but a short time have succeeded in creating a general good feeling both towards themselves and their business.

To build good will and business at the same time is one of the easiest propositions which faces the business man. It is entirely a personal matter with the founder of the business, and it ought to begin to sprout the first day of the business is established. Good will not only embodies the respect of the community surrounding your business, but it brings a desire on the part of the community that your business shall be successful.

The fundamentals of Good Will are cheerfulness, courtesy, affability, consideration, prompt attention, fair prices, the square deal, and last but not least, ready service—a service whose first consideration is the welfare of the customer. This does not mean that the personal interests of your own business are called upon to make any sacrifices for the customers profit or for "the good of the trade."

With good business principles established as the track upon which you shall run, and such principles adhered to rigidly as well as religiously, "value received" is a certainty both for the customer and the business. But that is only playing fair. Good Will requires something more, namely, the personal touch of the individuals who compose the business organization. That personal touch is not effusive or dissimulative, or a camouflage of excuses to cover over a lack of service, but that genuine interest in the welfare of your customers, friends and the public generally. The going out of the way to render a courtesy; the helpful hand to the outside demands; the broad spirit that takes into consideration the interests of the community and the life of the neighborhood, all through the channel of your individual business, not only will create but will expand a volume of Good Will, that will prove a most valuable assest in your business.

No man can live in a community—Just for himself and be a success. Selfishness may pile up money, but it can't make Good Will. So think it over, and see how you can weave into your business all the elements that are necessary to secure and retain the Good Will of your community.



JUVENILE EQUESTRIANS

Welding Without Preheating

by DAVID BAXTER

Many jobs can be successfully welded without preheating. That class of work is thoroughly explained in the following article.

THE oxyacetylene torch operator, especially the beginner, is repeatedly advised to heat cracked or broken iron casting previous to welding, that is previous to applying the welding flame, and in most cases to keep the preheater burning during the welding process. He is continually admonished for not getting the casting red hot, before starting to weld, and told to keep it that way throughout the welding. He is cautioned to do this principally to prevent the casting from warping or cracking due to expansion and contraction caused by the welding flame, during the welding, and afterwards. As a secondary consideration he is told to always preheat to save welding time and welding gases.

Then besides all the caution concerning the need of great care in preheating, the welder is doubly cautioned about regulating the cooling of the welded job. He is told to cool the welded casting very slowly and to always keep it covered and protected from cold air currents; to allow the casting to cool slowly; in fact to allow it to cool as slowly as possible. Most welding instructors claim that this is the only safe way to secure a good weld.

So insistent has beeen the instruction to preheat extensively, and so oft repeated has been the caution to cool slowly, that it seems it bids fair to become a bugbear to the student of the welding art. It seems, it would frighten away many prospective torch welders. In fact there probably are many blacksmiths who hesitate to take up a business requiring so much care in regard to the details. They probably have gathered the idea that every job must always be preheated, re-heated, and slow-cooled, all of which sounds like a lot of trouble to simply repair a broken casting.

Of course most of them must know, that many of the small castings need no heating previous to welding; at the same time, they are unintentionally led to believe, it is absolutely essential to preheat all large broken castings. In some shops they even go to the extreme of preheating all jobs, and especially the heavier work.

It may be safer to make a general practice of heating everything previous to welding; at least, it usually does no harm. I do not want to be understood, as advocating the elmination of preheating, or to disparage its value, chiefly for the reason that it may cause some of the less experienced welders to go to the other extreme and thereby

Fig. 1. SHOWING THE LOCATION AND EXTENT OF THE FRACTURE "V" GROOVING AND MANNER OF HOLDING BROKEN PARTS IN PLACE

ruin some particular jobs. However, there are many castings, that are ordinarily spoken of as heavy jobs in the average shop, on which the process of preheating may be entirely eliminated from the welding operation. The preheating may be omitted without materially adding to the cost of the welding, and without detracting from the facility with which the welding may be accomplished. In other words, it does not always lessen the expense of welding, or does it effect a great saving in gas, or even add to the fluidity of the metal; to use the preheating method on each and every occasion. With all due respect for the fact, that red hot metal will melt easier and quicker; the matter of time saved in not arranging the work for preheating, and the saving in cost of preheating fuel, will about balance any saving effected by melting the metal easier.

Now, in order to be able to eliminate preheating the welder should understand that it depends mostly upon the location and nature of the fracture. Preheating may be omitted where the break is located in one section of the casting while the same job with the break located in some other part, would be impossible to weld without preheating. In other words a casting might have two fractures; one of which could be welded without preheating, while the other would require the whole casting to be preheated. It is then scarcely necessary to say that the whole thing hinges upon expansion and contraction, leaving the matter of preheating, to save expense, to the judgment of the individual welder.

If the welder doesn't need to consider the factors of expansion and contraction, it is plain that he may do as he pleases or as conditions warrant in regards to whether or not, he should preheat. So that when he decides to omit the preheating, he should first know how the expansion and contraction are going to act, since all metal reacts when heated.

An attempt to clearly define the difference between castings that must be preheated, and those which do not need that preparation, would lead to a long discussions of metal structure, casting design, conductivity, and other elements of metallurgy with their complexities, which might be out of place in an article of this nature. Lack of space also forbids the lengthy discussion which alone could do justice to the subject. For the sake of convenience then, let us therefore roughly divide the castings into two general classes. First the kind where expansion and contraction are retarded or obstructed from natural action by the shape of the casting. Secondly, the kind where these elements have free play.

To understand this the welder should have a fair knowledge of

heat reactions. The fundamentals of which are that metal expands when heated, the expansion increasing as the heat is increased; in effect the metal swells or enlarges its own dimensions as the heat increases, the rapidity of the expansion being governed by the rapidity with which the heat is increased. Then upon cooling, the casting shrinks or reduces its size until it reaches approximately its normal condition, when it is as cool as before heating it. In effect the metal automatically shrinks or decreases its dimensions as the temperature is lowered. Or as the heat radiates or is conducted away, the hot casting gets smaller.

Now if the metal can swell and then shrink with nothing to prevent a natural action, there will be little or no danger of cracks or open fractures. Providing of course that there is not adverse influence bearing upon the process, such as artificial cooling of any part of the job.

But if the shape of the casting is such that the contraction of one part pulls against another part, one must give and then crack. Or if the contraction of one part is retarded on both sides, an inner strain is set up or an open crack results. The meaning of this may be illustrated in a simple way with the weld for example. The heated weld expands to the fullest extent and tends to push the surrounding metal outward. If nothing prevents the weld from expanding, the action will take place in a natural manner. But if the surrounding casting resists the outward push of the weld, it must warp up or downward; or if the weld is strong enough it may push the surrounding metal outward enough in some direction to crack some other part of the casting. However, this is for the most part theoretical, since there is very little danger of cracks due to expansion in the average job; some parts of the casting will usually absorb the effects of expansion. Then too, the weld is arranged in advance to care for the expansion.

On the other hand, when the weld cools and shrinks the danger of cracking is greater. As the weld contracts in size, it tends to pull the surrounding metal apart, or to pull away from the surrounding metal. The first action is to pull the surrounding metal inward; if this attempt is unsuccessful the weld will crack in its weakest part, either directly in the weld or close to it, depending a lot upon the condition of the weld. Should this condition be such that its resistance is greater than that of other parts of the casting, the contraction of the casting, or the contraction of the weld will pull the casting apart at its weakest point. That is, if that part of the casting immediately surrounding the weld is strong enough to resist the pull, then the weld will draw it inward, and if nothing prevent the whole casting from being drawn inward there will be no cracking.

The main object then, is to cause the casting to expand, thereby

Fig. 3. THE COMPARATIVE SIZE OF THE WELDED CYLINDER

furnishing more room for the expanding weld. Then the contraction of the casting will follow the contraction of the weld, inward, as the whole thing cools. In other words, both the weld and the casting will shrink in unison, if properly heated and cooled. The welder should keep this thought in mind when endeavoring to distinguish the castings which he may weld without preheating; he should picture in his mind the action of the weld as it expands, dwelling particularly upon the contraction, by practice he will learn to tell at a glance whether or not, the weld can push part of the casting outward, as the flame is applied, and then draw it back as the heat radiates. As soon as he grasps the principle of the thing he will no doubt be able to save a great deal of time and money .

A good example of the kind of job that may be welded without preheating is illustrated in the photos accompanying this article. Here is illustrated in its simplest form the principle involved: expansion of the weld pushing part of the casting outward and contraction drawing it back again. The broken bearing is moved back and forth by the reaction of the heat, when applied to the weld.

This job was a cylinder block casting for a large heavy-duty farm tractor. In fact, there were a pair of these castings both broken in the same way. Each was prepared and welded in the same manner in regards to the V-grooving of the fractures and applying the filler metal. Both jobs necessitated handling by an overhead trolley with chain blocks. The devices used in making this repair were few and simple.

These cylinder blocks were what is ordinarily called heavy jobs, weighing several hundred pounds. One bearing and one bracket was broken from each casting. The strengthening bracket of each part was broken also, which made a double weld necessary, since it required the turning of each casting in order to weld both sides completely. The metal in these castings was a soft grade of cast iron varying in thickness in the fracture, from one inch to an inch and a half. The thinner metal being located in the brackets. This variation of thickness in the same weld required a slight change of pace in handling the flame and filler. A process which sometimes puzzles a novice, if he welds from the thin metal onto the thick without noticing it; he is likely to make a poorer job of the thick metal. He will not melt deep enough or mix the metals thoroughly.

Both fractures of each block were prepared for welding in the customary way by cutting away enough iron on each side of the fracture to form a wide V-groove when the broken pieces were fitted to the casting. This grooving was done with a hammer and chisel on the body of the block, as there was little danger of breaking it. The grooving of the bearing and bracket was accomplished with an emery wheel, as there was some danger of breaking the lighter parts. The groove metal of all parts was removed from the full thickness of the casting. Commencing at the bottom of the fracture and gradually sloping back to the outside surface of the block, thus making the groove about twice as wide at the top as the metal thickness through which it

ran. This wide sloping groove offered a better opportunity to fuse the weld from top to bottom, which was absolutely essential to secure a strong bond. And while chamfering the broken parts, a portion of the surrounding metal was cleaned of all grease and paint; the metal was made bright and bare to prevent any foreign matter from entering the melting weld. Figure 1 indicates the location of the fractures and the extent of the grooving. It also shows the simple device used for holding the broken pieces in place until they were partially welded. This rather crude appearing arrangement has the advantage of offering absolutely no obstacles to the full play of expansion and contraction, such as might be the case with clamps or bolts.

This picture also illustrates the uselessness of any preheating. Either of the broken parts will move in and out quite freely with the action of the weld. Any expansion of the heated metal in the weld can easily push the broken part outward. Then as the weld contracts, there is nothing to prevent the parts from being drawn inward. This is an example of the kind of fracture that needs no preheating before or during the welding; ar. illustration of the theory in a simple form.

When making the welds, the operator started on the groove in the smaller break, first; the piece held in place by the V-blocks. By making this weld first, there was nothing to interefere while turning and tilting the casting to make the other more complex weld.

A standard neutral flame was brought in contact with one end of the groove bottom, until it melted together for a space of about an inch. Then a quarter inch cast iron filler rod was placed in contact with the flame over the melting groove. Enough filler was added on top of the melted groove bottom to fill the groove, sloping gently back from where the bottom melting stopped. Then half an inch or so more of the groove bottom was melted, to which was added some more of the filler metal; this new metal being sloped back upon the first application. During both operations, the welder was careful to see that both the sides and the bottom of the groove were in a molten state before adding the filler. He was also careful to see that the filler was fully melted when added. During the application, it was twisted and prodded in the weld and not allowed to drip therein. The flame, also, was kept moving in an arc up and down both sides of the groove. This constant movement was maintained during the entire welding of both fractures for the purpose of thoroughly fusing the metals while preventing injury to the weld by overheating. A torch, somewhat over medium size, was utilized.

The operator completed the first weld a section at a time, in the manner just explained. Each section being but a continuation of the preceding one. After the full

Fig. 2. FINISHING THE SECOND HALF OF THE BEARING WELD

length of the groove was welded the flame was worked back over the weld to level and clean it and to make certain all parts were connected. Then the welder was ready to proceed with the bearing weld.

The flame was applied to the lower end of the groove, while the casting laid, as shown in Figure 1. This weld was made to the first corner and about an inch up the slope after the manner described for the bracket weld; the same movement and application of the flame and filler being used.

When the operator had worked up the slope, as much as was practical, the chain hoist was hooked to the upper end of the cylinders to tilt them enough to bring the groove horizontal. By this time, the weld was solid enough that the fire brick were no longer needed: the weld holding the bearing in place. After tilting the casting the operator filled that part of the groove which was then horizontal, fusing and knitting after the manner described. When the corner was reached, the casting was lowered again to bring the last section of this half of the weld horizontal. This was in turn welded like the other, then the casting was turned completely over to bring the other side of the bearing upward.

The turning and tilting of the casting are dwelt upon more to show the novice, ways and means to which he must often resort in order to make a good weld.

The welding of the second side of the bearing was but a repetition of the first side in manner of filling and fusing; the weld being almost identical with the first as regards metal thickness, tilting and corner welds. From this it will be understood that both sides of the bearing brace were chamfered to form a groove on each side, where it joined the casting.

As fast as each weld was completed, the flame was played back over it, in an effort to dislodge any bits of slag by re-melting, and floating them to the surface, where they could be flicked aside with the filler rod or blown out with a dipping motion of the torch flame.

The operator also employed the pressure of the flame to sweep the surface of the finished weld as smooth as possible, in order that no filing or grinding would be necessary. The latter part of the sweeping process is indicated in Figure 2, which shows the opposite side of of one bearing weld.

After the last part of the bearing weld was complete the casting was hoisted until the bearing stood upward. Then the operator touched up the inner side of the weld. Wherever the innerside of the groove showed indications of being poorly connected, the flame was applied until the spot melted, then a bit of molten filler was stirred and twisted into it.

A liberal supply of flux powder for cast iron was utilized throughout the welding of both cylinders blocks, by dipping the melting end of the filler rod in a pot of it, and quickly returning it to the weld.

The second block was handled the same as the first in regards to the grooving, filling and shifting procedures. In fact the work was made continuous by going from one to the other with the different steps of the process. And no heating, previous to welding, was done on either job. The filler was applied

Fitting Pistons

By N. WARD GUTHRIE

THE familiar old adage of the chain and its weak link might be easily revised to suit the present day needs of the motorist by saying "A motor is as good as the pistons and rings with which it is fitted." The important part that well fitted pistons and rings play in the successful performance of any internal combustion motor is often not given the consideration to which

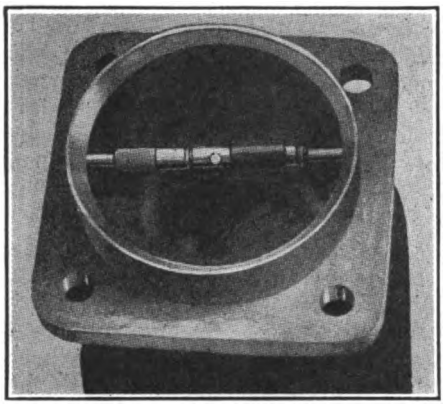


Fig. 1. SHOWING HOW THE CYLINDER BORE IS CHECKED UP WITH INSIDE MICROMETERS

such an important function is entitled.

Before descibing the manner of installing the new pistons it might be well to consider what happens when these parts become worn, and are no longer working properly. When the clearance between the piston and the cylinder wall becomes excessive, a noise, commonly described as a piston slap, results. In severe cases the noise becomes quite audible, due to the piston tipping back and forth at each end of the stroke. This causes an excess wear on the cylinder walls, and if run sufficiently long will wear the cylinder out of round enough to necessitate regrinding of the cylinder in order to properly correct the trouble. Then too, an excess wear and strain is placed on the piston rings.

Leaky piston rings are responsible for more than a mere loss of compression, as is commonly supposed by many. An excess of oil works up past the pistons, resulting in carbon deposits and all the kindred troubles with which the motorist is only too familiar. But worst of all, during the compression stroke, the rings instead of confining the gas above the piston head and utilizing all of its energy in the explosion, permit the gas to leak past the piston and into the crank case. This results in a two fold loss, primarily in the loss of fuel and power, and secondarily, the gas destroys the lubricating qualities of the oil to such an extent, that not infrequently bearings are burned out for sheer want of lubrication.

Some people may be inclined to dispute that assertion. The writer has in mind the case of a car, which persisted in burning out connecting rod bearings from no apparent cause. The dealer finally decided that the oil was at fault. A chemical analysis of the oil in the crank case showed that the presence of gas had almost entirely destroyed the lubricating qualities of the oil. Most certainly, each and every case of leaky rings will not result in such serious damage, but a bad effect is certainly produced. The extreme possibilities are mentioned for the guidance of those who are prone to look lightly on the matter.

Before fitting a new piston, the cylinder should be carefully inspected for such common defects, as scores, the cylinder being out of round or else being worn tapered. A visual inspection will disclose the former, while the latter conditions can be detected only through measurements. Inside and outside micrometer and an indicator are a great help to the repair man, although the work can be successfully accomplished with the use of only a thickness gauge.

It might be well to describe the several ways in which these measurements are taken, then the reader can select the method best suited to his means and equipment. The quickest and most accurate way is to use an indicator, an instrument having a protruding point, the depression or movement of which is recorded in thousands of an inch on a watch face dial. The instrument is fastened to a base and then slid into the cylinder in such a manner, that while the base rests on one side of the cylinder wall the recording point is in contact with the opposite side of the cylinder wall. By sliding the instrument up and down the full length of the cylinder, the point will be moved when it encounters any difference in diameter. Likewise by turning the instrument in the cylinder any irregularity in the diameter will be recorded.

This method, while it is quick and accurate, is distinctively a factory method of inspection, and few shops handle a sufficient volume of work to justifly the expense of such equipment.

The next most accurate method of detecting cylinder irregularities is with the use of the inside micrometers. Figure 1 shows the manner in which such a measurement is taken. This equipment possesses the advantage of being less expensive, but unfortunately it is difficult for the inexperienced person to take accurate measurements, since there is a possibility of taking diagonal measurement instead of directly across the

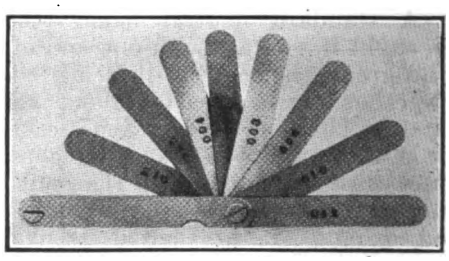


Fig. 2. A THICKNESS GAUGE. A HANDY TOOL THAT HAS A NUMBER OF USES IN MOTOR REPAIRING

cylinder and of measuring the chord instead of the diameter, that is measuring either to one side or the other of the center. It is obvious that an incorrect reading would make a perfect cylinder appear to be out of round. However, when properly done, the measurement is taken at several points and the readings compared. Thus if the reading is

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about as fast as the operator could handle the flame, so that no time was lost by any preheating. And the welded jobs appeared to be as strong as any preheated weld could be; no strains or cracks were in evidence, although both castings were tested with a hammer.

Figure 3, shows one of the finished castings, also the comparative size of the job; demonstrating the advisiability of the welding process without heating previous to applying the torch.

.003" less at the bottom of the cylinder than at the top, it is obvious that the cylinder is tapered .003", and measurements across the diameter disclose whether the cylinder is worn out of round.

This process, like the preceding one is very accurate, but requires expensive equipment and skillful operation to produce satisfactory results. There is a much simpler way of accomplishing results, although not as accurate, but which meets the average requirements very nicely and there is much less liability of

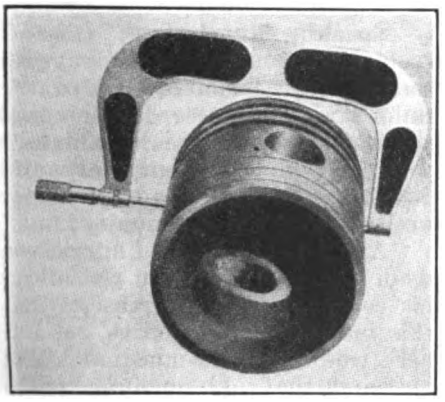


Fig. 3. CHECKING UP THE PISTON FOR ROUNDNESS WITH A PAIR OF OUTSIDE MICROMETERS

an error. It is by the use of a thickness gauge or as commonly called "a set of feelers".

It is an inexpensive little tool consisting of a collection of metal strips of various thickness with their thickness marked on each blade in thousands of an inch. The blades being used either alone or in combination with others, a wide range of measurements may be taken. Figure 2 illustrates its appearance.

We will take a piston which for the purpose of convenience, we will assume to be round, and later take up the matter of piston inspection in its proper place.

The piston is placed in the cylinder with one of the blades of the feeler inserted between the skirt of the piston and the cylinder wall. A blade which fits snugly is selected. The piston and feeler are turned to several different points and the results observed. If on turning the piston half way around, it is found that the gauge binds very tightly, or else it is so loose that a thicker blade can be inserted, it is at once apparent that the cylinder is out of round. The extent can be determined by the difference in the thickness of the blade used. Thus, if at one side a .004" blade is used and at the opposite side a .006" blade can be easily inserted, the cylinder is out of round approximately .002" It should be remembered that the blade should not be forced between the piston and the cylinder, because it is possible to spring the piston several thousands if force is used. It is necessary only to have the blade fit snugly.

The taper of the cylinder can be determined by measuring the clearance between the cylinder wall and the skirt of the piston while the piston is at the top of the cylinder and then repeating the operation at the bottom of the cylinder. If a .006" blade be used at the head of the cylinder while at the bottom only a .002" blade could be inserted, then it would be safe to assume that the cylinder is tapered .004".

It will be observed in fitting new pistons to old cylinders that the greatest wear has taken place near the top where the rings come in contact with the cylinder wall. The smallest diameter is usually found at the extreme bottom. Cylinders of 4" or less, and which are out of round more than .002" and are tapered more than a similar amount are conceded to be unfit for good service and should be reground. Cylinders which have been scored, either through lack of oil or from a wrist pin having worked loose, should be treated similarly.

We now come to the inspection and installation of the piston. The piston of an automobile engine acts as a seal for compressing the gases and transmitting their energy to the crankshaft, and also as a guide for the piston pin end of the connecting rod.

Because of the difference of expansion between the piston and the cylinder, it is necessary to fit the piston with clearance between it and the cylinder, and further, since the head of the piston is subjected to more heat than its lower portion, its skirt, it is therefore necessary to allow more clearance at the top of the piston than at the bottom. This is taken care of in manufacturing, the piston being made .005" to .010" smaller at the head than at the skirt. Scored and leaky pistons and those which have become worn undersize have to be replaced.

The scored piston, if it is not badly damaged, may be dressed off with a mill file. However, this practice is not recommended unless it is done by one who is skilled in the use of a file, and even then the diameter is either materially diminshed or else the piston is filed out of round. Usually a scored piston means a scored cylinder, which if serious, requires reboring or regrinding of the cylinder and fitting with an oversize piston.

A leaky or cracked piston may be detected by filling it with gasoline up to the lower level of the wrist pin bushings. If cracked the gasoline will seep through.

Undersize pistons cause excess wear on the walls, due to their tipping motion while running. They are wasteful of fuel and cause the motor to knock. The compression on a cylinder having a worn piston may be restored by the use of new rings, but because of the wear that a piston in that condition causes on the cylinder wall, it is false economy.

Due to jar and rough handling in shipping, and to the various methods used in storing pistons, they become out of round. In fitting new pistons it is therefore necessary to watch for such conditions. Measurement of the outside diameter of the piston with a pair of micrometers will disclose such a condition. Figure 3 shows such a measurement being taken.

If no micrometers are available, the feeler may be used for the purpose, as shown in figure 4. The feeler is inserted between the skirt of the piston and the cylinder wall, and the piston checked up by the holding the feelers stationary, and turning

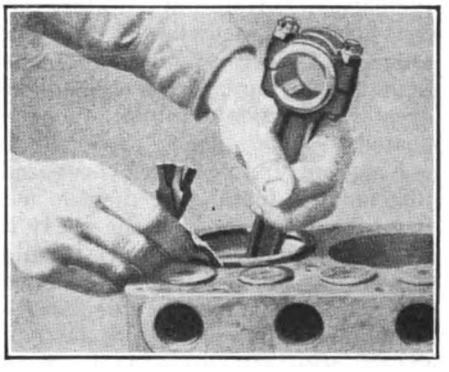


Fig. 4. FINDING THE PISTON CLEARANCE WITH A THICKNESS GAUGE

the piston a quarter of a turn at a time and again checking it up. Should the piston be out of round, tap it on the greatest diameter of the skirt, to true it up. A rawhide mallet is used for this purpose.

The usual clearance allowed for cast iron pistons is .001" for every inch diameter of the cylinder. Thus in fitting a 3¾ piston, it should be tight on the .004" blade and loose

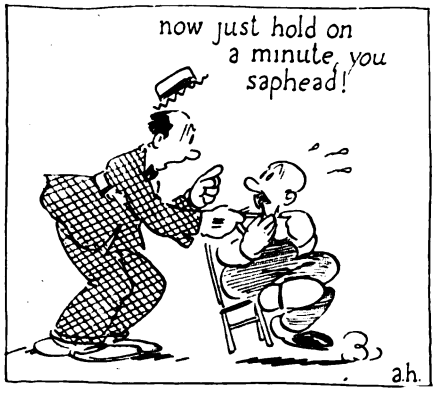
on the .003". It is important to check the clearance at both the top and the bottom of the cylinder, because of the tendency, after having been used, to be slightly smaller at the bottom. Aluminum or alloy pistons are fitted with at least twice the amount of clearance that is used in fitting cast iron pistons, due to the greater expansion of aluminum when heated.

Frequently in fitting oversized pistons it is found that they do not have the requisite clearance. It is important that the clearance should not be less than stated, for if fitted too tightly, the piston when it becomes hot will score either itself or the cylinder wall or even both. Such pistons have to be lapped in. The piston is covered with a suitable abrasive material mixed with oil, and by means of a handle fastened to the wrist pin, it is worked up and down the full length of the cylinder until the requisite clearance is obtained. The progress is checked up from time to time by removing the piston, washing it thoroughly in gasoline and also cleaning the cylinder wall and again using the thickness gauge, as previously described.

Dave Decides He Can

By D. G. BAIRD

I'LL admit I'm a mighty busy man, what with attendin' to my own affiairs and lendin' my invaluable advice to my friends and all, and I've always politely but firmly declined membership and high office in the Society for the



Improvement of The Sandwich Islanders, the I. W. W., and other philanthropic organizations, but b'lieve me I'm gonna take a day off some o' these times and go before the League To Enforce The Use of The English Language and make a speech in favor 'uv abolishin' the well-known and exceedin'ly popular frase, "I can't afford to."

About nine times outa ten, when a bird says, "I can't afford to" he'd be a lot nearer the truth if he'd say instead, "I can't afford not to!" Trouble is he's kinda got the habit of lettin' things run themselves and ain't never learned that anything that acts that way always runs down hill, and his business is gone to the bow-wows and he's needin' a haircut and a shoeshine and a new set 'uv apparel and all, and his shops needs paintin' and there's steen pailin's off 'n the back fence and his machinery needs overhaulin' and his place needs renovatin' and all—and just because the fickle public don't manifest a uncontrollable desire to rush in and purchase his goods, he thinks he can't afford to clean house and make improvements.

That was the trouble with Dave Colwell. Dave had been runnin' the only sales and service station in Marlboro ever since Fords was first hatched, and he'd kinda got a notion back in the rear of his cranium that just because he always did a good honest dollars worth o' work for a hundred cents and didn't hold nobody up and take his roll by force, the folks would just naturally keep on patronisin' his shop whether or not he whitewashed the back fence.

But when the Jones Boys started a bang-up shop over on Elm street and started out after the business in the latest and most approved manner, Dave soon found that the public don't go very strong on gratitude for service rendered in the past.

Well sir, things just went from bad to worse in a hurry. The Jones Boys begun cuttin' in on Dave's business right from the start, and it wasn't long till Dave didn't have no business a-tall except a few personal friends.

And the funny part of it was, Dave didn't seem to know what the trouble was or if he did he thought he couldn't afford to remedy it. So instead 'uv gettin' busy and buckin' the Joneses and hangin' onto his old trade and bringin' in new business, he got grouchy and begun to complain that there wasn't no more gratitude in the world and everything was goin' to the devil.

I hadn't dreamed things was so bad as they was till one day I stopped for a little free air and Dave begun makin' sarcastic remarks about my new Easter outfit, showin' very plain he was developin' a bad disposition and was jealous of folks that could afford to doll up a little in the spring 'uv the year.

I let him go on till I see he's got it real bad, and it's my boundin' duty as a friend to come to his rescue, then I cut loose on him.

"Speakin 'uv clothin'," says I real sauve, "might I not suggest that a little business trip to the tailor's and the haberdasher's and the barber's and the boot-black's would redound to your glory and advantage as well as to the better sanitation of the community?

"And I might add," I hurries on seein' him begin to turn red under his coat 'uv dirt and grease, "that this imitation hose you've got out here wouldn't hold mud much less air, and that old one-lung pump wouldn't burst a second-hand tire after it'd been run 10,000 miles. Why don't you give a little service."

"Oh sure!" Dave interrupts real bitter, "that's the way it goes! A man serves this here community year in and year out, always doin' honest work and chargin' fair prices and that's all the thanks he gets for it. When folks want a

little free service they're glad to come around to old Dave's shop, but when they've got repairin' or trade they slip over to a new concern that ain't served them as many months as he has years."

"Quite so, quite so. And did you ever stop to ruminate on the why and the wherefore of such peculiar conduct on the part of the human race?"

"What else do you think I been

thinkin' about for the last year? I've thought a lot about it, but anybody with eyes in their heads could see what the cause is without lookin'. Them fellers put on a lot o' dog and charge high prices and a lot'uv advertisin' and make the public pay for it, and folks is just fools enough to think they're gettin' better service or somethin'. Don't I know."

"Just a minute, you poor babe-in-arms," says I seein' he's wound up for eight days if I don't stop him. "Do you mean to delicately insinuate that the highly-enlightened populace of this cultured community has no more gratitude—to say nothin' of a sense of values—than to quit a old shop thats been givin' good service for years and leave a personal friend and run off to a new place that's conducted by total strangers who charge more, just because it don't know no better?"

"Well, facts speak for themselves, don't they?" says Dave. "Last year I did a little more'n $10,000 business; this year it'll be about $3,000, and it's gettin' worse all the time."

"I see." I cogitate for a few seconds, then I pronounce sentence: "The difference between $10,000 and $3,000 is $7,000 is it not? Yes. And seven thousand iron men would go a long way toward installin' a new air hose and patchin' the back fence and whitewashin' your electric light posts and burnin' down this old shack and erectin' a commodious buildin' and settin' up some first class machinery and equipment—"

"But you don't think I'm gonna spend any money on a new plant in this burg, do you?" Dave butts in. "Catch me going ahead and soakin' a fortune in a lot'uv improvements after the way I've been treated here! In the first place I can't afford it, and in the second place I wouldn't do it if I could. No sir! If I've got to start all over again, I'll start in a different town. Let the folks of Marlboro do their business with the Joneses if they like—I don't have to depend on their old trade. There's a lot of other places—"

"Now just hold on a minute, you saphead;" says I soothin'ly. "You're not gonna leave this excellent village 'til the undertaker hawls you away. You're gonna brace up and fix up and look prosperous, and the worthy citizens 'uv Marlboro are gonna help you to be prosperous.

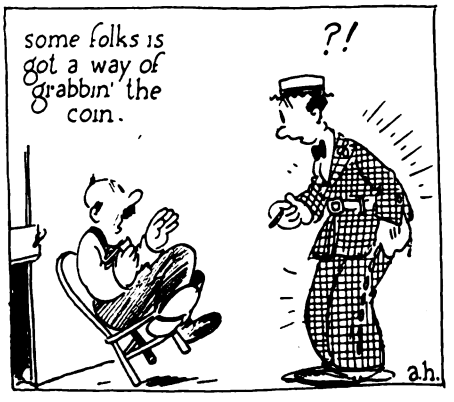
"Now just tell me this, David," I continue without givin' him a opportunity to object, "can you remember when you ever spent a dollar for improvements on this establishment? Or when you ever installed any new equipment? Or when you ever made provision for givin' your customers better and more convenient service? Or when you ever—"

"But how am I to make any improvements when I'm losin' money as it is? " Dave wails. "W'y I can't afford to try to keep up with the Joneses when—"

"Yes, and that's just your trouble right now," I cut in. "The Joneses have got a nice brick buildin' haven't they? And with a cement floor and with show windows for displayin' accessories attractively ain't they? And their salesrooms 're dressed up like a million dollars? You bet they are! And then you wonder why they're gettin' your business!!"

"But I can't afford to—" Dave begins again, but I've heard enough of that frase by now, so I shut him up real unceremonious.

"Of course you can't afford to! You can't afford to stand around and whine because you're about ninety-nine years behind the times and a coupla kids're takin' your business away from you! You can't afford to keep on tryin' to do business in this old shanty—it might fall in on you! You can't afford to keep on goin' around with a funeral-look on your ugly physlob and makin' folks think you're down and out. You can't



afford to keep hidin' your business from the public 's if you was afraid somebody might come along and bring in a little business for you. You can't afford to—"

"Aw! you give me a pain with all your big talk," Dave says somewhat uncomplimentary-like. "I tell you I can't afford to go ahead and spend a lot-uv dough fixin' up like a Christmas entertainment when I'm goin' in the hole as it is without spendin' any unnecessary coin for improvements."

I begin to lose hopes 'uv ever hammerin' any horse-sense into a mule-head, and havin' at last got my tire pumped up enough to keep off th rim till I can get as far as the Joneses I prepare to jog along. But I can't help givin' Dave a last word of good council for old sakes sake, so I says as I'm mountin' into the old wagon:

"You can just ruminate on this till I see you again, friend Dave; The world loves prosperity and if you make a show of prosperity it'll help you **be** prosperous. But just let it be hinted that your business is goin' down hill and folks'll just naturally help it along down.

"You sell this old barn for kindlin' and your equipment for scrap iron and put up a pretentious edifice and equip it with all the new-fangled machinery and accessories and hang out a general air of prosperity, and I'll find you lookin' like a candidate for president when I come around again.

"There's just one other thing you can do—you can go on lookin', appearin', talkin', actin', and bearin' yourself generally like a down-and-outer and I'll find you diggin' ditches next year."

Well, I'll confess I thought Dave was a hopeles case. He sure did have it bad, and it looked like all my eloquence and fine business advice wasn't gonna do no good.

It was nearly a year before I saw him again and—well, do you smell this Havana I'm smoking? Some smoke, b'elieve me! Dave gimme a whole box of 'em when I was down his way last month. And say! You oughta see the swell plant he's got now. All brick and steel and plate glass, with a seventy-five foot frontage on one o' the busiest streets in town and all kinds of up-to-the-minute equipment for doin' a good job and doin' it quick. Then there's a accessory-display that'd just make a fellow buy something' whether he needed it or not. And **service**—say! Dave's got more ways of handin' out useful information and advice and all-round helpfulness than any other man I know.

The Joneses are still in Marlboro, but they're not gettin' Dave's business—there's enough business for them all—and Dave told me he's expectin' to take in about $20,000 this year.

Appliance for Turning Crank Shafts

IN the accompanying illustrations Fig. 1 is a front view of a clamping disc or jig for holding crank-shafts of small steam and internal combustion engines in the lathe while the crank-pins are being turned or trued up. Fig. 2 is a side view. Two of these discs are required for holding a crank-shaft as shown in Fig. 3, and here the discs are mounted between the lathe centers in line with the left-hand crank.

The disc with the attached clamping lug is much to be preferred to the chucking arm shown by Fig. 4, as here the set-screws deface the shaft, and also the arm is only suitable for one size of shaft. The clamp in Fig. 1 has the great advantage of not marking the shaft, and is also adjustable for a large range of diameters.

Where repetition work is done the disc can be permanently marked out for centering double, triple or quadruple crank-throws shown in the diagram (Fig. 5). The annular rings should then be marked with steel type, giving the length of throws in inches of the cranks, then divided out for two, three or four cranks, and drilled and countersunk as shown. This operation must be done with the greatest accuracy, as the correctness of the resulting work depends entirely on it. Thus when a multiple crank is fixed right between the centers for one division in Fig 5, the remaining cranks will come in line with the lathe centers as each division on the discs is put between the centers.

When turning up a new crank-shaft direct from the forge, it is customary to test the crank throws for accuracy of pitch and size before any turning of consequence is attempted. This test when made on a divided disc, as in Fig. 5, will quickly show if the cranks are pitched right, and also show whether there is sufficient metal to clean up for each crank without having the crank reset at the forge. This test is especially necessary in repair work, in factories where the work is turned out in quantities. The forgings rarely, if ever, require resetting by the smith, as there are special means in the forging for securing accuracy; and also a good quantity of metal is left on, it being found cheaper to machine it off than to carry the work to the forge several times.

When this set of jigs is used on shafts of small diameters, half liners are required in the bottom seating of the lug as shown in Fig. 6. By using these liners, the shaft and the center of the crank throws will always be concentric with the circles and centers on the discs.

On referring to Fig. 3, where the crank-shaft is shown mounted between the lathe, centers, it will be noticed that the latter, if set up tight (as they should be to avoid chatter in the work), would create a bending moment in the shaft, and to avoid this bending tendency the lathe man usually drives in wood thrust-pieces where the dotted line appears in Fig. 3. A better method is to use a pair of adjustable thrust centers, one of which is shown by Fig. 7. It consists of a piece of 1-in. mild-steel tube with a piece welded in each end for a thread and center-piece. The screwed center end is run out to jam between the crank web and the disc and locked by the lock-nut to the face of the tube, thus preventing them flying out when in use. When the shaft is between centers the webs are supported with a block of wood or a bolt and nuts, as shown in the right-hand crank (Fig. 3).

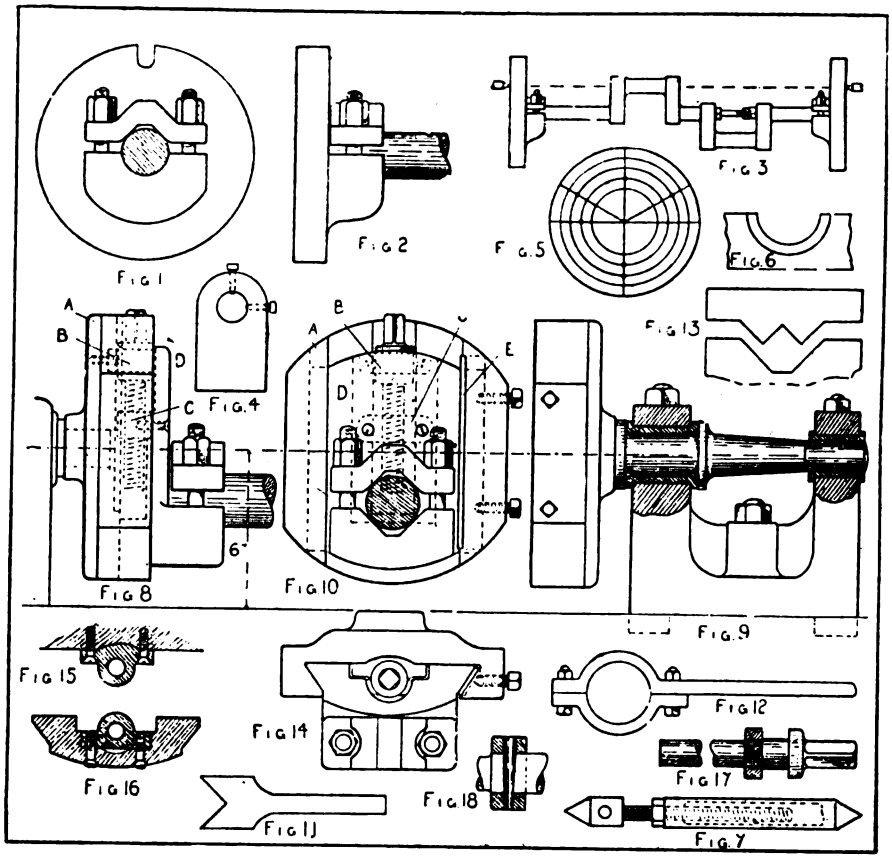


Fig. 8 is the side view of a special chuck to screw on the lathe mandrel for holding crank-shafts while the crank throws are being turned. A similar chuck is used at the opposite end to clamp the other part of the shaft. This chuck runs in a special headstock of exactly the same center of the lathe to which it is fitted (see Fig. 9). The adjustable clamp and slide is not shown in this figure, as it is identical with Fig. 8.

A front view of the slide is given by Fig. 10. It consists of a body or shell A in wrought-iron or steel casting with a boss for screwing to the mandrel, and V-grooves to guide the adjustable clamp and slide. The latter is moved by a screw revolving in a fixed bracket attached to the shell of the chuck B and threaded to a fixed nut C, which is secured to the slide D, and as designed will give a 3-in. maximum of eccentricity on a 6-in. lathe or 4-in. on a larger lathe. That is, it will turn cranks of 3-in. and 4-in. throws respectively; but there would be insufficient space to swing a multiple crank-shaft on a 6-in. center lathe, and when four-throw

crank work is anticipated, the chucks should be made to fit a 10-in. center lathe. Then the chucks could be somewhat larger in proportion, and there would be no necessity for blocking up the heads and rest as if a smaller lathe were used.

When the slides are adjusted to the required amount they are locked by the adjusting strip E (Fig. 10) and set-screw acting on the strip. The scribing block is used to test the shaft for parallelism with the lathe-bed, and a centering fork (Fig. 11) held in the slide-rest at the height of the lathe centers will quickly bring the crank throw concentric. Now test again for parallelism, and tighten the clamps and adjusting strip. The chuck in the right-hand mandrel (Fig. 9), should be nicely adjusted in its bearings. There should be free running without any shake. By the use of these chucks end thrust is removed in the crank, although when a little wear takes place in the auxiliary head at the collars of the mandrel (see Fig. 9), it would be advisable to steady the mandrel by running the center of the poppit mandrel against it; but not so tight as to cause undue friction of the collars against the brasses, of a torsional strain would be set up in the shaft to overcome it, and this should be avoided.

It is an understood thing that extra light cuts must be taken on crank throws, and even when every precaution has been taken, the work will show faint chatter marks left by the tool, and in such a case the work is lapped with emery and suitable size laps (see Fig. 12). Made in either cast-iron or wrought-iron usually lined with copper or sheet lead, the lap is charged freely with oil and emery powder, commencing with coarse and finishing up with fine, while the work is revolving at a fairly good speed (say 200 per minute). The lap is continually moved laterally to prevent the emery grooving the crank pin.

When extra-small diameter shafts are to be clamped, a different shape clamp is required to slip over the studs, as shown by Fig. 13. Fig. 14 gives the end view of the chucks, showing the slide recessed to clear the bracket, and also the shell slightly recessed to give clearance to the nut. Fig. 15 shows the bracket sunk to the shell and fixed with screws, and Fig. 16 is a sectional view of the nut recessed to the slide. Fig. 17 gives an enlarged view of the screw blank, showing how the screw is retained in the bracket with the screwed collar, and the latter is fixed permanently in its required position by a taper pin as shown in Fig. 18.

A. E. R. in Work.

FORGING HIGH SPEED STEEL.

There is a decided difference between high speed and carbon steel and each have to be treated differently during forging. High speed steel is the harder of the two to work because it resists the hammer and to overcome this difficulty a higher forging temperature must be employed. High temperatures envolve some serious possibilities due to the fact that after the critical point in temperature has been reached, there is a decided tendency to produce large grains in the metal. This is a condition to be avoided, as it damages the quality of the steel quite noticeably. A similar result may be produced by keeping the steel at a high temperature for any length of time. However, this condition may be corrected to a certain extent by thoroughly forging the work, as this has a tendency to break up the large grains. It should be borne in mind that this forging does not penetrate far below the surface, the center remaining unaffected. The proper forging temperature is an orange color or even a canary yellow.

It is most important to have the steel heated evenly before working. Too much stress can not be laid on this point. It is very easy to heat the work rapidly thus causing the outside to be much hotter than the interior. Minute surface cracks are thus produced and become apparent only when the work is ground or machined. Or the heating may be the very opposite to this condition. That is the work may be so heated that it is hotter in the interior than it is on the surface. If there is a decided difference in temperatures, the amount of contraction will not be the same throughout the piece of work and interior cracks are most apt to result.

The way to avoid uneven heating is to heat the work slowly, especially during the latter part of the heat. When the heat is advanced gradually, it affords the interior and the exterior an opportunity of remaining nearly the same temperature. It is advisable to have the forging temperature high enough so that a metallic will not be produced when the work is struck with the hammer. There should be only a dull sound.

In hardening, the heat limit is about 2400 degrees Fahrenheit. The metal, although a brilliant white, will be short of the melting point. Watch the thin edges. When conditions do not permit grinding after hardening, the heating is not carried to a brilliant white but is stopped at a light straw, a bright lemon or even at a very bright orange. It is considered better for most purposes to use a very high heat, if the conditions permit. Cold water should not be used for cooling, but instead an oil bath or a current of air, if pressure is available, should be used.

"PENNIES"

Many persons are puzzled to understand what the terms of "fourpenny," "sixpenny" and "tenpenny" mean as applied to nails. "Fourpenny" means four pounds to the thousand nails or "sixpenny" means six pounds to the thousand nails, and so on. It is an old English term, and meant at first "ten pound" nails (the thousands being understood), but the old English clipped it to "tenpun" and from that it degenerated until "penny" was substituted for "pounds."

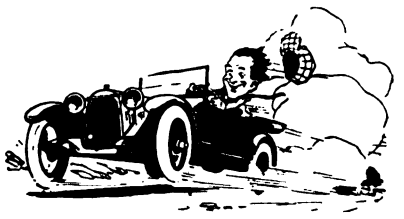
A "monkey wrench" is not so named because it is a handy thing to monkey with, or for any kindred reason. "Monkey" is not its name at all, but "Moncky." Charles Moncky, the inventor of it, sold his patent for $2,000 and invested the money in a house in Brooklyn.

It is sometimes desirable to drill, or otherwise work, some part of a hardened piece of steel after the hardening. Ability to do this can be assured by clamping on to the heated piece a block of cold metal, before hardening, at the point designed to remain soft.

By this means the quenching will be so retarded as to prevent hardening.

Put hard soap on lag screws, wood screws or any screw for wood. It will surprise you how much easier they will go in.

High Spots



UNREASONABLE

Film Fun.

Studio Manager—What did you do to the star to make her cry like that?

Director—Nothing, except to insist that she take off at least a pound of her jewelry while she's playing a scrubwoman role.

"Is there anything in the rules of the Union," asks "Bat" this morning to prevent the garment workers from sewing pants buttons as tight as the size tag?"

A Washington, D. C., Post-Office Clerk, nettled at the many questionnaires he has been asked to fill out and return to Congress or to organization headquarters, has suggested to Thomas F. Flaherty, secretary of the National Federation of Post-Office Clerks, the following draft of a questionnaire, which he says more nearly meets the needs of the government clerks than any other yet proposed:

1. Are you married or single?——— Why?———
2. Do you drink near-beer?——— Why?———
3. What is your favorite flower?———
4. If a box clerk, are you troubled with insomnia?———
5. Did you withdraw any money from the bank during the past year?——— Where did you get it to put in?———
6. Does your wife play the piano?——— What effect does this have on your rent?———
7. Are you a light eater or heavy?—— If heavy, state how and why.———
8. Has your yearly expenditure for rent increased since the shortage of houses prevents frequent moving?———
9. Are you on friendly terms with your relations?——— Why?———
10. If possible, give the name of someone less intelligent than yourself, yet making more salary.———
11. State average monthly grocery bill and payments if any.———
12. State briefly (no profanity allowed) what your wife thinks of being married to a post-office clerk.———
13. Do you drink and where do you get it? (This information will be treated as confidential.)———
14. Exclusive of bartenders, how many people depend on you for support?———
15. Do you keep chickens? Does your wife know about it?———
16. Does your wife take in washing to help support the family?——— Have you suggested this to her?——— If so, state results and name of hospital.———
17. What do you think is a fair salary for a good worker?——— For yourself?———

The Bolsheviki might preach that the easiest way to bring about prohibition would be to pass laws prohibiting it.

Reform is proverbially modest. Even the naked truth is apt to shock her.

When high words pass between people even the tenor can make base remarks.

Perhaps the advance in aviation may yet enable us to reach our castles in the air.

Muggins—"I never knew anyone to be such a stickler for the little niceties of social form as Dolittle." Buggins—"Yes, Dolittle wouldn't even go to work unless he had received an engraved invitation.

Blobbs—"That girl is a mighty pleasing conversationalist." Slobbs—"Yes, she doesn't exclaim: "Say, listen," about every other minute."

THE VILLAGE BLACKSMITH

(Modern Version)

By Henry Wadsworth Longfellow and Channing Pollock

UNDER a spreading chestnut tree
The village smithy stands;
The smith, a wealthy man is he,
With diamonds on his hands;
And the bracelets sported by his wife
Are broad as iron bands.

His roll is crisp, and green, and thick,
He calls his chauffeur Dan;
His brow is dry beneath a high-
Priced hat that shades his pan;
And he looks the whole world in the face,
And sasses any man.

Week in, week out, from ten till five
He hears the hooters blow;
Automobiles, with wabbly wheels,
That do not want to go,
Pay tribute to his doubtful skill—
And the tribute's never low!

He drives to town most ev'ry eve,
And goes out with the boys;
He hears the latest jazz with meals,
He hears the soubrette's voice
Singing in the cabaret,
And it makes his heart rejoice.

Toiling when there's naught else to do,
Onward through life he goes;
Each morning sees him open shop,
And very promptly close;
Something attempted, someone done,
Has earned a night's repose.

Thanks, thanks to thee, my worthy friend,
For the lesson thou hast taught!
Thus in a job that serves the mob
Our fortunes must be wrought;
Since now we pay so much a day
For ev'rything but thought!

Sat. Eve. Post.

Who isn't afraid to spend a red cent
To advertise, when he's back on his rent?
Who is it that's always on business intent?
The Optimist.

Come to the point," exclaimed the busy man. "Time is money." "I'll trade you five minutes of mine for five dollars of yours," suggested the chronic borrower.

The disgustingly healthy individual was rubbing it in on the doctor. "I've never been sick a day in my life," he chuckled. "You know me, Doc." "Alas! I know you too well," retorted the doctor.

Uncle Sam is never deaf to the voice of the people. U. S. spells us.

When a girl drops a fellow he is generally broke, either before or after.

The poker player defines the income tax as an obligation to kitty out for the house.

You never can tell. Many a man with money to burn has an innate dread of fire.

Peace consigns the implements of war to the scrap heap. Even the cannon is canned.

As yet the milk of human kindness isn't under government control. It isn't all grade B.

Muggins—"My wife shot a burglar last night." Buggins—"Gee! What was she shooting at?"

It all depends upon the point of view. The people who love to hear themselves talk would rather be blind than deaf.

Nell—"I have frequently caught her telling lies, in spite of the fact that she is such a prude." Belle—"Perhaps the naked truth shocks her."

"Clothes don't make the man," quoted the Wise Guy. "No, a shiny coat doesn't necessarily distinguish the polished gentleman," added the Simple Mug.

"I believe there is military rank even in the commissary department," said the civilian. "Yes, the commissary department is mostly rank," growled the disgruntled soldier.

It's a good plan to forgive your enemies before they have a chance to say what they think of you.

Warning to the Living (?)!

A man died owing a Missouri editor six year's unpaid subscription to the paper. The editor did not send any flowers. He attended the funeral and placed a palm-leaf fan and a block of ice on the casket. —Cincinnati Enquirer.

Drunken men talk like $1.98 phonographs.

The water invariably escapes when it is only half tide.

Too many people feather their nests with borrowed plumes.

A man arrested for vagrancy naturally has a pinched look.

It takes a real genius to originate new ideas in love making.

A man seldom gives his health a thought until he loses it.

A girl who uses a gold hook when fishing for compliments needs no bait.

The great drawback to the best fish stories is that they are wholly unreliable.

Fortune is apt to favor the man who works as if he expected to succeed without it.

The many so-called progressive people are always looking for an opportunity to butt in.

When a women talks nothing but small talk she is almost as bad as the man who always talks big.

In this day and age the sooner the bride begins to cook the sooner the honeymoon will bump the bumps.

BEGINNING AND END OF IDEALISM

Over the restaurant table—
Over the salads and sauce—
Talking the back country idylls,
The meadows, the streams and the moss—
(That is the place to talk idylls,
There's no discomfort or loss,
Sunburn or hives or mosquitoes,
Over the salads and sauce!)

In place of much competition Dinah Gilly ought still to be distinctive and conspicuous at the basket picnic of the Society of Immortals.

THE TRACTOR IS PERMANENT PART OF THE ARMY'S EQUIPMENT

AT A RECENT REVIEW OF TROOPS AT FORT BLISS, THE ENGINEERS USED TRACTORS TO PULL THE PONTOONS INSTEAD OF THE CUSTOMARY ARMY MULE OF THE PAST

A BLACKSMITH WHO PULLS TEETH AND REPAIRS WATCHES

PEASANTS AWAITING THEIR TURN FOR THE ATTENTION OF THE VERSATILE BLACKSMITH

The village blacksmith in a Montenegrin town is a most accommodating person. He will pull your teeth as readily as he will shoe your horse, and whether it is your watch or your plowshare that needs repairing, he will set to work with his sledge and his tongs as readily on the one as on the other. There are few things he can't do, and there is nothing that he won't attempt. Shoeing horses is only one of his trades.

There are few tools to work with in Montenegro, and usually a peasant will have but one plowshare, or hoe. When this breaks they must take it to the blacksmith and hold up work until it is repaired. This explains why Balkan war reconstruction is so slow. The only aid received so far has been from America, the Red Cross bringing in a million dollars' worth of modern farm machinery to sow and harvest the crops, meanwhile giving out clothing, food and medicine in order that the people might live.

Unfortunately, the crops last autumn, which were to have supported the people through the year, were a complete failure, owing to the enormous numbers of grasshoppers and locusts, and the Red Cross has therefore not yet been able to withdraw from Montenegro as it had intended. Its aid will be sorely needed for another year at least.

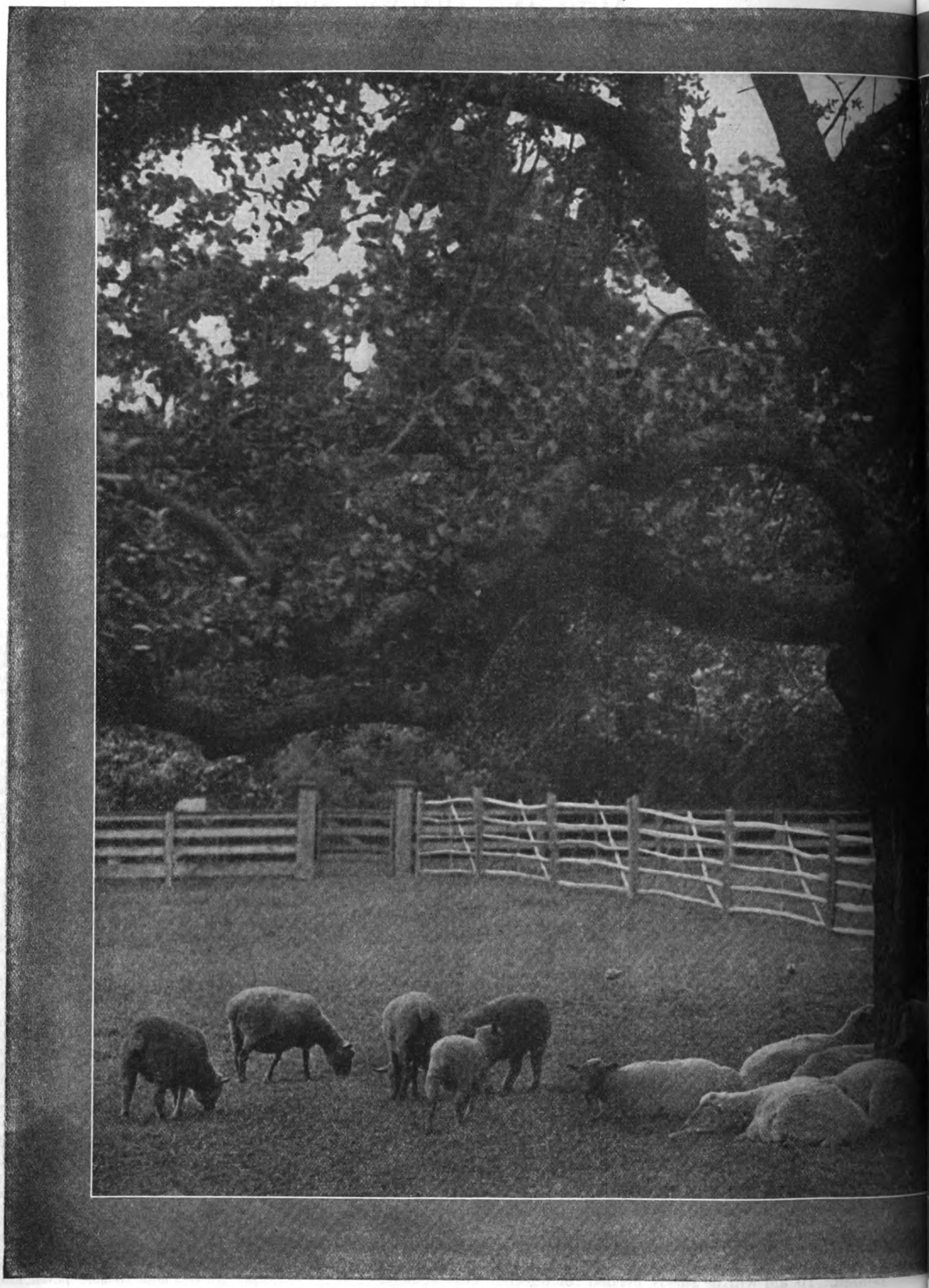
Benton's Recipes

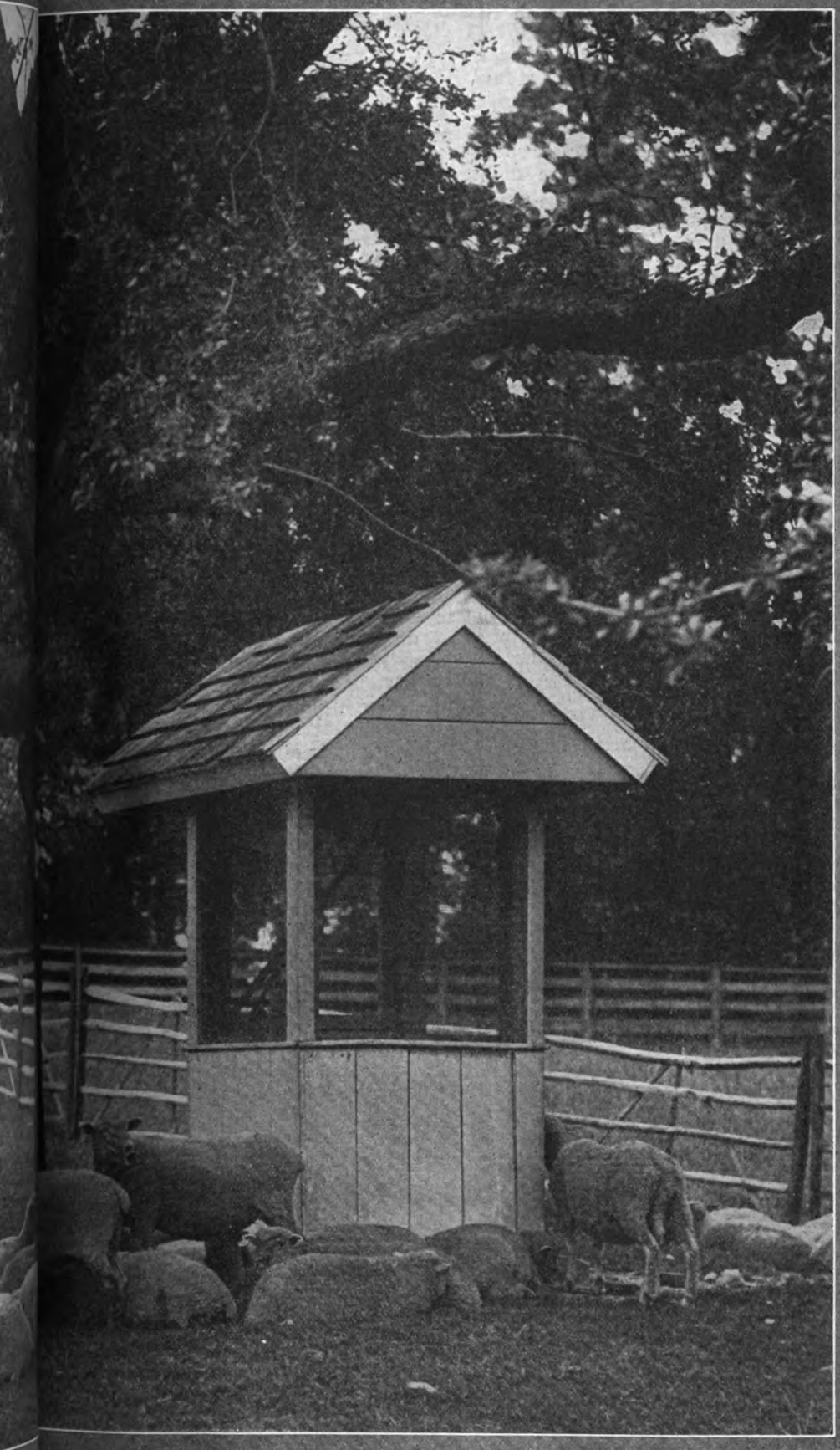
Tempering Compound for Steel—The following receipt for a tempering compound I have found very useful when it was impossible to procure a good grade of steel. This compound will be found especially good for cold chisels, center punches, lathe tools, drills, etc., and in fact almost any tool not having irregular forms or thin cutting edges. To 6 quarts of good clear rain water add 1 ounce of corrosive sublimate and 2 pints common salt. Stir until thoroughly dissolved. This compound seems to both harden and toughen steel; the tools are dipped and drawn in the usual manner.

To Prevent Hot Lead Sticking to Work—About three years ago we had a new quick-break switch to manufacture in large quantities. One piece of the switch was required to be hard at one end and soft at the other. We tried several methods of annealing so as to leave one end hard, but found that the temper was drawn throughout, and all were rejected. We finally decided that a hot lead bath was the only way that would anneal one end and leave the other end hard, but we then encountered the difficulty of the hot lead sticking to the work. A number of receipts were tried for preventing it without success, but finally I discovered a process that is quick and very cheap. Mix common whiting or cold water paint with wood alcohol and paint the part that is to be annealed. The hot lead will not stick, no matter how long the piece is held in the pot. Of course, in the work mentioned, the pieces were lowered quickly into the hot lead and removed as soon as possible, in order to prevent drawing the temper of the hard end, and then the whole was plunged in a pail of cold water. Water will do as well as alcohol to mix the paint, but alcohol is the most convenient inasmuch as it can be used without waiting for the paint to dry. If water is used, the paint must be thoroughly dry, as otherwise the moisture will cause the lead to fly.

Wash for Whitening Metal Work for Laying Out—Mix whiting and white lead with boiled linseed oil to a thick paste; add some Japan dryer, and thin with benzine or gasoline. This makes a fine preparation for whitening sheet iron and other work previous to laying out, as any lines drawn on the surface show up very distinctly. It also makes a very good stenciling or marking paint.

Black Finish for Steel—The pieces to be blackened should first be polished with No. 120 emery cloth. After polishing, the surfaces should be cleaned carefully, and then the work placed over the fire and drawn evenly to a second blue. Then, the work is dipped in lard or sperm oil, from which it is immediately removed, and all loose oil shaken off. This prevents the forming of blisters. An old piece of rubber, for instance a piece of old garden hose, is then placed on the fire, and as it burns, the work is held over the flame and smoke that comes from the rubber, until it is covered with a thick coat of black soot. The work is then removed from the fire, and permitted to cool off slowly. When cool, it is rubbed with an oiled cloth. All this must be done in one heat.



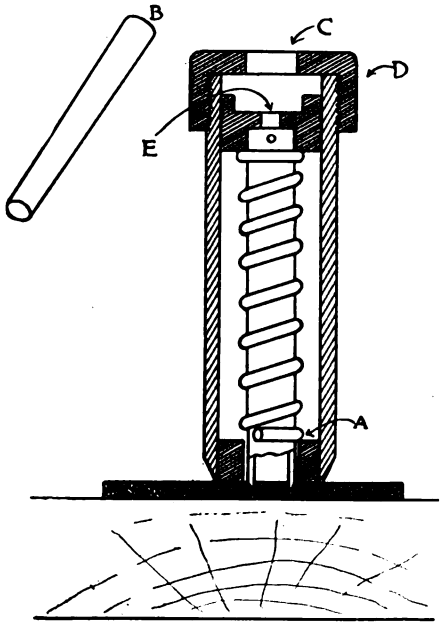


In the Shade

Helpful Shop Suggestions

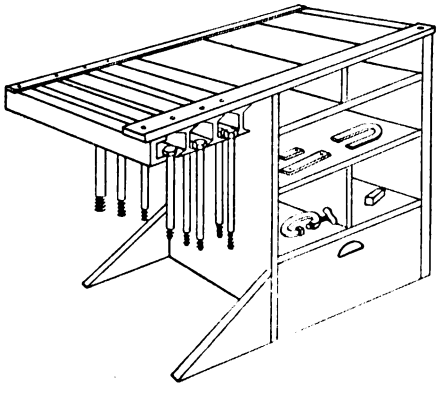
SOFT WASHER PUNCH

Having need of some soft felt washers for shafts, oilers, bearing end dust protectors, etc., I made a special punch for cutting them out at one operation, as shown in the sketch herewith. The large cutter or outside cutter is of 2½" steel tubing and the inside one of 1½"



steel tubing, both having the cutting edges ground to a sharp taper.

The inside cutter is guided by a loose bushing A, and this bushing is soldered to a spring and acts as an ejector for the washers. The inside hole is cut first by putting the pin B into the hole C and striking the top of the bushing C, then the pin is removed and the outside of the washer cut by striking the cap D. The slugs of the inside cutter are pushed out by a rod worked down through the hole E.



BOLT RACK

The other day I chanced to drop into an auto and tractor repair shop and I was attracted to the drill press where the mechanic was drilling out some cylinder head studs of an engine. I noted the handy bolt rack and drill press tool stand. It is an idea worthy of passing along, so I have tried to sketch it for the readers.

The main part of the stand was built of heavy lumber and was divided into several shelves and a drawer for holding clamps and straps and washers. The unique feature was the over-hang bolt rack made of several short lengths of small I beams and channel iron such as used for auto frames.

Each bolt hung down and was supported by its head resting on the lower edges of the I beams and channel irons, which were spaced to suit the bolt diameters. Any length bolt is at once obtainable for they are all in plain sight.

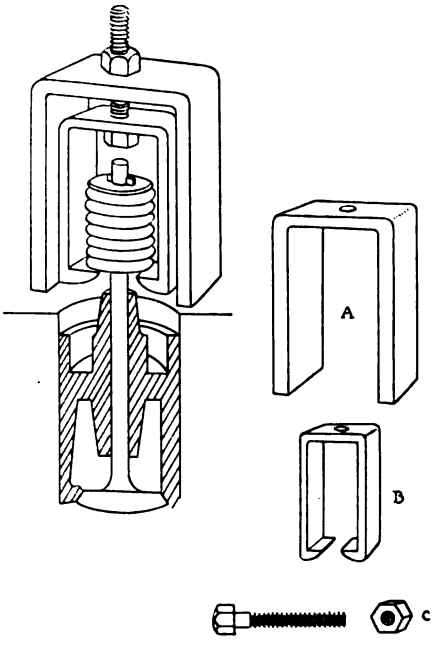
MAKE A DOLLAR

Have you ever racked your brain figuring out a solution to some puzzler around the shop? Your solution may be a big help to some other fellow, who is up against a similar problem. You can make a dollar by telling us how you did it. A brief description and a sketch, so that we will know how it works, is all that is necessary. We'll do the rest.

BUICK VALVE CAGE PULLER

There are many types of pullers for stuck Buick valve cages, but none are easier to make or more simple to operate than this home-made affair, which consists of three parts, the outside housing or frame A, the inside sliding puller B, and the common screw bolt C. The piece B has two feet bent at right angles. These slip under the lower valve spring washer and the bolt is then tightened and the cage withdrawn as shown in Fig. I.

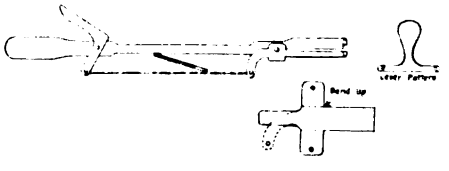
Chas. H. Wiley.



WELDING ROD HOLDER

A simple tool that will hold the short pieces of welding rod can be made by any mechanic with little or no difficulty. Through its use, it is not necessary to weld the short rods together, thereby effecting a saving in both welding gas and time. It will hold a piece of rod until it is almost entirely used up. The long rod, to which the handle is fastened, is made of 5/16" round stock, while the grips or jaws are made from ⅛"x7/16" iron. The movable jaw and lever are cut out from flat stock and bent up as shown in the accompanying cut. A coil spring maintains a constant pressure on the jaws, and it is necessary only to squeeze the lever on the handle to release or adjust the hold on the welding rod.

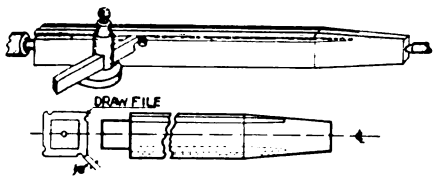
George Work.



MAKING A REAMER FOR AN EMERGENCY JOB

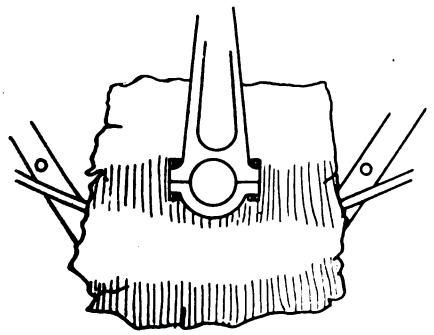
Not infrequently the mechanic doing general repair work finds a pressing need for a special sized reamer to do some special job. When one of proper dimensions cannot be readily obtained, an improvised tool, which answers the purpose admirably, can be made in any shop having a forge and lathe. A piece of tool steel of suitable size is forged square and the end tapered to suit the requirements of

the work, as shown in the accompanying cut. Both ends of the piece of stock are then centered and placed on the lathe, where the corners are turned off until they present a surface about 1/8 inch wide, which dimensions will work very satisfactorily on the 3/4 inch reamer. For next operation, a



round nosed tool is placed in the tool post and the tool is then fed up and down the work by running the carriage back and forth on the bed, thus using the lathe as a shaper. The groove or flute is cut along the edge of the chamferred corner. The operation is repeated until a sufficient depth is obtained. Then the portion which corresponds to the land, on the ordinary reamer, is draw-filed to give the necessary clearance. This leaves the edge of the groove a cutting edge. It is discretionary with the maker, whether four or six cutting edged are employed. Since the former works very nicely, it seems hardly necessary to go to the added bother of making six. The shank is then turned up to suit, and the reamer is hardened and tempered to suit the class of work for which it is going to be used.

B. C. Lester.

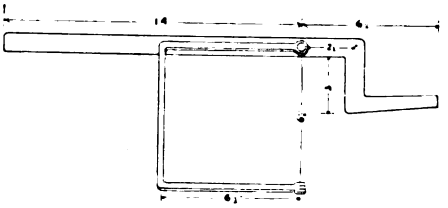


A HUGE ROAD FUND FOR 1920

According to a statement issued by the Department of Agriculture, more than $600,000,000 is available for the construction of hard surface roads in the United States, during the coming year. The amount is nearly four times as great as the amount spent for that purpose in the preceding year. The Department announces that the expenditure of this fund will be dependant upon the ability of the railroads to furnish sufficient cars to transport the necessary material.

A HANDY VALVE SPRING LIFTER

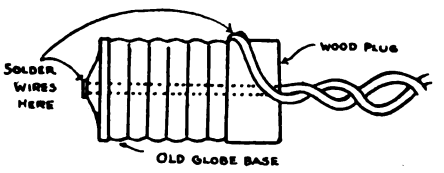
In grinding valves, frequently as much time is used in removing and replacing the intake and exhaust manifold, as is used in grinding the valves, after they have been disconnected from the springs. A valve spring lifter that obviates much of the wasted time in that respect, and one that works particularly well on motors having removable heads, is shown in the accompanying cut. It can be made from any convenient size of flat stock, that will be found laying around almost any shop. The dimension that will suit the average conditions are shown in the illustration. The off-set part of the bar or lever rests on the upper portion of the valve chamber, when the tool



is in use. One end of the "U" shaped part is hinged to the lever with either a bolt or rivet, while the other end, which is made fork shaped, slips under the spring to be lifted. A slight upward movement of the hand will raise the spring sufficiently so that the pin or washer with which the valve is fastened can be removed very easily.

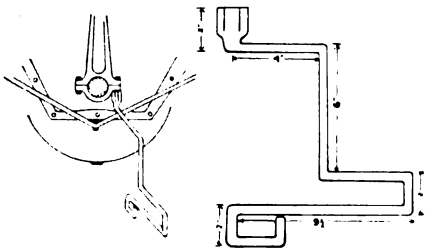
A FORD REAR CONNECTING ROD WRENCH

Anyone who has ever attempted to remove or adjust the rear connecting rod bearing cap on a Ford motor, and used an ordinary wrench for the purpose will agree that it is not a most accessible place to work, and will appreciate a wrench that will facilitate the operation. The cold chisel and hammer method is even less desirable here than on other kinds of work, since at best it only mutilates the part to be removed, and besides in this particular instance, it is most apt to send either the chips or the nut itself flying into the crank case. It is difficult to remove such pieces



from the crank case, due to their tendency to stick to the magnets. Not infrequently, it is necessary to take the motor out of the car in order to remove a nut that has slipped into the crank case. The wrench shown in the accompanying cut will remove these nuts quite easily without mutilating them or without much danger of them slipping into the case. The wrench can be made from a cylinder head cap screw wrench. The socket being the proper size, it is necessary only to heat the wrench and give it a short bend close to the socket. Sufficient 1/2" round stock is welded to the handle and it is then bent as shown in the illustration. To further obviate the possibility of the nut slipping into the crank case even when using the above described wrench, a piece of burlap bag, or stiff paper slipped back of the connecting rod and the other end permitted to hang over the edge of opening through which the work is being done, will allow the nut to roll out on to the ground, in event that it should slip off of the bolt.

James Baldwin.



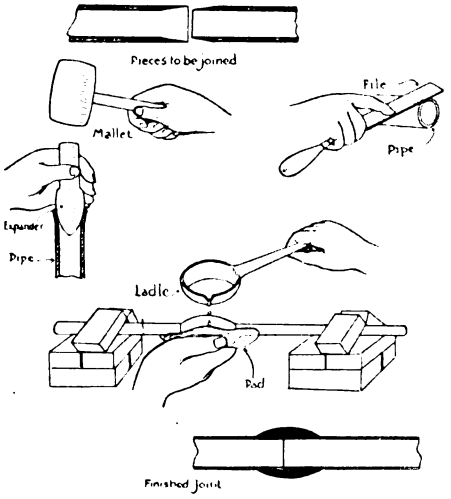
AN EMERGENCY EXTENSION PLUG

When an extension plug is needed, and one can not be readily secured, one that will work very satisfactorily can be made from the base of an old electric light bulb. The cut shows clearly how it is done. One wire is run through the base and soldered to the projecting lug, while the other wire is soldered to the metal outside of the base.

The production of pig iron in Canada in 1919, including both blast furnace iron and pig iron made from scrap metal in electric furnaces, is estimated at 920,000 short tons, of which not more than 8,000 tons were electric furnace pig iron. The production of pig iron in 1918 was 1,195,551 short tons. The estimated production of steel ingots and castings in 1919 was 1,020,000 short tons, compared with 1,873,708 tons in 1918.

WIPING JOINTS

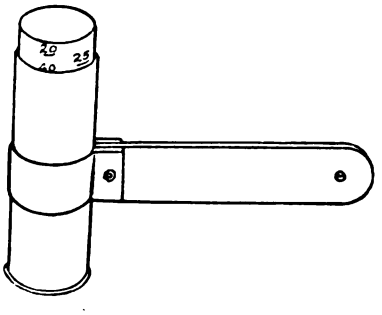
Ordinarily, wiping lead joints is not the job that a blacksmith or general repairman is called upon to do. It is distinctively a plumber's work. There are however, emergency cases, where it is very handy to know at least the rudiments of the work in order to make an emergency repair. The novice will find, perhaps, that it is not quite as easy as it looks and probably will have a burn or two to commemorate his initial attempt. With a little practice is may be accomplish-



ed quite satisfactorily. The two pieces of pipe to be fitted together are treated in the following manner. The end of one is swaged out or expanded slightly bell mouthed. This is done by inserting a tool, not unsimiliar to an ordinary top, into the end of the pipe and tapping it gently with a mallet, the other piece of pipe is worked down with a mallet, until it becomes tapered shape, and sufficiently smaller in diameter so that the end will slip into the bell mouthed piece. The outer surface of the smaller end is then scraped bright and smooth for a distance several inches from the end. The inner edge and outer surface of the other is treated in a similar manner. The two pieces are then fitted together, and the overlapping edge is beaten down with the mallet. At a point several inches back from the joint, the remainder of the pipe is covered with a strip of paper held in place by library paste. This is to prevent the solder from sticking only at the joint, thus making a smooth end to the wiped joint. Now comes the more difficult part. The surface on which the joint is to be wiped should be clean and bright—this is imperative. The solder is heated on either a forge or a gasoline furnace. When it is heated to a point where it slightly colors a white pine stick or a piece of plain white paper, it is at about the right temperature. The pad is then held under the joint and the molten solder poured from a ladel directly onto the joint. The surplus runs down and is caught in the pad, and with a wiping motion, it is worked up and around the joint. The process is repeated until sufficient metal is deposited on the joint, then before the solder has cooled and hardened, it is smoothed off with a wiping pad. The greatest difficulty the beginner experiences, is in getting the solder at the proper temperature, so that when it is poured over the joint that it will not melt off the metal that has already adhered to the joint. A little practice will permit one to judge the proper temperature.

A HANDLE FOR THE PRESSURE GAUGE

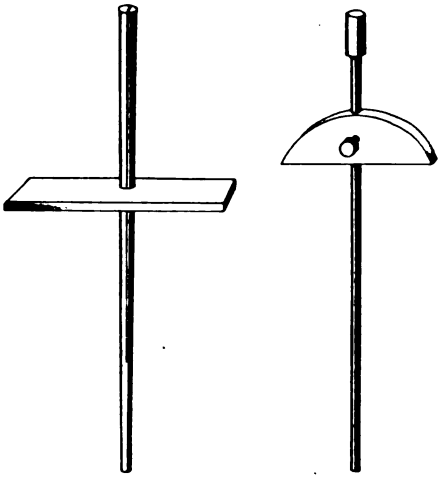
Sometimes it is necessary to press the gauge with considerable effort in order to have it register the air pressure. The shape of the gauge and its position on the wheel occasionally makes this a mean task. A handle fastened to the instrument greatly facilitates its use.



A thin strip of sheet metal, a small bolt and nut are all that is needed to make the improvement.

TWO TYPES OF EASILY MADE DEPTH GAUGES

A very handy tool for the general mechanic and one that can be made easily and inexpensively, are the depth gauges shown in the adjoining illustration. They can be used for many purposes around the shop and will be found as practical as they are inexpensive. The right hand figure shows a gauge made from a piece of 1/8" round rod and a medium sized pulley key of the Woodruff type. The measuring bar is locked firmly in place by means of a knurled head machine screw. The other figure is made by splitting a rod for the greater portion of its length. It is then

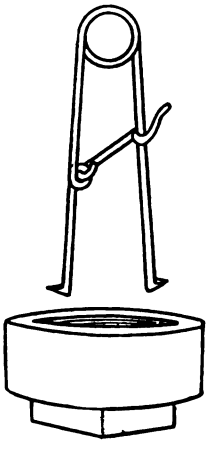


sprung apart. When slipped into the hole drilled through the cross member. the sprung portion will create sufficient friction to hold the rod in place, when it is being used.

HUB CAP THREAD CLEANER

Sometimes when the hub caps are taken off their threads get gummed up with dried oil and grease and when replacing them the fine threads are crossed or burred. When such is the case it is necessary to clear out the threads.

A very useful little tool that is quite simple to make that will do this work very well is shown in the accompanying cut. It is made of spring steel wire. An old valve spring annealed and straightened out, then bent to the shape shown for this tool and its ends filed to fit the threads will make a good quality tool. The clamping lever A, forces the legs apart and holds them so while turning the tool to clean the threads.



Tractor Hitches

NO special hitch is necessary for one binder alone, as the stub tongue of the tongue truck can be used with a clevis or other connection to the draw bar of the tractor. The tongue truck itself should be taken off. Or if the binder has the long tongue it can be sawed off to a stub, just short enough for turning the tractor and avoid the wheel. However, for those who do not want to dismantle their tongue truck or saw off the long tongue, a special hitch can be supplied for one binder only.

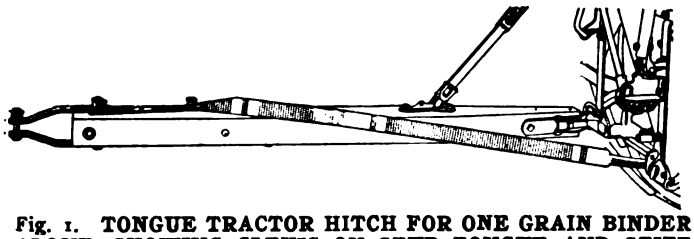


Fig. 1. TONGUE TRACTOR HITCH FOR ONE GRAIN BINDER ALONE, SHOWING CLEVIS ON STUB TONGUE AND STIFF TONGUE BRACE

Pulling two grain binders is recommended when using a 10 to 20 horse power tractor, because of the additional work that can be done. A third man is needed, but this is more than offset by the fact that the tractor can be kept going at all times in spite of the hot weather.

When it is desired to hitch two binders behind a tractor, a tractor hitch for the first binder of two is shown in Figures 4, 5 and 6. This must be used on the first binder. The reason for this is the hitch parts for pulling the binder with horse are for pulling only one binder and also because some parts of the steering tongue hitch must be used on both front and rear binders. When a large tractor over 10 to 20 H. P. is used, a steering tongue tractor hitch is necessary on the first binder as shown in Figures 8 and 11 in order to permit it to cut a full swath and to clear the reel when turning. When the binders are pulled by a small tractor, the steering tongue tractor hitch, or hitch for the second binder is used in connection with the hitches described.

The person who tries to operate two binders behind a tractor will at once appreciate the value of the Steering Tongue Tractor Hitch. This hitch permits the operation of as many binders behind the tractor, as the tractor has power to pull. The operation is simple. The tongue is pivoted to rigid iron frame and swung by a geared quadrant and pinion. Figure 4 on illustration 8 shows this feature. It is controlled from the seat by means of a crank and a worm gear mounted on the binder frame. By this device the binder can be swung in either direction as required. The steering tongue tractor hitch can be placed on either the right or the left hand side of the binder without making changes or drilling holes in the binder frame.

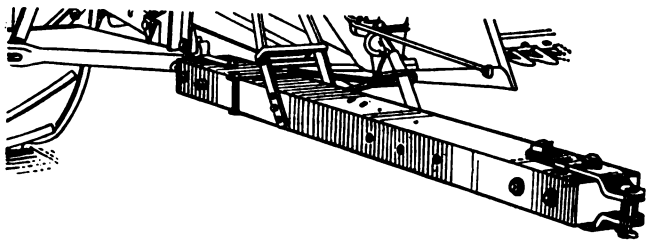


Fig. 2. STUB TONGUE TRACTOR HITCH FOR ONE BINDER ALONE, SHOWING CLEVIS ON STUB TONGUE

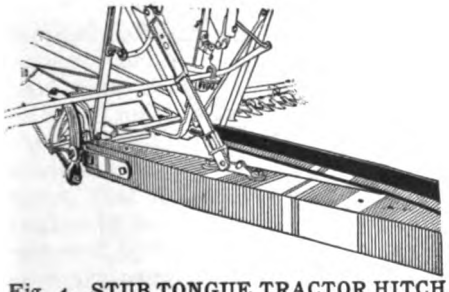


Fig. 4. STUB TONGUE TRACTOR HITCH FOR FIRST BINDER OF TWO, SHOWING STIFF TONGUE BRACE AND REINFORCEMENT OF TONGUE PIVOT

In the hitch as shown in Figure 10 there is a roller at the front end of the tongue, which travels on segment Z, B, at the rear of the front machine. This arrangement supports the front end of the tongue and is provided with reinforcements, which overcomes side strains on the binder frame and platform. This roller and segment makes the tongue self-aligning.

Fig. 5. STUB TONGUE TRACTOR HITCH FOR FIRST BINDER OF TWO, SHOWING CLEVIS AND STUB TONGUE

EXTINGUISHING OF OILFIRES

Mark Meredith

THE storage of oil or petrol has always been accompanied by great fire risk, owing to the difficulty in extinguishing the flames by ordinary means. The use of water results in a further spread of the blaze over a large area on account of the well-known property of oil to float on water. The use of carbonic acid gas is ineffective because of the great diffusion in the atmosphere by the rising currents of air and other natural conditions. Both of these difficulties are reported as being overcome by a method which has been recently introduced into practical use.

The process is based based upon the principle of applying a froth or blanket of bubbles containing the carbonic acid gas which concentrates the gas so as to make it more effective. Not only are flames extinguished by this means but the smoke and fumes are also smothered. Another advantage is the comparative dryness of the foam compared to water, as it possesses no tendency to soak into the material, and thus there is less damage. The composition of the solution used for the formation of the bubbles has not been revealed. The froth resulting from the release of the liquid from the extinguisher is eight times in volume that of the original liquid and therefore has a large area covering capacity. The

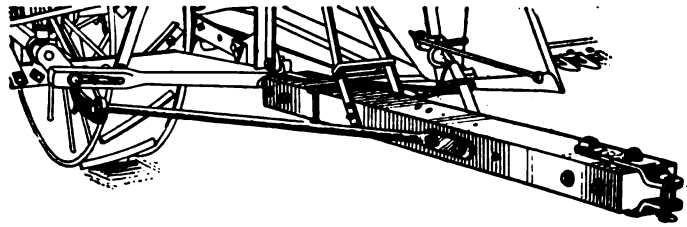


Fig. 6. STUB TONGUE TRACTOR HITCH FOR FIRST BINDER OF TWO, SHOWING CLEVIS AND STUB TONGUE AND ADDITIONAL TONGUE BRACE

physical properties of the froth show it to be heavy, tenacious, and lasting. Portable means for the application of the method have been provided. For large storage tanks permanent installations are used.

In a test of a 55,000-barrel tank with a strong wind blowing, the foam blanket smothered the blaze in 48 seconds. The tank was 114 ft. in diameter, presenting 10,200 sq. ft. of surface, and the foam was discharged from two containers placed at diametrically opposite points on the periphery of the tank. According to experiments that have been conducted, the amount of foam required can be calculated in accordance with 'the

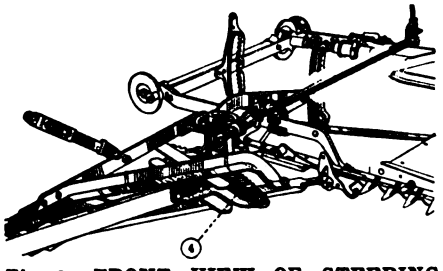


Fig. 8. FRONT VIEW OF STEERING TONGUE TRACTOR HITCH USED ON THE SECOND GRAIN BINDER OF TWO. IT IS EASILY OPERATED

nature of the fire risk, and the number of square feet of area requiring protection. The maximum distance to wihch the foam can be discharged is 50 ft.

THE testing of sheet metals is a subject of considerable interest and importance, not only on account of the insight which such tests affords into the physical properties, but also on account of the information which can be derived from them with reference to the behavior of the metal in actual use and its capacity for standing further mechanical work, such for example, as bending, spinning, stamping, etc.

In the case of sheet metal two distinctly different classes of material have to be considered namely, one which is supplied in the cold rolled state, in which maximum strength and hardness with but slightly ductility are the chief features, and the other, which is supplied in the annealed condition, in which a high degree of ductility is the essential characteristic.

Intermediate or medium tempers, as they are often termed, between these two extremes are also quite frequently required, and, indeed, the temper specified should always be chosen with due regard to the amount of working to which the metal is intended to be subjected.

The selection of a suitable test or tests for a particular purpose is a matter for very careful consideration, and it would be well if producers and consumers were to come to some definite agreement respecting the mutual adoption of a test or tests, which would give each the particular information necessary from their respective standpoints. Even if the consumer is content to leave the testing to be performed by the producer, he should still be conversant with its nature and objects, and the bearing thereof upon his own problems.

Proceeding, the very wide applicability of the tensile test, emphasising the stringent necessity for employing a properly designed machine, in which the gripping mechanism, for example must be such as to hold the test piece so that it is truly axially stressed, etc. Stress should be laid upon the necessity in sheet testing for taking into consideration and stating the gauge upon which the tests nave been carried out as well, of course, as the results of the tests themselves. There is a most promising future for "grain size" measurements in connection with the correlation of the mechanical and physical properties with the behavior of the metal in practice.

It has been found that "hard-soft" ratio gives a very ready and practical means of ascertaining the relative sensitiveness of the different tests of note, this ratio is the

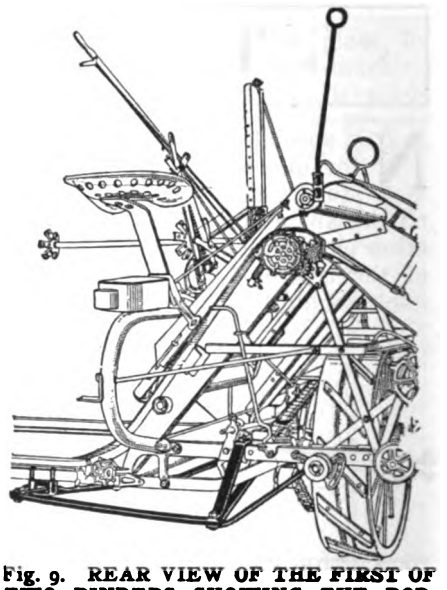


Fig. 9. REAR VIEW OF THE FIRST OF TWO BINDERS SHOWING THE PORTION OF THE STEERING TONGUE TRACTOR HITCH WHICH IS PLACED ON THE REAR OF THE FIRST BINDER

quotient of the test figure for the cold-worked metal in the condition of maximum, hardness by that for the dead soft metal, obtained by the thoroughly annealing of the cold worked product.

Mark Meredith.

Read something somewhere every single day which will make you a clearer sighted, shrewder, stronger, and more skillful business man. May be you will find it in the daily newspaper, in the trade publicaton, or an inspirational magazine—but find it somewhere. Ideas are what keep business men from going to seed.

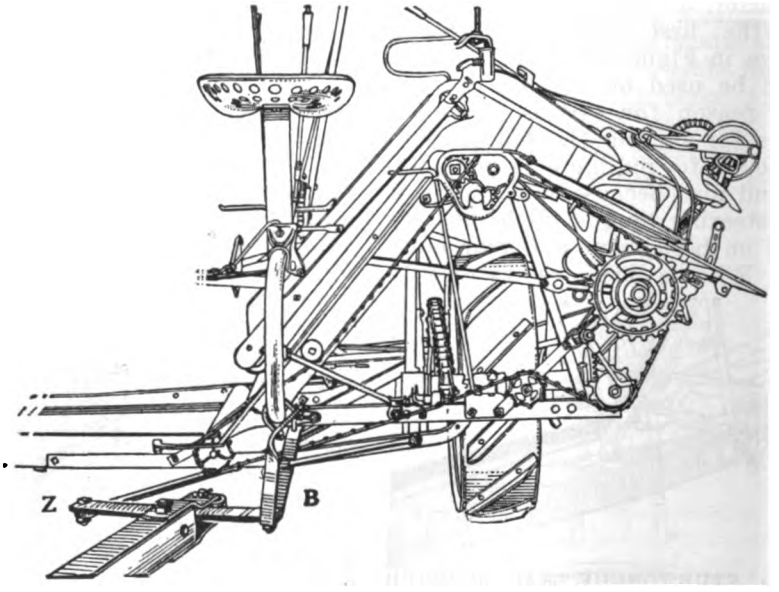


Fig. 10. REAR VIEW OF THE FIRST OF TWO BINDERS SHOWING THE PORTION OF THE STEERING TONGUE TRACTOR HITCH, WHICH IS PLACED ON THE REAR OF THE FIRST BINDER

The Problem of Good Valves

By WALTER C. WILLARD*

GOOD valves are a real problem and require specialized treatment both as to design and production. Valve makers are best equipped to solve such problems. No part of a tractor is more vital to service.

A tractor is usually operated at points quite far removed from repair stations. It is operated by people who are not necessarily experts in the mechanics of their machines. It is called upon to work

This Valve was literally burned up and removed from a tractor in the field. The material was good, the design correct, but the application was wrong. Its present condition after brief use, emphasizes the need for proper valve selection.

perhaps day and night under conditions where delays and shut downs mean serious losses. While in operation it is called upon to deliver its full power capacity, or nearly so, at all times with no let up.

This continuous maximum power requirement under adverse conditions has forced the development of radical improvements in engines, for this service. These conditions affect every feature of design and manufacture, strength of parts, size of bearings, accessibility, protection against dirt, cooling, lubrication, carburetion, in fact, each part must receive design attention as based on these requirements.

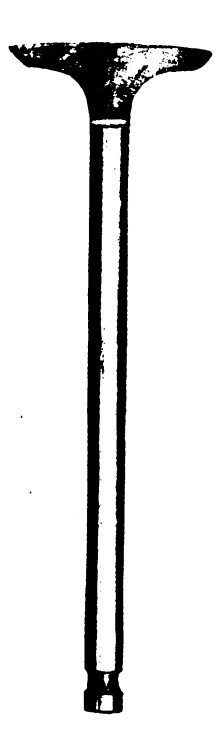
Continuous trial and revision of models has proven, beyond argument, that an internal combustion engine to be adapted to the service imposed by tractor operation must be more rugged and substantial as to its wearing parts than for any other kind of service. It has shown the necessity of designing and building special engines, built up around actual operating needs. We have learned that the severe service conditions imposed require the use of highly specialized parts, both as to design and material, in order that each piece may play its full part in the completed machine.

Since the engine is required to develop its full power under all conditions of operation, and this power capacity depends directly upon the maintenance of constant maximum gas pressure within the cylinder, it becomes self evident that any disturbing factor which tends to decrease these pressures should be eliminated or minimized in the design and production. Maximum gas pressures can only be maintained when compression pressures are maintained. Among other things, this means tight valves, valves which are made tight and which stay tight at all times in operation. It is comparatively simple to make a valve tight in the first place, but to make it stay tight involves the intelligent use of all our engineering and manufacturing abilities . It involves valve design and material as based on the specific demands in hand, engine design in general, and specifically, as to local cooling, lubrication, mixture, speeds, fuel, seat areas, port areas, port forms, maximum and mean explosion temperatures, in fact one can hardly mention a detail of cylinder construction or engine type which does not in some manner affect the valve problem.

There have probably been more individual cases of valve failure (at least so called) in the comparatively short history of the tractor than in any other service. This is due to the extremely hard use and to a too limited knowledge of what would satisfactorily "do the trick." Experience is the final check on specifications. It was only when we tried to adapt standard automobile engines to tractor service that we began to discover the necessity for better valve conditions. Failures developed through permitting an engine to operate with a gas leakage past a valve. That gradually burnt the valve, also the seat. Perhaps the area of seat was insufficient and the valve material was subjected to surface strains beyond the elastic limit of it at that particular temperature. Maybe a tappet was set up too close. Or, again, the seat was unevenly cooled, causing warpage of both seat and valve, and so on, each instance being a "valve failure."

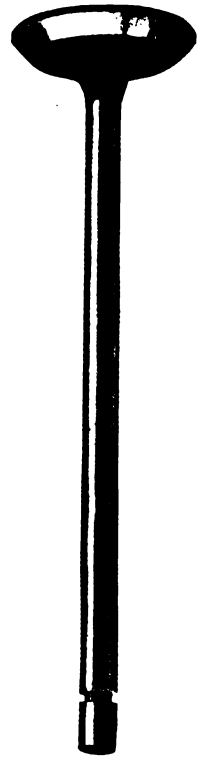
From the data thus accumulated, engineers can forestall many of these difficulties, but a tractor engineer is usually not a valve engineer any more than he is an ignition or carburetion engineer. Because of the exceedingly rapid progress in the art, valves have become just as highly specialized as any accessory or adjunct of the machine, but as with the other items of construction, in order to make good valves, accurate and complete knowledge of conditions of operation must be had. From this knowledge materials may be chosen and valve design prepared.

Valve makers are no different from the manufacturers of other



The head of a Cast Iron Seat Valve which ran 10,000 miles. It was seating perfectly when removed.—From an unretouched photograph.

One piece Steel Valve with Cast Iron Seat, head sawed in two to show the rim of cast iron around seat.



This Special Alloy Valve has been through a test as severe as it will ever receive in actual service. It shows no sign of pitting or warping. Special Alloy Steel Valves have hardened heads with stiff stems, and retain these qualities in operation.

*Quality Engineer. The Steel Products Co., Cleveland.

high-grade parts. They are anxious to have their product prove satisfactory in service, but at the same time, they are required by the engine builders to furnish valves in accordance with the purchaser's specifications. If such specifications are not prepared upon a basis of a full understanding of operating conditions, then other cases of "valve failure" are recorded. Instances are many in which a perfectly good valve was installed in a perfectly good engine but failure followed when put into tractor service. Slight variations of either engine or valve design or material would have made success of such failure.

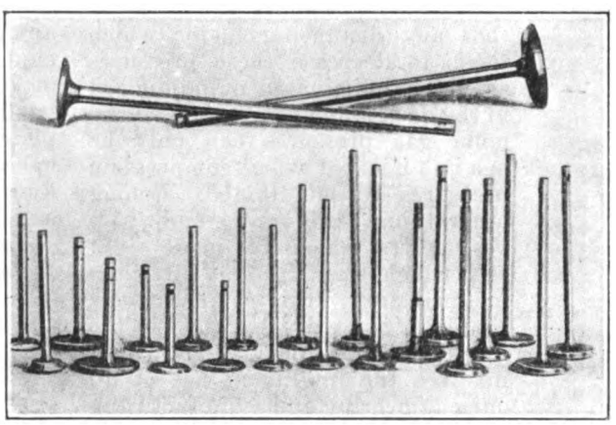
In this connection, it does not always follow that in order to get valve service the highest priced materials have to be used. Often engine conditions are such that a comparatively low priced valve may be used, providing it is accurately installed. The length of time required for continuous unfailing operation between periods of overhaul or repair has much to do with necessary valve specifications.

A valve is an obstruction in the gas passage and should, for this reason, be designed so as to impede gas travel as little as possible. However, this gas travel takes place in opposite directions over the intake and exhaust. Logically, then, in designing for minimum restriction the valves will assume different shapes, one accommodating inflow and the other exhaust. Next comes the question of heat radiation and conduction. The amount of heat necessary to carry away in the two is widely different and should be considered separately in design for best action. An attempt should be made to prevent dangerous temperature rise in any part of the valve and to so proportion the valve mass as to conduct heat away from the center as fast as it accumulates. A careful study of the relation of exposed areas, head and stem mass, head form, seat area, and seat cooling is necessary to so manipulate the design of these items as to give service.

At best, the duty which a valve is required to perform is almost beyond belief, so that it is vitally important to make all the surrounding conditions as rational as is possible and relieve the valve of unnecessary handicaps.

The very variety of valve design today indicates that nothing in the nature of standard practice exists, yet probably as the art develops we will find it possible to adopt a reasonably "standard practice" under given conditions, but until that happy time arrives we can but study each case with the greatest care and continually strive toward the ideal in valve specifications.

The experience which valve makers have been able to accumulate over a considerable period of time, during which they have devoted specialized study to valve problems, places them in a position to be of great assistance to manufacturers in the speedy solution of such problems. They, in many cases, have been able to reduce these problems to mathematical formula according to which certain conditions can be met by fixed specifications for valves. Such information and assistance is always available whenever a manufacturer wants better valves made. And the tractor engine builders do want better valves, the same as they have found they need better ignition, better carburetion and better lubrication.



THESE EXAMPLES OF VALVES PRODUCED FOR DEFINITE SERVICE IN DISTINCTIVE TYPES OF ENGINES SUGGEST THE WIDE RANGE OF PROBLEMS WHICH THE VALVE MANUFACTURER IS CALLED UPON TO SOLVE

HARDENING SMALL CARBON-STEEL TOOLS

Special care must be taken in the tempering of small tools of carbon steel. A small gas furnace, inclosed with a chamber for the heating of the tools, is desirable, but a coal or coke fire properly banked is satisfactory. The fire must be burned down to a bed of live coals, and it is best to insert a section of tubing into the fire to protect the tools from the direct blast. The quenching heat may be determined accurately by instruments, but where these are not available, the use of a magnet is suggested. When the magnet no longer has an attraction for the steel being heated at the part in the fire, the proper point for quenching may be determined by permitting the steel to remain in the fire a few moments longer. The point at which the magnet ceases to attract is about 1,425° F., and the best heat for tempering is 10° above that temperature.

Cracked and damaged tools in the hardening process frequently result from the failure to relieve the strain on the steel after quenching, and the moment that it has cooled sufficiently to harden. While still grasping the tool in the cooling bath, the instant that the tremor from the sudden plunge stops, the piece should be withdrawn quickly, and permitted to cool in the open air. The steel will still be too hot to hold in the hand. This is only necessary, of course, when the steel is not to be drawn to temper on the original heating.—A. Dane.

STUDY THE MAN

Any smith whose business it is to dress tools, I would advise to study the man who uses them. A skilled mechanic, who knows how to grind a tool and use it properly, will use a much finer and higher tempered tool than a poorer mechanic or an apprentice could use successfully.

Put a piece of resin the size of a walnut, into your babbit; stir thoroughly, then skim. It makes poor babbit run better, and improves it. Babbit heated just hot enough to light a pine stick, will run in places with the resin in, where without it, it would not. It is also claimed that resin will prevent blowing when pouring in damp boxes.

There is nothing in the open market which will bring more money than a genial smile. Some people are so chary of their smiles that they cannot have very many in stock. Funny thing about smiles. They are mighty like sweet peas and pansies and some other fragrant flowers. The more you pick and use, the more grow in their places. Get the habit!

The French Blacksmith and His Job

By JOHN B. WOOD

THE Forgeman of the small towns in France is a prominent citizen, just as the blacksmith of the American small town is a power in his community. Whether his specialty be that of farrier to the work and coach stock of the country-side or iron-working in general he has been through a long and arduous schooling in the duties of his calling and takes a serious pride in his work. All the trades of European countries are still bound up in the theory of apprenticeship, somewhat elastic, to be sure, but still there to the end that no young blood can burst into the sacred circle of skilled craftsmen without having been through a long period when he got little or nothing for his labor and was glad to listen to instruction. The task of shoeing a horse or an ox has been developed to a science in the old countries, and although there are not so many ways of spreading information over there as here, yet each man who comes to the point where he can set up his sign as a smith, usually, is equipped with knowledge of exact nature, and quite up to date. They take their few trade and technical journals mighty seriously over there. So probably the French farrier and blacksmith is equal to the American in point of skill, although he often lacks the energy and 'pep' that characterizes the western man, and has not the labor saving machinery to help him boost his output.

THE SPANISH MULE 'EN YOKE

The small town usually is built around the church square and the village pump, with the few stores and the blacksmith shop near by. As the teamsters drive through with their loads or return homeward with empty carts they often stop and unhook, leaving the big wains standing in midstreet while they place their stock or broken equipment in the shop and then go off to some nearby tavern for a social glass. It is by no means uncommon for the blacksmith's wife to conduct a grogg shop in the same building, thereby adding to the family income and relieving the teamsters of the necessity of going out in search of refreshments. Often the smith stops work long enough to join his patrons at the plain wooden table, for time is of no great consequence to him, and sociability is one of the chief tenets of his creed.

His equipment in the shop is crude and scanty, unless perchance he is located near some industrial center, in which event he will possess a power blower, drill press, welding outfit perhaps, and other items of French or imported machinery and supplies. But the average country smith is content with his hand-made forge and tools and the classic leather bellows of prehistoric days. Outside the door will be found an ancient millstone to be used when there are jobs of tire-setting to be done, and like as not there will be an ox-sling of heavy oaken timbers and cumbersome leather bands. There is a romantic touch to the smithy, especially at night, when much of his work is done. He is apt to sit about drinking wine most of the day, fitting a few shoes on rush jobs now and then. But when night settles down he and his boys go out and blow up a rousing fire, and then they fall to upon some job of iron working and beat and sing by the forge light, while the small boys stand about and shout as the sparks fly.

There are three kinds of work stock in general use in France. In the north the horse is supreme. The stocky chunks of Normandy and Brittany are gentle and very strong; in fact they were very much in demand during the war for artillery and transport use. Usually they are driven tandem, to two wheeled carts, with the lead horse hooked directly to the ends of the shaves. The cart is equipped with two props, so that it stands upon two wheels and two legs when the horse is taken away. Loading requires good judgment in order not to put too much weight upon the wheel-horse, yet enormous loads are carried. In central France cattle are much used for hauling. Both cows and oxen are made to work. The big estates are stocked with two types of cattle, milch cows and work cows, and the latter are bred with great care and success. A good example of the work cow is the well known Gascony breed, weighting from eight to sixteen hundred pounds, and possessing all the attributes of the work ox. Males of the milch breeds are used for draft purposes, as well as heavier oxen of beef types.

THE OX TEAM—AN UNFAMILIAR SIGHT IN THIS COUNTRY

One of the most interesting animals of France is the Spanish mule, which is widely used in the extreme South, from the vicinity of Bordeaux to the Spanish border. These animals are very small; their

shoes are mere playthings when compared with the small shoes of our American mules. Yet the Spanish mule is quick and strong, and he packs a wallop in his rear system that outdoes the kick of the deer in concentrated energy. These mules are trained to work under yoke like cattle, the yokes being very light frames which fit about leather collars. They too are driven to the universal two-wheeled cart and are guided with sticks as are the cattle. Inasmuch as most of the roads of that country are surfaced with fine rock it is necessary to keep draft stock well shod, and the farrier must be able and willing to handle whatever comes into his shop, whether it be horse, cow or mule. And his life is not always devoid of danger and excitement.

THE CHURCH SQUARE. WAGONS LEFT BY TEAMSTERS WHO ARE VISITING THE BLACKSMITH SHOP

In villages near industrial centers, as in the northern factory regions and the iron centers of the south-western coastal country the blacksmith often is called upon to work on broken machinery. Such a man often becomes very expert in the use of modern welding apparatus. There was a man at the village of Lue who often worked for the Americans. He operated a small woodworking establishment and a small machine shop under the same roof, and owned an oxy-acetylene welding outfit. However, the military exigencies of the period kept him always bereft of oxygen so he never could do anything unless our supply officer furnished the fuel. Whenever there was a rush job to be handled a truck was dispatched to him, loaded with a tank of oxygen and another of acetylene gas, and a man was sent along to stand watch over the precious gases so that none of it would be used for other than our own needs; and the blacksmith dropped everything to do the work. He possessed an uncanny sense of proportion and could weld a broken pulley so skilfully that it could be put back upon its shaft and used without any testing for balance. Many of the French smiths operate woodworking plants, thereby filling their days with gainful occupation, for the local needs often are not great enough to keep them busy in the iron-working line.

There are many villages built up around ancient castles, and often one finds the blacksmiths occupying the same little masonry stall that his forefathers used in the days of long ago, when iron-working was a trade that specialized in the production of defensive and offensive equipment. The secrets and special patterns have been handed down, and even now one finds that these men can produce beautiful specimens of the iron-worker's art, such as knives and iron gates. France presents a strange mixture of old and new in almost every particular, and the trade of the blacksmith is no exception.

THE SUCCESS FAMILY

The father of success is Work.

The mother of Success is Ambition.

The oldest son is Common Sense.

Some of the other boys are Perseverance, Honesty, Thoroughness, Foresight, Enthusiasm and Co-operation.

The oldest daughter is Character.

Some of her sisters are Cheerfulness, Loyalty, Courtesy, Care, Economy, Sincerity and Harmony.

The baby is Opportunity.

Get acquainted with the "old man" and you will be able to get along pretty well with the rest of the family.

FORGING KNIVES FOR THE SURGEON

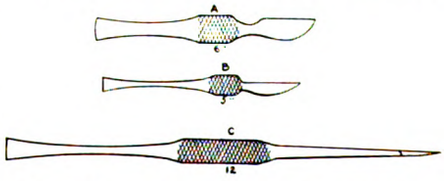
The average blacksmith is seldom, if ever, called on to forge knives for the surgeon. Such requirements are quite distantly removed from the average practice. It is, however, work that I am frequently called on to do, and I believe a brief description will prove interesting to other smiths, who are not engaged in such delicate work.

Of all the surgeon's instruments, his knife is not less important than any of his other instruments. To answer their purpose properly they must be light, delicate and still strong enough to withstand hard usage, and above all they must be so tempered, that they will withhold their cutting edge.

Figure A shows the pattern of a knife used for general practice. It is 6″ long, and is forged from a fine grade of tool steel. Danemore steel or Bethlehem steel, brand XXX possess excellent qualities for the purpose. The center part of the knife is knurled. This acts as a handle. The surgeon, holding it between his fingers, can cut in any direction.

The knife shown in figure B is not dissimilar in general appearance to the one shown directly above it, other than it is shorter and somewhat lighter throughout.

Figure C shows the appearance



of a long slender knife used for some operation in the throat. It is forged from Huntsman steel ½″ x 1-1/16″, at the knurled part, and is drawn out to a long slender point. It is a delicate forging task, as the knife is drawn out to 12″ in length. The knives are first forged to shape, great care being used not to have places where dirt can lodge, they are tempered, then ground, after which they are nickle plated.

Queries-Answers-Notes

THIS department is the meeting place where you are free to ask for information, answer questions, discuss shop matters and business conditions and any other notes you feel would be of interest to a fellow mechanic. Make use of this Department as often as desired.

Blacksmith Should Charge More:—In a recent issue, a Missouri Blacksmith wanted to know if it would pay to have a power hammer for plow work. It sure does. It not only does better work, but it will sharpen two while the smith who uses the old anvil method is sharpening one. I have a 50 pound hammer and am well pleased wih it. For best results it is necessary to keep the dies in good shape so that it will draw the iron. By keeping the dies rounded a little and a little lower on each of the ends, you will not have a hammer mark on your lays or shovels. I would be lost if I did not have a hammer to do my work.

I can not understand why the Blacksmiths in Missouri do not get better prices for their work—any one can get 80c an hour for their work. We get $1.50 for sharpening plow lays, and $2.50 for pointing and sharpening. $10.00 a team for never-slip shoes and $8.00 for common shoes. It is time the Missouri Smiths charged a reasonable price for their work.

Robert Johnson, Nebraska.

By All Means Buy a Power Hammer—In reply to the brother asking for information in regard to a power hammer, I would say to get one and don't lose any time about doing it. A hammer is as good as three men, when it comes to getting work out promptly. From my experience I would advise the purchase of a hammer slightly larger than is necessary for your largest work. For instance, if your largest weld is a 2" axle, then get a hammer that will handle a 3" job conveniently. I prefer the helve type of hammer, as there are no guides in the way when welding tires, and besides you have more than one set of dies. A pair of plain ones will come with the hammer. You can have the top and bottom ones of different shape. A very convenient style is to have one half of the bottom round and the other half plain flat, using this for drawing out stock. Another convenient pattern is to have the die beveled for drawing out wedges. Only a very little should be taken off of the edge of the round die and you will be surprised to see the work they will do. You will find these dies very inexpensive if you make the pattern yourself and have the dies cast from a good quality of cast steel. They will require but little machine work after they have been cast. If there is no foundry in your locality equipped to make steel castings, send the pattern to the factory of the hammer maker. I have made a good many of these dies myself slipping them over the bottom die and using lugs to hold it in place. Again I would say get a hammer by all means, and you will kick yourself for not having bought it long before. H. N. Pope, Connecticut.

What Do You Like — We are most anxious to publish articles which will be of general interest to the majority of our readers. We would appreciate any comment in that respect. Won't you tell us what you like best? The following letter is from one of our subscribers. "The paper is getting better all the time. It sure is great to read the good news. I would like to see more of the welding notes, especially some hard job or some simple one. How do you do it? Maybe we would like to know. I have 112 taking welding here at the State College, Brookings, S. D. All of the 112 Auto Mechanics get welding, as it runs parallel with the course. They take up the different branches in which they wish to specialize, such as Auto Repairing, Tractor work, Ignition and Oxy-Acetylene Welding. They are also given lectures and notes on the different metals, pretaining to the action of each while in a heated or molten state. Instructions are also given as to the gases, regulating valves, torches, and flame. Off hand the students must be able to draw and explain every detail of the regulating valve. They are then taken to the Welding Room and given instructions in welding. We have 30 problems in cast iron and steel, also malleable iron repairing, brazing and aluminum welding and soldering. The last of the class exercises are the expansion and contraction problems. When these are accomplished satisfactorily, they must do field welding. The student must have 70 hours of actual field welding to his credit before he gets his rating. We are now doing all the field work we can handle. The cars that are brought here to be repaired afford us a great deal of practice. We have welded three cylinder blocks and one aluminum crank case, within the last ten days, and have accomplished many other minor jobs.

R. H. Anderson, Instructor of Welding, Brookings S. D.

Why Change Your Occupation — For many years I have been a reader of the American Blacksmith, and of course have always been interested in all subjects relating to my line of work. I commenced my career here about twenty-three years ago, beginning as a general blacksmith and horseshoer. At that time I had some strong competition from the two other shops. One was doing horseshoeing exclusively, while the other was engaged in the general blacksmith and wheelwright business. Naturally my business proved to be rather discouraging from the fact that people are slow to depart from their regular places of doing business. The general work seemed to promise a little more than shoeing, and as I had concluded that I was not cut out for a successful horseshoer, I decided to discontinue that part of the business. I sold my horseshoeing equipment, toe calks, etc., to my neighbor shoer, and this ended my shoeing forever. I procured a gas engine, a rip and jig saw and started in the general business.

About two years ago the horseshoer bought the building in which I was located, and wishing to occupy it himself, compelled me to seek other quarters. I built another shop 28' x 40' a short distance from my former location finishing it with a cement floor and equiping it with a buzz planer, band saw, boring machine, and a drill press, all of which was run by a gas engine.

In this review of my personal affairs, I am drifting from the point I have in mind —the mastery of ones own affairs through the thorough knowledge of the work. I have noted the American Blacksmith gradually slipping from the lines which interested me most, that the automobile is coming more into prominence and regardless of the frequent suggestion that we take more to the automobile business, I must confess, I am not in accord with this idea. I am well along in the fifties, and still find that I have much to learn, and to take on a new business that I know much less about, I believe would be an act bordering on folly. There seems to be an unlimited number of young men anxious to get into the automobile business and a very few are learning the blacksmith and wheelwright trade. I have come to think that the latter trades are quite as pleasant and renumerative vocations, as the automobile repair business. We have two garages in the place, one is enclosed all winter, the other has done a little in the way of overhauling a few cars that were left in the Fall, while we have had all we could do all winter and most of the time we could not keep up with the work as it came in day by day. There are a large number of wagon wheels and other jobs staring us in the face as Spring approaches.

As a friend ventured to say a few days ago "who would take the place of the horseshoer and yourself, should you drop out in the near future". Perhaps, when we no longer hear of the music of the anvil, there will be two more garages in the place and the farmers will be compelled to let their horses go unshod or learn to shoe them themselves, and also learn to repair wagons, farm tools, and machinery or else buy new equipment when the old breaks or is in in need of repair. In conclusion I wish to state that I have become thoroughly convinced that the blacksmith and wheelwright trade should be classed in the future with the best trades in this country.

D. L. Williams, New York.

Lining Lathe Centers:—I would appreciate having you tell me through your columns, the method of checking up the lathe centers. I have experienced some difficulty in that respect and think perhaps there are better methods of doing it than I use.

Chas. Boyer, Texas.

To turn work square and parallel, it is necessary that the lathe centers be in line with each other and with the line of tool motion. If the centers are much out of line, as they would be after turning a taper, they be roughly set by placing the dead centers very close to the live center and adjusting until the points seem to be opposite, or the dead center may be set by the use of the scale or the

zero mark on the tailstock. To adjust the dead center accurately, a test bar about a foot long may be used. It is carefully centered with its ends finished to the same diameter and the center portion slightly reduced. The bar is centered between the lathe centers and the tool is adjust to touch the bar at the live center end. After the tool is thus adjusted the carriage is then moved to the dead center end and the tailstock is adjusted, so that the tool touches the bar at this end. The test should be repeated until the centers are alike at both ends. After the centers are lined, the work being turned should be carefully calipered as the cut proceeds, to be sure that the lining was correctly done.

Shellacing Carburetor Floats—I would like to get some information on shellacing carburetor flots as I have been unable to get any shellac, lately, which will stay on the float.

Oscar Walters, Illinois.

The most probable reason for the shellac failing to stick to the float is that the float has absorbed a certain amount of moisture from the fuel. All the old shellac should be scraped from the float and then the float should be thoroughly dried. Placing it in an oven with a slow heat, being careful to neither burn nor char it and then applying several coats of good shellac, will overcome the difficulty.

Hardening a Cutting Die—Please advise me how to temper a knife for a die to cut paper gaskets so it will not crack or warp when I dip it in the water. Also state what color the temper must be. The knife is 10″ long and 1¾″ wide and ⅜″ thick. The cutting edge is beveled on one side.

E. G. Behling, Wis.

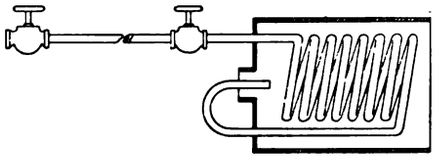
In tempering a blade for cutting paper gaskets, it is important to know just what kind of steel you are using. The grade of steel ordinarily used and which works very satisfactorily for this purpose, contains about 1.00 per cent. carbon. Dies used for cutting leather, cloth, paper, etc., are frequently made of "Backed" steel, that is the portion that bears the cutting edge is of hardening steel, while the balance is of wrought iron. The cutting edge can be bedded down into the coals with no danger of overheating. When dipping, a bath of light oil or warm water is used. If cotton seed oil is found to be to heavy, a small amount of light mineral oil may be added to obtain the right consistency. In drawing the temper of cutting dies, the material to be cut must determine the amount of drawing. The range, however, is generally from a brown to a dark blue (500° to 570° Fahrenheit). It should be borne in mind that the lower the carbon content of the steel being tempered, the higher the temperature will have to be.

What Constitutes Profiteering?—I wish to ask through the columns of your paper, the honest opinion of every brother smith, who has ever done any road grader blade sharpening or drag sharpening, if I have done anything in the way of over-charging or profiteering. I have been accused of such an offence by a County Official, who seems to think I have over-stepped my rights. I sharpened two drag blades, 8′ long and ½″ thick, and my charges for the work were the same as for grader blade, $7.00. I really do not believe I have over-charged for the work, and I ask any or all of the smiths to be the judge. I would be mighty glad to hear their personal opinion.

C. C. Schmidt, Iowa.

Editor's Note—It is indeed a strange fact, that people will pay without question, the prevalent scale of wages of many of the trades, but will take exception to the charges for other classes of work. A bricklayer is paid from $1.00 an hour upward and nobody voices a complaint about paying from $1.25 to $2.00 an hour for good automobile work. Yet let a blacksmith charge a similar amount for his services or even less and—Robber. Apparently his experience and knowledge of the works counts for nothing, or else it is regarded as an occupation requiring no skill whatsoever. As a body the blacksmiths are not paid in accordance with other trades, and a charge of profiteering certainly reflects on the intelligence of the person making such assertions. We would appreciate hearing from some of our readers as to what the charges are for this kind of work in their various localities.

Making a Preheating Torch—In answer to the inquiry of J. W. Simmons, in regard to making a preheating torch; I made one that worked very satisfactorily, and used scraps that were laying around the shop. It required 16′ of ⅛″ pipe; 1 piece of 4″ boiler flue 8″ long; 6′ of ¼″ pipe and 2, ¼″ globe valves. The ¼″ pipe is coiled so that it will fit inside of the fine boiler flue. One end of the flue is



capped with a plate having one hole drilled through it, and a short nipple large enough in diameter to accomodate the pipe. The accompanying drawing shows how the parts are assembled. The opening in the pipe may be swaged down until the hole is of the proper size to suit the individual case. I use 40 pounds of air in the tank and am able to heat anything.

In regard to Mr. Clark's inquiry about welding auto axles, it has been my experience that they can not be welded so as to give any satisfaction.

In reply to Mr. Brownings inquiry about repairing concrete mixers, the bands should be welded good and smooth and given about 1/32″ draw when they are cold. They will hold, and will not break the flanges.

Wm. Exline, Kansas.

Setting Plow Beams—Would you or some of your readers tell me the easiest and best way to set a plow beam?

F. R. S. Georgia.

To set a plow beam, first set your plow on a level floor and then set the beam so the front end of it measures 14″ from the underside of the beam to the floor. This measurement will work nicely for a 14″ plow, while for a 16″ plow, it should measure 14½″. For a steel beam, heat back about a foot from the front end and spring it down to the required point. The beam should also run to the right about 2 or 2½″ and line up with the land side.

A Pointer on Drilling—Small drills are less apt to break if they are run through a block of wood with enough of the drill protruding through the block, to drill to the desired depth. The annoyance of breaking 3/16″ and ¼″ drills can in most instances, be avoided by this method.

R. N. Henderson, Louisiana.

Removing Broken Studs—We do general repair work in our shop and in the course of our work have considerable difficulty with cap screws breaking off, leaving the broken stud deep in the work. It seems unnecessary to add that they are not the easiest things in the world to get out. W have tried drilling a hole down through the center of the stud and then driving a square drift into the hole. I cannot say that we have been altogther successful. In many cases, the drill, although much smaller than the stud, will run to one side and damage the thread. We have tried drilling out as much as we could without injuring the threads, and then chipping the remaining shell out with a small chisel. This has been a slow and tedious process and I believe that there are better means of overcoming this difficulty than we have so far tried. Any suggestion you could make would be greatly appreciated.

E. A. Newman, Oklahoma.

In the February 1920 issue on page 126 is a short article entitled "Removing a Broken Cylinder Head Screw". While the article will not solve every problem in removing broken studs, it offers a suggestion which can be applied to many other kinds of work other than the one mentioned. Another way of removing broken studs, particularly where they are of a large or medium size, is to drill a hole into the broken stud being careful to use a drill sufficiently small so that the thread will not be injured. Then screw a left hand thread tap into the hole. As the greater majority of studs are right hand threads, they can be removed in this manner. It should be remembered that the tap is hard and has a tendency to be brittle, and it should be treated accordingly, otherwise you will experience the added difficulty of not only having a broken stud to remove, but a tap as well. Large studs can be successfully removed by building them up to the surface with an electric art welding outfit, care being used not to weld the stud in the work. When the shank is built up above the surface a large nut is welded to it. A monkey wrench does the rest.

Making Knives for a Disc Sharpener—I am trying to make a set of knives for my disc sharpener. However, they won't work. I can't get the temper right. They are made of ¼″ x ¾″ steel. Maybe I didn't use the right kind of steel. Now if you can give me some good advice, I would be greatly pleased and a thousand times thankful.

E. H. B., Illinois.

It is rather difficult to diagnose the trouble, since we do not know the kind of material from which the cutters were made. It might be that the wrong material was used, perhaps it was the tempering method, or maybe a combination of both. We are wondering in what way the knives failed, whether they were too hard, or whether you found it impossible to harden them sufficiently. If the latter is the case, in all probability the failure is due to the quality of steel. If you are using a steel with a carbon content of 0.75, we believe that tempering them between a brown and light yellow will produce good results. The tempering color may be varied, either one way or the other, to accommodate the differences arising from the amount of carbon, which the steel contains.

AMERICAN BLACKSMITH AUTO & TRACTOR SHOP

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WILLIAM F. WENDT, *President.* L. J. WISCHERATH, *Editor.*

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THE FIELD OF THE RURAL MOTOR EXPRESS

Today, transportation is the foundation of all prosperity. The growth of cities has pushed the producer many miles back from his market and mines and scources of raw material are so segregated that industrial development, business efficiency, increased production to meet increased demand, in fact, the very livelihood of the nation depends upon an adequate means of transporting goods from the producer to the consumer.

In the whole history of transportation, of its three forms—ships, railroads and highways—the latter received the least attention until the motor truck came forward and supplied for the highways what the steam engine supplied for the railroads and waterways—rapid transit. As a result of the introduction of the motor truck, we are in a new transportation era—that of highway transportation, just as economically justified and just as sure of steady development, as the ships and railroads were in their early stages. In the face of the constantly increasing number of rural motor express routes in operation throughout the country, it is evident that the motor truck serves a field that is not satisfactorily covered by any other means of transportation.

No doubt you have often noticed a string of empty freight cars left on a siding for day after day, and thought that waste was hardly consistent with the crying need for cars to carry coal from the coal mines. Delay and unproductiveness such as this are everyday occurrences, and the cause of it all is the inconvenience to the railroad of handling what is known as "short haul" traffic—shipments of short distances and transfers within a city. It is because of this kind of business that a freight car travels on an average, only six miles a day. It is unprofitable business for the railroads. Motor trucks have proven themselves to be qualified to handle this kind of traffic not only quicker and more satisfactorily, but at a lower cost. The gross cost of shipping 100 pounds of freight from New York City to Newark, N. J., for instance, a distance of about nine miles, including teaming charges on both ends, is 91c by railroad and 15c by motor truck. By railroad the shipment takes days while by motor truck it is a matter of only a few hours.

The field of the motor truck is as an indispensible supplement to the railroads rather than a competitor and it is only a matter of time before they will take over entirely those forms of transportation that are unprofitable to the railroads, that congest their terminals and create a shortage of freight cars for use in long distance haulage.

The potentialities of the motor truck have much to offer toward increased prosperity in this country. They create wealth by increasing land values, and lower prices by establishing more direct connections between the farmer and his market. They give a market outlet to food supplies hitherto unavailable and open up productive regions that have never been touched because of their distance from market and because of the lack of transportation. Their increased use will be of great benefit to the railroads and water transportation lines because they will feed to them tonnage from previously undeveloped sections and sections that the railroads cannot afford to penetrate. They will substitute for the disintegrated personality and limited liability of railroad shipping on short hauls, an agency that personally collects and delivers produce, performing marketing as well as transportation functions.

Through the economies of the motor truck, expensive and inconvenient handlings and special packings of produce that are involved in shipping by rail, are eliminated. Goods are transported from the producer to the consumer more quickly and in better condition than is possible under present methods. The motor truck goes right out among the farmers, gets their produce, and brings it directly to the buyer in the city, without the loss of time on the part of the farmer to take it to the railroad station and on the part of the buyer to call for it at the terminal. The result is an actual saving in dollars and cents in transportation costs, and with perishable products, such as milk, fresh fruits and vegetables, the saving is tremendous. According to a congressional investigation, the people of this country pay more than $500,000,000 a year in excessive costs for transportation of food products and it is estimated that fully fifty per cent of the perishable food products in America are wasted through insufficient methods of transportation

The use of motor trucks by farmers also allows the maintaining of men and horses on the farm that are ordinarily utilized in driving to market with produce. For the farmer who does not ship in large enough quantities to warrant the purchase of one or more trucks, the rural motor express gives him all the convenience of a personally owned truck without the cash outlay. It not only hauls his product to the market, but brings him on the return load, the daily requisites of the farm.

To have food and fuel, we must have adequate transportation, capable of keeping up with increased production as it is demanded. Every new step in national progress is born of necessity and it is this necessity that points ahead to a steady and tremendous growth of motor truck transportation that will bring with it prosperity and a better standard of living.

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Vehicle Spring Making and Repairing

By WILL BISHOP

WELL it's been quite a long time since my last article appeared in Our Journal; and though she's changed her name and gone consort-'in with greasy automobile surgeons, I read her regularly and am still for her, absolutely. I'm strong for the auto and tractor stuff, for I see in them the future business of the former horseshoer and wagon smith. Get in the game, boys, we've got to learn to tinker 'em. The time is now here when the fellow who lets the auto and tractor work get by him is due to have the seat of his pants worn out while he waits for business that goes to a modern shop. Why sit on a shoe keg and sigh for the good old days when your shop was full of horses every day? Better days—modern days—are here. Take advantage of them. Get in the game.

All of this don't have anything to do with spring making and repairing; but it does sort of lead up to it. For one of the strongest levers we have for prying the automobile public loose from its repair business is spring work. The ordinary garage man can't do spring work. He has either to take it to the blacksmith or put in a replacement spring.

Right now, at the beginning of this article, I want to set my readers straight on the subject of spring making. Spring making is not a tinkering job, to be done hit or miss, or in an any-way-to-get-it-together manner. Spring making is a trade and must be learned in exactly the same way as you learned the blacksmith trade. Of course it is, in a manner, a branch of the smithing trade; and the fact that a man is a smith helps him to more quickly master it. But make no mistake about this: no matter how good a smith a man is, if he has not learned the principles of spring making and has not the proper equipment he cannot make a good spring. Another thing: you **must** have the proper equipment for spring work. To shoe a horse you have to have shoeing tools. To set a tire you have to have certain tools. To do wood work you have to have wood-working tools. Neither of these jobs can be done with the tools used for the other; and just as certainly you can't do spring work with any of those tools. You must have tools for the fitting and setting of springs, and a furnace for heating and a tank for quenching and hardening. In the following, I aim to explain the proper method of making, fitting, hardening, and drawing of temper in auto springs, and illustrate same with sketches of tools and furnace.

We'll pass up the technical stuff and talk this over using smith shop language. Any printed work on the subject will ball you all up with technic and formula and other isms and asms. Also, most of it will tell you that it is impractical to rest old springs. That's bull—old springs can be reset and hardened and tempered just as good as new. I do claim that it is impractical to weld broken leaves. Not that sometimes a broken leaf may not be welded so that it will stand indefinitely—it can. But it is the strength of the supporting leaves that holds it more than anything else. In rare cases, where the smith is an expert at welding high carbon steels, several, or even all, of the leaves may be welded and the spring will not break in the weld or at the end of the weld. But— and here's the point—the whole spring will settle, or straighten out in the portion that has been heated, making a very unsatisfactory job of it in the end. Because—get this—because the setting of a spring is only one of the two main operations in doing a good spring job, and the lesser one at that. The most particular operation, the one requiring knowledge

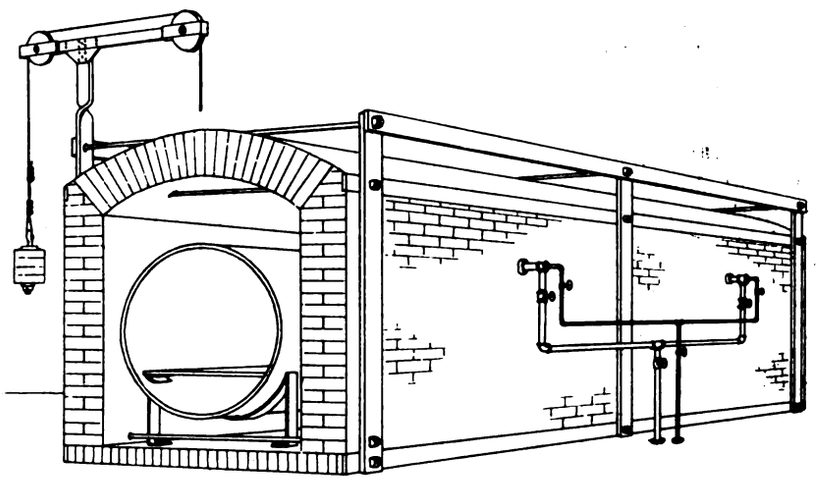
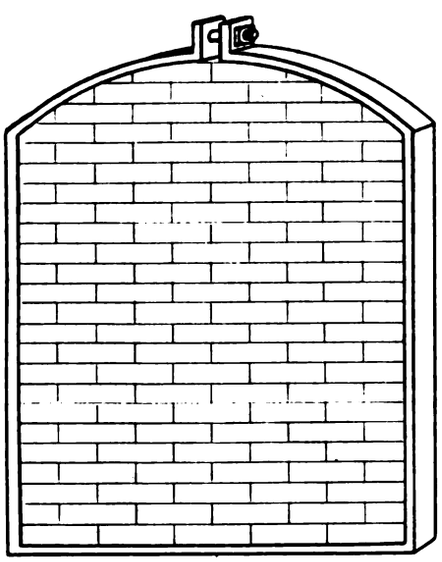


FIG. I—THE MUFFLE TYPE OF FURNACE FOR HEATING SPRING LEAVES. THE LEAVES ARE PLACED EDGEWISE ON A PLATE FASTENED ON THE INSIDE OF A LENGTH OF LARGE PIPE. IN THAT WAY THE LEAVES ARE PROTECTED FROM THE DIRECT HEAT. ONE END OF THE FURNACE IS SEALED AND VENTS ARE PROVIDED IN THE TOP. A FIRE BRICK DOOR AFFORDS ACCESS TO THE WORK. EITHER GAS OR OIL IS USED.



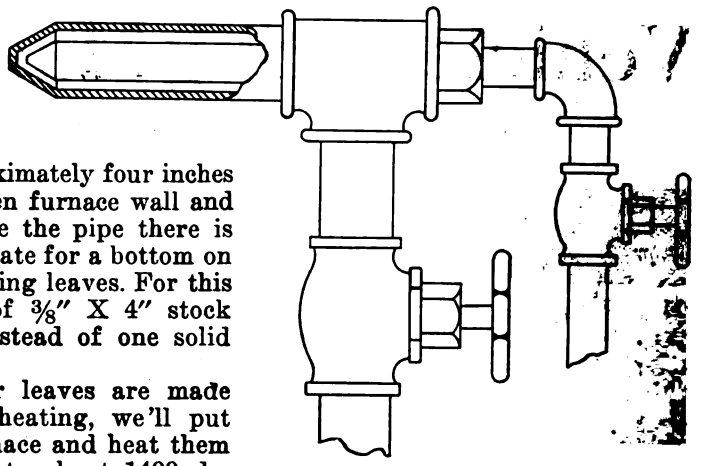
THE FURNACE DOOR IS MADE OF FIRE BRICK BOUND WITH A 3/8" x 3" IRON BAR. IT IS SUSPENDED ON A CABLE WITH AN ATTACHED COUNTER WEIGHT BY WHICH MEANS IT CAN BE EASILY RAISED OR LOWERED

and skill in the performing, is the hardening and tempering of the spring after it is set. And a welded spring can seldom be tempered to stand satisfactorily.

If your spring needs resetting, do it. If there are broken leaves put in new ones in their place, and if you get the temper right it will be just as good as new. You understand, of course, that all old leaves must be heated to reset, and as this removes the hardness, they must all be retempered.

We'll take up the operation of making a spring and carry it through to the finish, using the sketches as shown to help us out. Of course, the first operation is to cut the steel the desired length for our leaves. Then we turn the bolt eyes on the end of main leaf, and draw out ends of other leaves. For these operations be careful of your heat. Heat slowly to a good red and edge up the part to be drawn so that when it is drawn out to required thinness, it will be but slightly wider than the rest of the leaf. It is bad practice to hammer edgewise more that barely enough to finish nicely. Make ends smooth and true, and do not hammer after the steel starts to blacken. Cold hammering is ruinous. After all leaves are drawn out and ready for setting, drill center bolt holes, if it is that class of spring. We are now ready for the operation of fitting and setting. For this we must have a furnace of some kind that will take in the entire length of the spring leaves and give an even heat the entire length. The sketch of furnace at Fig. 1 is a good model for a gas or oil burner. Gas is the best fuel if it is available. You will note that it is simply a long brick furnace containing a section of large black iron pipe which reaches the entire length of furnace. There should be a space of approximately four inches all round between furnace wall and the pipe. Inside the pipe there is a piece of 3/8" plate for a bottom on which to lay spring leaves. For this several pieces of 3/8" X 4" stock may be used instead of one solid piece of plate.

Now that our leaves are made and ready for heating, we'll put them in the furnace and heat them up to a red heat—about 1400 degrees Fahrenheit—and turn down the gas to hold that heat while we set up the leaves. Next we'll take out the main leaf and form to desired shape. As it is hot alike all over, we'll bend it to the desired shape at one heat. For this purpose it is a good plan to have a form made of, say, ½" X 2" soft steel. Have this form just long enough to fit the inside length of the main leaf between the bolt eyes, and bent to the circle you want the spring. Several of these should be kept, one for each standard size of spring. Lay this form edge up on a face plate, or on the floor, put the hot main leaf along side and clamp to a close fit with tongs.



SECTIONAL VIEW OF THE OIL OR GAS BURNER. THE INNER NOZZLE SUPPLIES THE FUEL AND HAS A ⅛" OPENING AT THE END. THE OUTER NOZZLE SUPPLIES THE AIR UNDER PRESSURE AND HAS AN OPENING ¾" IN DIAMETER. IF OIL IS USED PRESSURE MUST BE MAINTAINED EITHER THROUGH GRAVITY BY RAISING THE TANK OR BY USING COMPRESSED AIR.

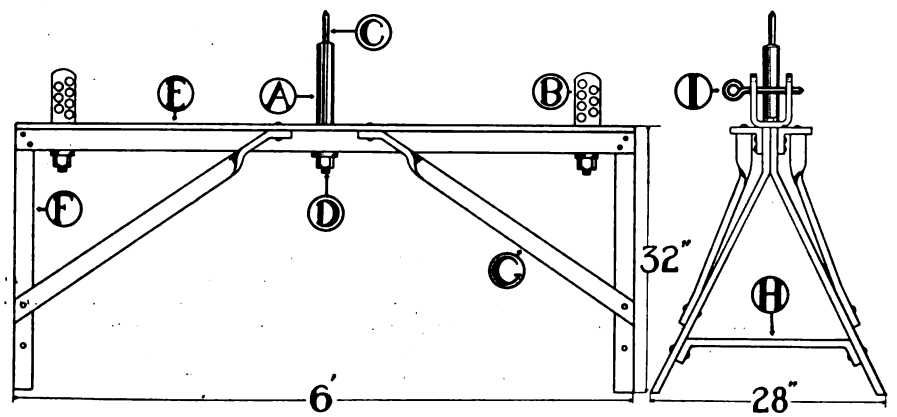


FIG. 2—SPRING SETTING RACK

A—CENTER UPRIGHT 1" x 2" STOCK.
B—JAWS ½" x 2½" STOCK.
C—GUIDE PIN 3/8" OR 7/16" ROD.
D—¾" NUT.
E—⅜" x 2" x 2" ANGLE IRON.
F—LEGS ½" x 2" STOCK.
G—BRACES ½" x 1½" STOCK.
H—BRACES ½" x 1½" STOCK.
I—PIN ¼" ROUND STOCK.

Let the main leaf cool off until black; then put it in the setting rack and adjust for tension. See Fig. 2 for sketch of rack. Next we'll remove the second leaf from furnace place it on top of main leaf, as in Fig. 3. Now take tongs like those in Fig. 4 and clamp on a pair about every six inches on both sides of the tie bolt hole. Leave a few minutes to cool a bit; then take out both leaves and replace second leaf in position occupied by main leaf. Depress ends a trifle to insure tension; remove third leaf from furnace and operate as before. Repeat this operation until all leaves are set, decreasing the tension a little bit in each leaf until the top leaf fits fairly snug on the one under it when removed from rack. You will note that by depressing the ends of the leaf which is adjusted in the rack and fitting the next one to it in this position there will, when both are removed from rack, be a space be-

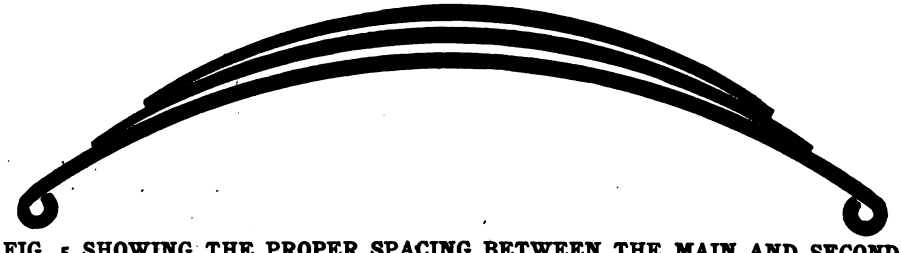
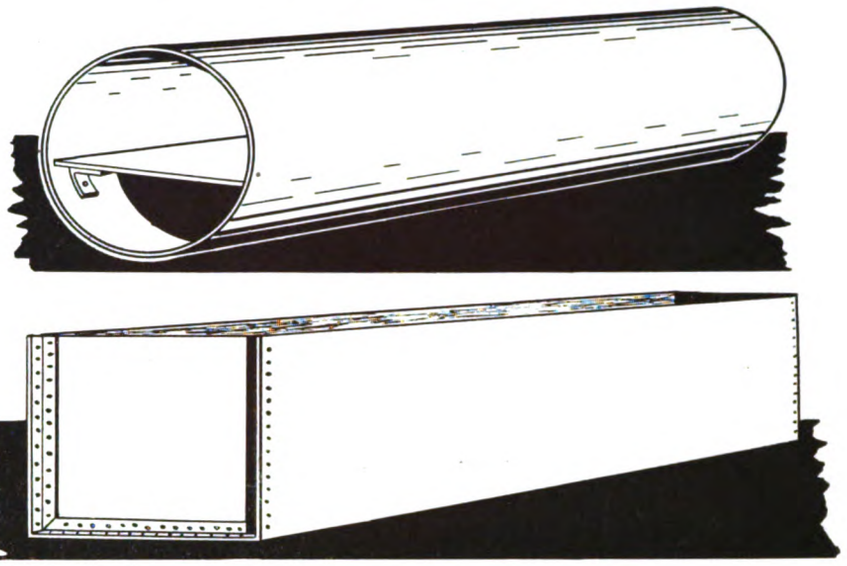


FIG. 5 SHOWING THE PROPER SPACING BETWEEN THE MAIN AND SECOND LEAVES. THE SPACE BETWEEN THE MAIN AND SECOND LEAF IS THE THICKNESS OF ONE LEAF. THE SPACE BETWEEN THE SECOND AND THIRD LEAF IS SLIGHTLY REDUCED AND SO ON UNTIL THE LAST TWO FIT FAIRLY SNUG.

tween the leaves in proportion to the amount of depression, or spring, put in the bottom leaf. Between the main and next leaf this space should be about the same as the thickness of one leaf. The space should be reduced gradually on to the last leaf. See sketch at Fig. 5 for illustration of proper spacing.

Now the spring is made and fitted and we are ready for the most particular part of the operation, the tempering. On the manner in which we do this will depend the life of the whole spring. It takes skill and judgement and experience to enable us to make and fit a nice spring; but it takes more of each of those qualities to enable us to do a good job of tempering. But we can do it; so here goes. We'll place all the fitted leaves in the furnace, edge up always, and heat them to a low red, 1350 to 1400 degrees Fahrenheit. Then we'll take a pair of light, long handled tongs, reach into the furnace and grab a leaf about the center of its length, remove from furnace and plunge into quenching tank filled with fish oil. Plunge edge-wise and perectly level so that entire length of leaf is covered at same time. Let it cool in the bath until the oil stays on when removed. Treat all leaves in this manner; then take them one at a time and replace in furnace. Let the leaf stay in furnace until oil on it takes fire and blazes; then take out quickly and plunge again into tank. Repeat this three times, laying on floor the last time without dipping in tank, and let cool in the air. Treat all leaves the same. This method, with a little practice, will give uniformly good results with most grades of spring steel. Should you find that your springs are too hard, however, burn off the oil four times instead of three. If too soft, burn it off only twice. As I have said, it takes lots of experience and "hoss sense; but if you have one you can acquire the other.



THE UPPER ILLUSTRATION, FIG. 7, SHOWS THE LENGTH OF 12" OR 16" PIPE WHICH IS USED IN THE INSIDE OF THE HEATING FURNACE. THE LEAVES ARE PLACED ON THE 3/8" PLATE FASTENED TO THE INSIDE. THE LOWER CUT, FIG. 6, IS A GALVANIZED QUENCHING TANK 12" HIGH AND 14" WIDE. BOTH THE TANK AND THE PIPE ARE MADE SUFFICIENTLY LONG TO ACCOMMODATE ANY LENGTH OF SPRINGS

At Fig. 6 is a sketch of quenching tank. It can be made of sheet metal, galvanized iron, or wood. At. Fig. 7 is illustrated a section of pipe and floor plate for furnace.

A few words, now, about the construction of the furnace and burners and I'll choke off. In the first place your furnace should be built long enough to take in the longest spring you are liable to get; and wide and high enough to allow at least four inches space around the inclosed pipe. It should be built of fire-brick, or at least lined with them. The end of pipe in back of furnace should be closed up tight; and the one next the door should be closed when spring is in it by standing a piece of plate in front of it. This keeps the flame from coming in contact with the heating steel, and insures a perfectly even heat through out. This class of furnace is called a muffle furnace, and is used in all first class steel working shops, the size and shape depending on the class of work.

The door is simply made by bending an outer frame of about three-eighths by three inch bar iron, filling in with fire brick and clamping by means of bolt at top. It is hung in front of furnace opening, and raised and lowered with a counter-balance weight, as illustrated. There are several gas and oil burners on the market, most of them good; but you can make a good serviceable burner, yourself, like the one illustrated. Note the insertion of nozzle as illustrated. The nozzle should not go clear through the wall of furnace, but go in just far enough to spray the fuel through the hole in furnace wall. Say about an inch and a half. The diameter of hole in wall should be about an inch and a half larger than outside diameter of burner

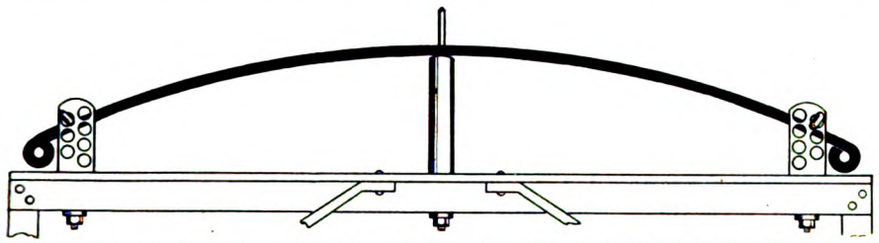


FIG. 3—SHOWING THE METHOD OF USING THE SPRING RACK. THE MAIN LEAF IS PLACED ON THE RACK WITH THE GUIDE PIN C INSERTED IN THE TIE BOLT HOLE. THE ENDS OF THE SPRING ARE HELD DOWN BY THE PIN I, THE OTHER LEAVES ARE HELD TO THE MAIN LEAF BY USING FOUR CLAMPING TONGS SUCH AS SHOWN IN FIGURE 4, EQUALLY SPACED FROM THE CENTER OF THE SPRING

FIG. 4—TONGS FOR CLAMPING LEAVES TOGETHER. THE JAWS ARE 3" LONG AND THE HANDLES ARE 20". THE CLAMP IS SO MADE THAT WHEN THE HANDLES ARE LOCKED TOGETHER WITH THE CATCH AT THE END, THE JAWS ARE THE THICKNESS OF TWO SPRINGS APART

pipe. The burners should be set high enough in the furnace to allow the fuel to enter above the large pipe in furnace. This causes the flame to pass over and around the pipe, heating it all over. Make two vent holes about four or five inches square in top of furnace, as illustrated. This is for draft and the escape of any gases that may gather from the burning fuel. If you use oil as a fuel you should have an air-compressor and keep about 70 to 80 pounds pressure on tank containing the oil. Gravity pressure can be used but it is not so satisfactory. High pressure air is also better for your fire blast; but a blower can be used very nicely for this.

If you build a coke furnace, it can be built along the same lines as illustrated, other than that a smoke stack must be used containing a damper and a grate used underneath the inclosed pipe. You will need no air blast in this case, the draft being sufficient and controllable by the damper.

This is about all the dope on the subject, that is necessary to start a smith on the road to success as a spring maker and repairer. Bear in mind that you have to get the experience yourself; and that you must have spring maker's tools to make springs, then get the tools and go to it. It's a great, big, important and growing field full of interest and dollars for the modern smith.

A gasoline fire is best extinguished with flour, sand or earth in the order named; water should not be used. If the gasoline be confined in small space, ammonia will smother it. Some users of gasoline find it well to hang a bottle containing about a gallon of ammonia from the top of the tank, or room containing the gasoline, by a string or fusible link, so that if the gasoline takes fire the bottle will fall and be broken, releasing the ammonia and promptly putting out the burning gasoline.

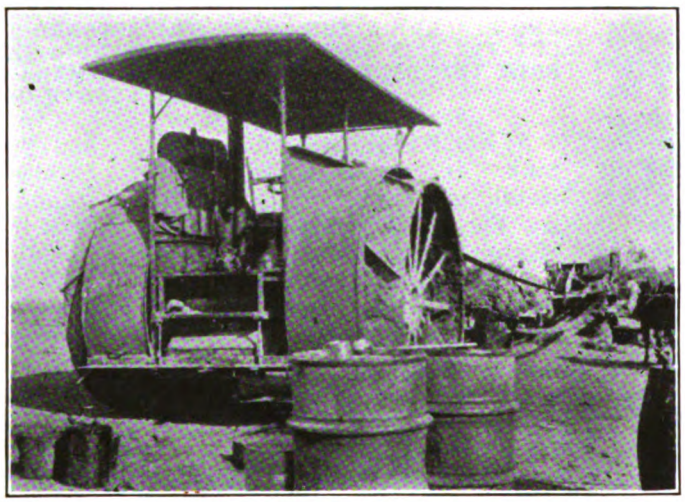
Make a better helper of your helper by asking his help occasionally. Talk thinks over with him. He must know something or you couldn't have hired him.

Tractorizing the Rice Farms

By ERNEST A. PHILLIPS

A few years ago the rice farmers absolutely refused to consider the possibilities of the tractor in making rice growing easier, more profitable and up to date. It is now satisfying to roam about through the extensive rice fields and watch the tractors at work.

Slowly but surely they have arrived, and slowly but surely the rice grower has been convinced that the days of the old lop-eared mule are gradually passing away; and now it is a common sight to see the large, powerful, grunting tractors operating the threshing rigs or pulling the massive discs and harrows, or drawing the big gang plows arear of them, or hauling the threshed rice into town to the rice mills, where it is polished and given the final treatment before being shipped to the open market.



A TYPICAL RICE THRESHING SCENE AS IT IS DONE TODAY. THE TRACTOR NOT ONLY GIVES DEPENDABLE SERVICE BUT EFFECTS A REDUCTION IN OPERATING EXPENSE AS WELL

When tractors were first demonstrated, the rice grower frowned and wrinkled his forehead 'till it resembled a corrugated wash board. "Huh, them things ain't no good for us rice farmers," they invariably said. "Why, can you imagine a thing like that plowing or pulling binders in the soft, gumboish soil? It can't be done."

But it has been done, time and again, and now the rice grower would find it somewhat difficult to proceed with his work unless he had the old reliable tractor to depend upon. It is but seldom, that one sees a farmer plowing behind eight or ten mules, now days; it is but seldom steam tractors are seen in the threshing season; it is but seldom mules or horses are seen dragging the disc or harrows up and down and across the vast stretches of land, required to grow rice on a profitable basis—but it is frequent that one sees the tractor doing this work, and let it be said for the tractor that the tractor does its work in a most pleasing manner—and at a far less expense in the long run.

Where it used to be thought that the big, cumbersome tractor would sink down out of sight in the soft, oozy gumbo, we now find them running up and down and around the fields, unaffected by soil conditions, and it is seldom that one gets marooned in the mud. Very seldom indeed, and then, ninety-nine cases out of one hundred, the fault lies with the driver.

And so it is—tractors doing every thing, plowing, discing, harrowing and threshing, hauling to the market, gouging out big irrigation ditches, doing little odd jobs on the farm in between times, and pulling a string of binders during the cutting season.

"Say, come right down to it," said a big rice grower recently," I'll be darned if I see how we used to grow rice in the old days. No I don't. The tractor is a difficult proposition to surpass in any respect, and cheap? Say, it can't be beaten any way you look at it. It's great compared with the old days when we used to plow with mules and horses, and spend hundreds of dollars each year feeding them."

This is exactly the way all rice growers express themselves when asked a similiar question. "Can't get along without'em," they enthusiastically reply—and as one pauses to reflect on the vast amount of work connected with rice growing, it is easily understood how true their statements actually are.

Alloy Steel, Its Use and Heat Treatment

By N. WARD GUTHRIE

THE great variety of alloy steel in present day use, has to a large extent been brought about by the present day requirements of the automobile manufacturers. Fortunes have been spent in its development that their needs might be satisfactorily filled.

THE COLORED CREW OF A RICE THRESHING RIG LINED UP FOR "CHOW"

These newer products have taken the place of carbon steel for all parts requiring great strength and fatigue resisting qualities, as well as toughness and high elastic limits. One seems safe in calling them newer products, because it is scarcely twenty years ago, that the present popular high speed steel replaced Mushet steel, which at that time was the only know metal superior to the old fashioned carbon steel. Now, we have a list of steels embracing so many chemical names, that one would almost mistake such a list for an extract from some pharmaceutical journal.

Instead of only carbon steel of different percentages, we have a great variety of alloy, self-hardening and high speed steels, each suited to some particular use, and each presenting its individual problem in heat treatment and hardening.

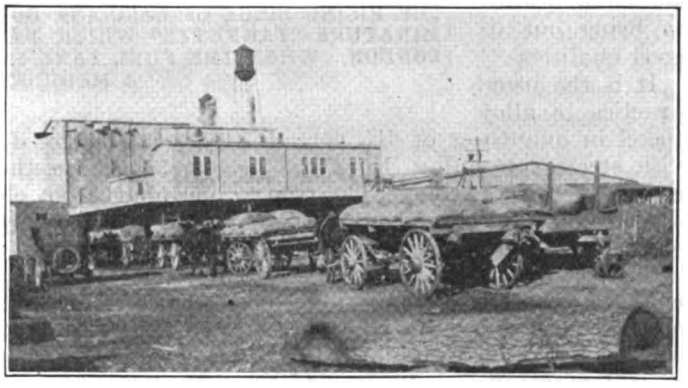
Since the use of alloy steel in its natural or annealed state offers but little advantage over ordinary carbon steel, the same people, who have greatly assisted in the development of the alloy steel, can be credited with contributing greatly to the perfection of the infinite number of heat treatments, which have so improved the properties and possibilities of the steel. No sooner has one method been developed, and the zenith of perfection apparently reached, than a new and better way has been devised, or some new alloy compounded which surpassed its predecessor. and thus the process goes on, ad infinitium, until it is highly questionable whether the ultimate possibilities of the alloy steels have been reached.

The different methods used by the larger manufacturers, have been reported from time to time to the Society of Automobile Engineers, and while intended primarily for their use, the data thus gained is nevertheless, available to all who have occasion to use alloy steel.

This article has not for its intention, a treatise on all the uses and heat treatment of alloy steel. It is obvious that such a complex and lengthly subject could not be treated properly in such limited space. It is merely intended to describe briefly the most commonly used low carbon alloy steels, and to give some ideas of their use and how it is customary to properly handle them in regard to heat treatments. The group includes nickel steel, nickel-chromium steel and chromium-vanadium steel, or as it is sometimes more commonly called, chrome-vanadium steel.

In discussing nickel steel, it might be well to mention nickel itself. Nickel is a metal that possesses many properties very similar to iron. It has the advantage of forming an almost perfect alloy with iron in nearly every proportion. While it has been successfully alloyed with steels containing all percentages of carbon, it seems to work to slightly better advantage with the steels of lower carbon content.

When properly treated, nickel steel is the ideal material from which to make all machine parts, requiring great strength and wearing qualities. For such parts as locomotive crank pins, automobile axles, drive shafts and crank shafts, as well as connecting rods for high speed engines, it is unsurpassed. It is also used for parts which require case hardening, because if properly treated, the core will be much stronger and tougher than if ordinary low carbon steel had been used. The tensile strength and ductility of 3 percent nickel



AS SOON AS THE THRESHER SEPARATES THE RICE FROM THE STRAW, LONG TRAINS OF WAGONS ARE SEEN HAULING IT TO THE MILLS

To grow rice on a profitable scale, it is necessary for the farmer to secure the largest and best and most powerful implements and vehicles known to the art of "power farming". This naturally means tractors, more tractors; and especially tractors of the best types. Rice growing is a stupendous undertaking—and without the best of power material on the market, the rice grower finds himself somewhat out of luck, all the way around.

The farmer who desires to farm on a large scale; the farmer who likes to farm with the largest and strongest vehicles used will find no other branch of farming so apt to suit his fancy, as rice farming will.

If you protect your customers with good goods, good values for the money honest representation in print and in person, you will have plenty of customers to serve and you will never need to fear for present or future prosperity.

steel when alloyed with open hearth steel containing .25 percent carbon, is said to equal the strength of .45 percent carbon steel.

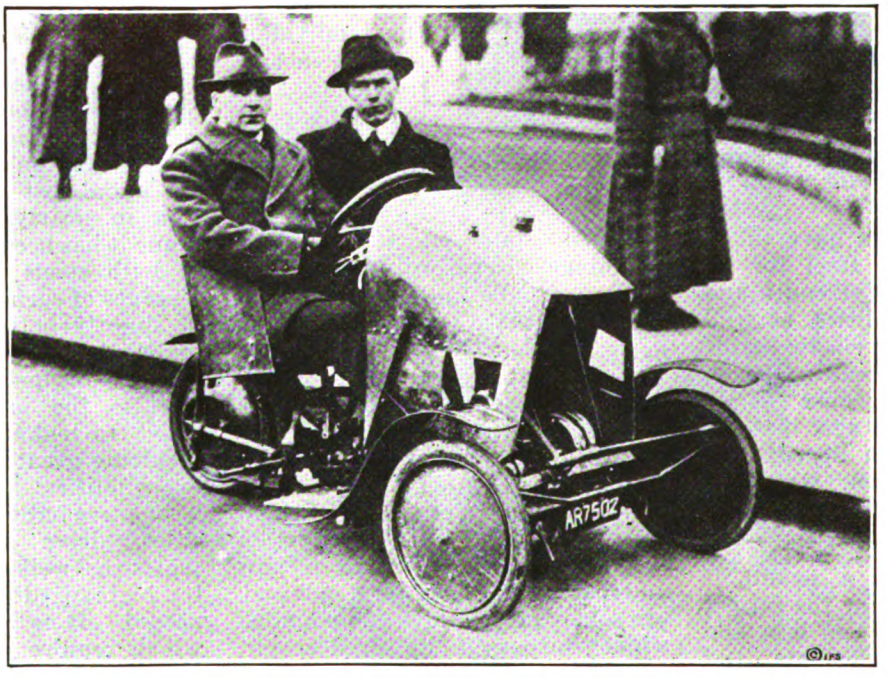
The term ductility, elasticity and tensile strength are sometimes confusing to the layman. Ductility means the amount or extent to which a piece of steel can be drawn out or stretched, after it has first been drawn to a point from which it is no longer able to return to its original shape and dimension. Elasticity of the steel refers to its ability of returning to its original shape and dimension after having been stretched. Tensile strength is the ultimate strength any material is capable of withstanding.

The influence of nickel on steel as regards to its elasticity increases greatly with the amount of carbon that is present. There seems to be a greater increase in the higher carbon steels than in those of lower carbon content. One advantage that carbon steel possesses over nickel steel, is that good forgings can not be made from the latter without subsequent heat treatment, consisting of annealing, oil tempering and reannealing to bring out its good qualities.

It is the usual practice to alloy nickel in quantities of 3½ percent with steels containing .15, .20, .30 and .40 percent carbon. The principal use of the .15 percent carbon being for the manufacture of parts to be case hardened. The treatment consists of carburizing in some carbonaceous material, such as charred leather or granulated bone, at a temperature between 1650° and 1700° F. for the requisite length of time to produce a case sufficiently thick. The basis for calculating the depth of penetration is that in the first hour, the hardness reaches a depth of .03″ and increases at about .01″ every hour thereafter, until the hardening material is exhausted or the maximum depth has been reached. The parts are allowed to cool in the material in which they were hardened and then they are reheated to a temperature from between 1300° to 1400°F., and quenched. An excellent practice is to heat the article to a temperature of about 400°F., and permit them to cool slowly. This will draw the temper and relieve any internal stresses, which are apt to damage parts of intricate or delicate design. Parts which are treated in the foregoing manner have a case that is extremely high in carbon and a core that is very strong and tough. Leather is a much better hardening agent, particularly for delicate work, than bone, because the latter contains phosphorus, an element that has a decided tendency to make the steel brittle and thereby weaken it.

The principal use of nickel steel containing .20 to .25 percent carbon is for parts to be case hardened, its advantage laying in the fact that the core is stronger than when steels of lower carbon contents are used. The treatment is virtually the same as for the steels of lower carbon content. It is also used for structural parts, in which case the heat treatment consists of heating the part to from 1500° to 1550°F., quenching, and then reheating from 1300° to 1400° F., and again quenching. The part is then reheated to between the temperatures of 550° and 1150° and allowed to cool slowly. The second quenching may be omitted, but in so doing, it will be observed that the parts will not be nearly as strong and tough. The quenching medium may be either brine, water or oil. The latter medium having the quality of imparting the greatest toughness, while the two former mediums effect the part's elasticity. The amount of toughness and elasticity is also controlled by the temperature at which the temper is drawn.

NOT A TWIN SIX BUT IT GETS THERE JUST THE SAME



THE RISING PRICE OF GASOLINE DOESN'T WORRY THE OWNER OF THIS MINATURE "TANKETTE" WHICH MADE ITS APPEARANCE RECENTLY IN LONDON. WHEN THE FUEL TANK IS EMPTY, HE REPLENISHES IT WITH A MEDICINE DROPPER

Nickel steel containing above .30 percent carbon is at times used for parts which are to be case hardened, but it is not recommended for such work. Its principal use is for automobile axles, crank shafts, drive shafts and etc. It may be used for parts which are to be case hardened, but it will be found to be extremely hard and the core will have a decided tendency to be brittle. To overcome this condition as much as possible, the temper should be drawn at about 500°F.

We now come to the nickel-chromium steels, which contain nickel in various amounts from 1.00 to 3½ percent and chromium from .3 to 1.50 percent, while the usual carbon content is about .5 percent, although it may run as low as .2 percent. The effect of chromium on steel is to increase its hardening powers without losing any of its strength, ductility or elasticity. The difference between a steel rendered hard by the presence of carbon and another hardened by chromium, is that the latter has all the hardness of the former without being weakened by any tendency to be brittle. It necessarily follows that a steel which is hardened by the presence of chromium is capable

of resisting a much greater shock and still it is sufficiently hard to resist wear. Such qualifications make it excellent for use in gears or parts requiring great shock resisting powers and still to be used successfully, they must be hard enough to wear but slightly. Such qualification meet the requirements of gears very nicely, for while the teeth have to be extremely strong at the same time they must be very hard to resist the wear, and yet they can not be brittle, or else they would not be able to withstand the sudden shocks to which they are subjected. This is particularly applicable to transmission gears.

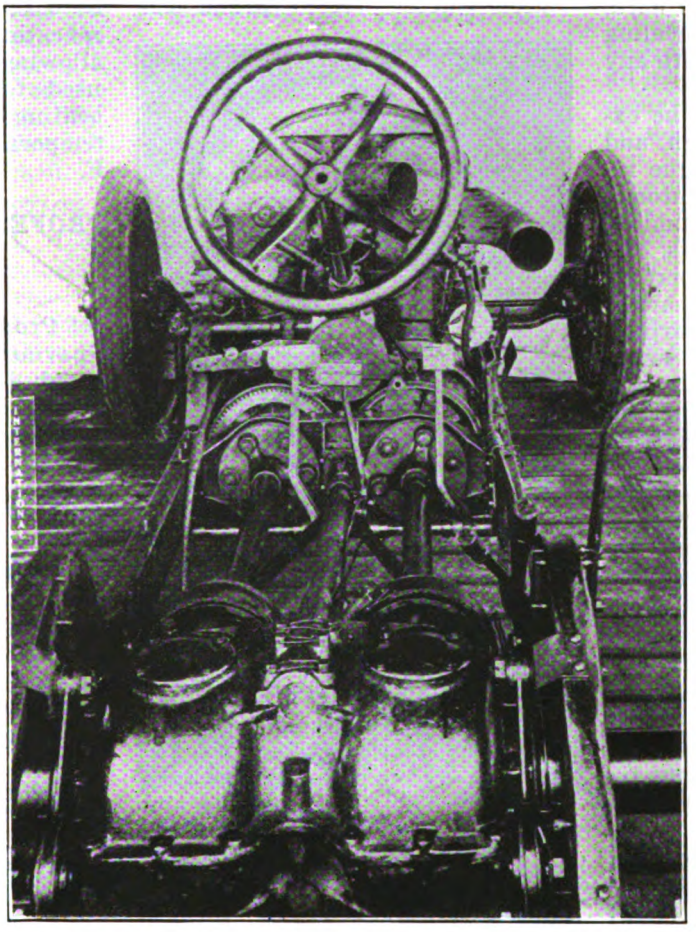
While this class of steel responds to heat treatments in about the same manner as that of nickel steel does, the chromium has the tendency to intensify the hardening effect. That effect is further increased as the amounts of nickel and chromium are increased.

This group of steel possesses one disadvantage in that it is most difficult to forge and machine, and where the carbon content approaches the .5 percent mark, it is virtually impossible to do any machine work on it without first thoroughly annealing it. This can be done to the best advantage by heating it to a temperature from 1450° to 1500° F. and allowing it to cool very slowly. In some cases it is even necessary to hold it at that temperature for a half an hour or more.

For the sake of convenience our discussion of nickel chromium steel may be divided into four major groups, namely those steels containing 1.25 chromium, steels containing 1.75 percent nickel and .60 percent percent nickel and 1.10 percent chromium, 3.00 percent nickel and .80 percent chromium and lastly those containing 3.5 percent nickel and 1.5 chromium. The foregoing group may for the sake of convenience be subdivided into various other groups according to the amount of carbon which they contain. Each combination or group while resembling the other in its basic properties, has its individual peculiarity and each requires a little different treatment if the best results are to be expected from the finished product. It will be scarcely necessary to delve into all the various combinations, since there is a basic resemblance as to properties and their response to heat treatment, so we will discuss merely those alloys which are most commonly used.

Beginning with the first of the major group, namely the steels containing 1.25 percent nickel and .60 percent chromium and having a carbon content of .20 percent. Its chief use is for parts which are to be carbonized or case hardened. Like nickel steel the treatment consists of carburizing at a temperature of between 1650° and 1700°F., and after the hardening has been carried to the desired depth, the parts are allowed to cool slowly in the carbonaceous matter in which they were hardened. Unlike ordinary low carbon steel, little if any carbonization occurs below a temperature of 1600° F., whereas with the lower grades of carbon steel the action commences at temperatures above 1400° F. The parts are reheated to slightly above 1500° F. and are quenched at a temperature varying between 1300° and 1400° F. The final operation consists of drawing the temper at from 300° to 500° F. This grade of steel is also used for parts which do not require case hardening, but it is never used without being heat treated.

BREAKS ALL AUTO RECORDS



A CLOSE UP OF THE SIXTEEN CYLINDER DEUSENBERGER IN WHICH TOMMY MILTON BROKE ALL RECORDS FOR THE HALF-MILE AND MILE.

Steels containing the same amount of chomium and nickel, but in which the carbon content runs as high as from .25 to .50 percent, are seldom used for case hardened articles. Their use is confined almost entirely to parts that must be strong and hard, but in which toughness is not an assential feature. The steels high in carbon are used to a large extent in the making of gears. The heat treatment consists of heating to 1550°F. or slightly less, quenching, reheating to about 1400° F. and again quenching and later reheating to a temperature from between 600° to 1200° F. and allowing the parts to cool slowly. The second heating and quenching may be omitted, but only at the expense of bringing out the best qualities of the steel.

The next major group comprises the steels which contain 1.75 percent nickel and 1.10 percent chromium. The grades of this steel containing .20 percent carbon are used for case hardened work, while all the steels of this group containing more than that amount of carbon are intended for parts which are to be heat treated. The carbonizing is identical with the previously mentioned process, except that amount of carbon are intended for parts which are to be heat treated. The carbonizing is identical with the previously mentioned process, except that the first quenching is at a temperature 1525°F. The work is reheated and quenched at 1300° to 1400° F. and the final temper drawing is done between the tem-

peratures of 250° to 500° F.

Oil hardened gears, spring, to which a similar treatment is accorded, and a great variety of other automobile parts are made from this variety of steel, having a content of carbon of .50 percent. The heat treatment consists of heating to slightly above 1500° and holding it at that temperature for half an hour, quenching at from 1400° to 1475° F., and later reheating to from 300° to 500° F., from which temperature the part is allowed to cool as slowly as possible. This material is naturally in itself hard, and requires thorough annealing before it can be machined with any degree of success.

For all parts which must be exceptionallly strong and tough, and which must have great fatigue resisting qualities, such as automobile crank shafts, axles, spindles, steering arms and drive shafts, 3.00 percent nickel and .80 percent chromium and .35 percent carbon is used. It is not used for parts to be case hardened, or it is never used without heat treatment, which consists of quenching in either oil or water at a temperature of from 1400° to 1500° F., after which the work is reheated to from 550° to 1200° F., according to the toughness and elastic limits which are desired, and allowed to cool slowly.

Gears are made as a rule from this variety of nickel-chromium steel, containing .50 percent carbon. The heat treatment is identical with the above, only that the final drawing is done between 250° to 500° F. This material also requires annealing before it can be machined.

The last group of low carbon alloy steel, which we will discuss are the chromium-vanadium steels. The advantage in the use of this class of steel over any of those already mentioned, is that it is much easier to forge and machine. It is even more ductile and elastic than chromium-nickel, which property makes it more suited to some purposes than the former. It is invariably used where great strength and toughness are required. It is extensively used for springs and other articles which are to be quenched in oil. The effect of vanadium on steel seems to intensify, or to make more pronounced, the properties of the other constituents of the steel. The use and heat treatment of this class of steel is not wholly dissimilar to the use and heat treatment of chromium nickel, only that as was previously stated the presences of vanadium greatly intensifies the action of the other ingredients and its heat treatment is therefore varied slightly to suit this condition.

As a rule, chromium-vanadium steel usually contain from .70 to 1.10 percent chromium and between .12 to .18 percent vanadium and the carbon content like all of the former, runs between .20 to .50 percent and in some cases it runs as high as .90 percent. For the sake of convenience the group is subdivided into those groups containing .20, .30, .40 and .50 percent carbon. The

"YES SIR. I'M THE PROFESSOR." SHAPING THE SHOE

first of this group is used almost exclusively for parts which are to be case hardened, and which require an extremely high degress of strength as well as toughness. The carburizing process is virtually the same as the treatment accorded the other steels. It is quenched first at a temperature between 1625° and 1700° F., reheating and quenching between 1500° and 1550° F., and finally heating to 250° to 550° F., and then allowing the part to cool slowly. The last quenching temperature should be as low as will successfully harden the case. The final cooling temperature being governed by the degree of toughness and hardness which is required of the work.

Automobile steering knuckles, axles and shafts, or in fact any part that is required to stand great stress, and have high fatigue resisting qualities and endurance, are made from this class of steel, having .30 to .40 percent carbon. It is never used without heat treatment, which consists of heating and quenching between 1600° to 1700° F., reheating from 550° to 1325° and allowing it to cool slowly. The final treatment as well as the quenching medium is varied to suit the requirements of the work.

The classes of this kind of steel, which contain from .40 to .50 percent carbon are used almost exclusively for springs and gears, because of its unusual high elastic limits, after having been properly heat treated. When used for gears, it must be annealed before it can be machined. This can be most satisfactorily done by holding it at a temperature from between 1550° to 1660° and holding it at that heat for at least an hour. The final treatment consists of quenching it at from 1650° to 1700° F., the same as with the other steels and then reheating to from 325° to 575° and allowing it to cool slowly. When used for spring work, the final heating operation is conducted at a temperature between 650° to 1125° F.

PROFESSOR OF HORSE CORNS AND SPAVINES.

George F. Paul

"Professor of Horse Corns and Spavins" is the unique title by which John D. Fitzgerald, of 4923 Cottage Grove Avenue, is known throughout the South Side of Chicago. This is a title to which he lays claim through twenty-five years of experience. His neighbors know him as "the Professor" and that title appears in large letters over the door of his busy shop. He was the man who seventeen years ago instituted a world-wide search for the origin of the "pig-tailed horse-shoe. "He often gives informal talks, on correct form in horseshoeing, for he is a great stickler on doing each piece of work in the proper way. This is his attitude toward his work: "In looking back to my early days at horseshoeing and working with the men of twenty-five years ago, I remember the pride that they took in their positions at work. If you were to get out of your position or stand crooked under a horse, they would correct you at once and insist on your doing it absolutely right."

Professor Fitzgerald believes that it requires, just as high an order of skill to sharpen a pritchel correctly as to give piano lessons or to teach youngsters how to paint a California sunset.

A FREE SERVICE CAR

The Star Service Co., Meridian, Miss., operate their service car free for the benefit of their customers, who receive gasoline or an additional tire on the road without the customary delivery charges.

UNUSUAL GARAGE AND REPAIR SERVICE PLANS

By Ernest A. Dench

GASOLINE REDUCTION TO CUSTOMERS

Salyes Garage, Newark, N. J., sell gasoline two cents per gallon cheaper to storage customers. Those motorists who buy gasoline merely as an accomodation have to pay two cents per gallon additional.

NIGHT AND DAY AUTO NURSERY

The Rialto Garage, Tacoma, Wash., conduct what they term the "Night and Day Auto Nursery". While cars can be parked at the rate of twenty-five cents a day, there is a special rate of five-dollars per month to business men.

SEVEN DAY TIRE SERVICE

The Quick Service Tire Co., Inc., Birmingham, Ala., offer motorists a free seven day tire service. In the Summer, particularly, the need for such a service is imperative on Sundays, when so many automobiles are used for pleasure. This is offered free in connection with an honestly marketed tire.

TIRE MUST DELIVER ITS MILEAGE HERE

The Tyre Shop, Bellingham, Wash., sells its new tires on an ironclad guarantee. Before a tire has delivered its guaranteed mileage, the motorist is entitled to a free repair service that covers every cut, bruise or blowout encountered under reasonable road conditions. What is more, this service is rendered in a section of the shop, where the car and its owner is protected from wind, rain, dust, etc.

A FIFTY CENT SERVICE

The National Service Co., Washington, D. C., offer a day and night service. The service truck immediately responds to the emergency call, removes the tire trouble —all for the inclusive amount of fifty cents.

TO TEST VULCANIZING SERVICE

Feltham's Truck Tire Service Station, Providence, R. I., are prepared to repair any pneumatic tire or tube free of cost for one year from date of purchase. The idea back of this is to have car owners test out their vulcanizing service, for this concern claims to have the most complete vulcanizing plant in Rhode Island, in charge of an expert with a Master Vulcanizer's certificate.

A SATIRICAL AD

H. L. Rhodes Vulcanizing Co., Salinas, Calif., quote a little story in their newspaper ads under the caption of "Let Rhodes Do It." The story, rich in satire, is quoted below:

"Grandma—Shall I teach you to make doughnuts'?

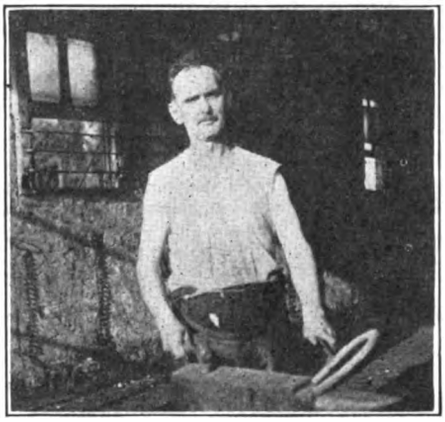
Debutante:' Yes, I'm terribly interested, but I can't understand how to fix the inner tubes."

NIGHT TRUCK SERVICE AT DAY RATE

G. G. Gerber, Portland, Ore., realizes that no business man desires to have his trucks laid off while their radiators are being repaired. Gerber therefore offers a night service at day rates for repairing radiators. All the truck owner has to do is to comply with the modest request below and leave Gerber to do the rest:

"Note

Let us know, if possible, just when you will bring your radiator



SHAPING THE SHOE

in and when you will want it out and we will make our arrangements accordingly, to serve you on the basis of the Golden Rule."

TRUCK TIRES FOR EVERY TRUCK

Nelson and Price, Inc., Los Angeles, Calif., offer a similar service in connection with the repair and replacement of truck tires. That no disappointment may be met with, truck owners are assured that they have THE tire for every truck, regardless of the size and type of motor truck.

CRANK CASE SERVICE THAT SELLS OILS

E. C. Brandt, Spokane, Wash., offers a free crank case service. The motor is drained, the crank case is cleaned and refilled with the car owners favorite oil—all for the cost of the oil, that being Mr. Brandt's specialty.

PERILS OF NEGLECTING LUBRICATION

The Auto Laundry, Shreveport, La., told car owners of the consequences that inevitably follow lubrication neglect. The piece of copy which they inserted on the subject is given in full:

Neglecting to give a car ordinary care and attention, failure to attend to its simplest needs, are responsible for more cars 'going wrong' and prematurely reaching the second-hand market, than faulty construction and hard service.

"Correct lubrication is a prime essential. Periodical changing of all oil and grease is an unescapable demand. Not because the car owner does not concede these things, but because he is forgetful in attending to them, harmful consequences occur.

"You can arrange with us to send for and deliver your car regularly on certain days of the week or month. WE won't forget—and then it will not matter if YOU do."

A LITTLE HUMOR

The Mission Auto Electric Co., Riverside, Calif., introduced in their ad a cut of a horse trying to pull a broken down automobile in the middle of a dessert. Underneath was a pathetic little poem as follows:

"This 'Bird' drove to another town,
While on the road—his car broke down.
He would not of had this fuss,
Had he brought the car to us."

100 to 1 Auto Service

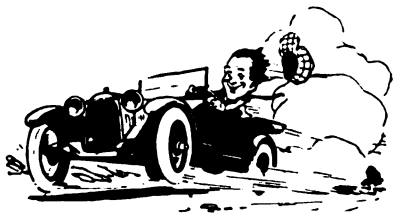
The Charleston Motor Car Co., Charleston, W. Va., offer what they define as 100 to One Auto Service. Their definition of this service to their would be patrons is quoted below:

"When we use this expression we repeat the idea, emphasized by one of our best patrons: "When you go to the Charleston Motor Car Co., It's a 100 to One shot you will get exactly what you want—and nothing more."

A WRITTEN REPAIR GUARANTEE

The Central Motor Service Station, Youngstown, Ohio, goes one better than free service promises, in regard to any repair work done that proves unsatisfactory. With each job as completed goes a written guarantee that entitles the car owner to call upon them to make good should the work not prove satisfactory, or the work fails to stand up as long as the car owner thinks it should .

High Spots



THOSE INVINCIBLE EDITORS

The sick-room was hushed. The great editor lay dying. The nurse was weeping, and the doctor bent over him, feeling his pulse.

"Poor man," he said, "circulation almost gone."

The dying editor leaped from his bed. "It is not," he shouted, "it's the largest circulation in the country!"

THE INDEPENDENT VOTER

A prominent lawyer in a Western city was also considerable of a politician. He had as a client a farmer who often consulted him, not only about matters of law, but also about many other things.

During a presidential campaign, the farmer became intensely interested in the political situation and read the newspapers omnivorously.

One day he sauntered into the lawyer's office.

"What's the meaning of this word, 'Mugwump?'" he asked, pointing to a newspaper in his hand.

"A Mugwump," explained the politician, "is a Republican who votes the Democratic ticket—that is to say, he puts his idea of right and wrong above party affiliations."

"Well," exclaimed the farmer, "I should say that he was a pretty good sort of man, shouldn't you?"

"Oh, a very superior man," was the reply.

"Now," said the farmer, after a moment's reflection, "what would you call a Democrat who voted the Republican ticket?"

The politician, much astonished by this suggestion, said with great animation, "Why, sir I should call him a damned fool."

AN AFTER-EFFECT OF WAR

Kind Old Lady—"Why, you brute! Don't you know better than to abuse a poor mule with a sore foot?"

Colored Driver—"He's a a-awmy mule, ma'am, an' he ain't lame. He's just standing at parade rest."

GOOD FOR A LONG TRIP

It is told that a New York couple, just married, boarded a train, and were so absorbed in each other that the bridegroom handed the conductor the marriage certificate when he called for tickets. "This is good for a long, weary journey," said the conductor, "but not on the New Haven & Hartford road."

The waiter—"Steak medium or well done, sir?"

Absent-minded parson—"Well done, thou good and faithful servant!"—London Opinion.

Some wag has said that in this year of grace and prohibition the old line "Wine, Women, and Song," should read "Ginger Ale, Wives, and Community Singing."—The Survey.

"Am yo' daughter happily married, Mrs. Perkins?"

"She sho' is, Mrs. Lumley. She's done got a husban' dat's skeered to death of her."—Boston Transcript.

Winnie's papa said to her one Sunday at luncheon:

"Winnie, dear, what was the parson's text this morning?"

"Oh, papa," said Winnie, with a shocked look, "it was, "Abdomen, Abdomen, my son Abdomen!"

The captain had ordered his men not to forage. That night he met a corporal coming in with a sheep over his shoulder.

"Forgot what I said this morning, Corporal?"

"Well—well, no, Captain, but no blamed sheep can bite me and get away with it."—The American Legion Weekly.

Thirsty days hath September,
April, June and November,
Every month's a thirsty one
Excepting February alone,
February (to its praise)
Has only twenty-eight dry days,
But Leap-year coming once in four,
Feb. must thirst for one day more.
—Leslie's Weekly.

BEDTIMES RHYMES

Tommy had been out playing till he was very tired, and did not feel inclined to say his prayers, but his mother insisted. So Tommony began:

"Now I lay me down to sleep
I pray the Lord my soul to keep—
"If," prompted his mother.
Tommy (sleepily)—If he hollers let him go,
"Eeny, meeny, miny, mow."

THE UP TO DATE BLACKSMITH

Under the spreading chestnut tree
Stands the village blacksmith shop.
The blacksmith now mends Fords you see,
And it keeps him on the hop.

There used to stand a zigzag row
Of wagons by the door.
Well, wagons stand there yet, you know,
But autos stand there more.

Old Dobbin's shoes still need repair,
Worn out by stone and slivers,
But blacksmiths wise now seek a share
Of the profit mending flivvers.
Frank Farrington.

The tongue of a woman is her sword—and she never allows it to rust.

The average lazy man gets along so well in this world that he encourages idleness in others.

On the principle that of two evils one should choose the lesser, it is better to own a dead mule than a live one.

It is told of a St. Louis miser that he eats his meals before a mirror because it doubles the dishes.

Some railroads advertise to carry passengers through without change—but they make a fellow pay, just the same.

Ridicule is a blow from the first, wit the prick of a needle, irony the sting of a bee, and humor the plaster which heals all these wounds.

"Fill thy life with true endeavor,
Strive to be the modest man;
Not what others do, but rather
Do the very best you can."

For light reading, why not try the gas meter?

Or the leaves of the trees, which are coming out now. But you can't read the other side of them till Autumn, when they turn.

Then there was the Irishman who saw in a bookstore window, "Dickens' works all this week for $4.30."

"Th' dirrty scab!" said he.

A well dressed stranger strolled up to a colored prisoner who was taking a longish interval of rest between two heaves of a pick.

"Well, Sam, what crime did you commit to be put in those overalls and set under guard?"

"Ah went on a furlong, sah."

"Went on a furlong? You mean you went on a furlough."

"No, boss, it was a sho' nuff furlong. Ah went to fur, and ah stayed too long."

Ben Franklin solved the high cost of living long ago when he said, "Reading maketh a full man." Try it!

Sweet are the uses of adversity, but the proof of the pudding is in the eating.

You never can tell. Casting reflections doesn't necessarily prove one's brightness.

The fellow who can't make up his mind between two girls is on the fence. They may both throw him over.

There was a time when the water wagon was quite popular, but that was when a man could do his own driving.

The Englishman who drops his h's and sings 'drink to me only with thine eyes" won't even be able to get an 'igh-ball.

Tommy—"Pop, this is a Christian nation, isn't it?" Tommy's Pop—"If turning the other check means a Christian nation, it sure is my son."

Selfishness is a thunderstorm that curdles the milk of human kindness.

Economy teaches some people to keep everything they made except their promises.

When a fellow gets the reputation of being dead cheap even the undertaker avoids him.

Some people are puffed up with pride, others go to the expense of paying a press agent.

Sillicus—"Has old Colonel Bunkum ever done anything really heroic?" Cynicus—"Well, he has had four wives."

PROFITABLE STUTTERING

"L-l-look here," said the stutterer at the horse sale, "that's a n-nice horse, my m-m-man. How much d-do you want for it?"

The owner looked the animal over lovingly.

"And a beauty he is, sir," he urged, "a horse I can thoroughly recommend. But you must make the offer."

"Well," said the stutterer, "I'll g-g-give you f-f-f—

"Forty pounds? Done" said the dealer.

"G-good!" closed the stutterer. "I was tr-trying to say f-f-fifty."

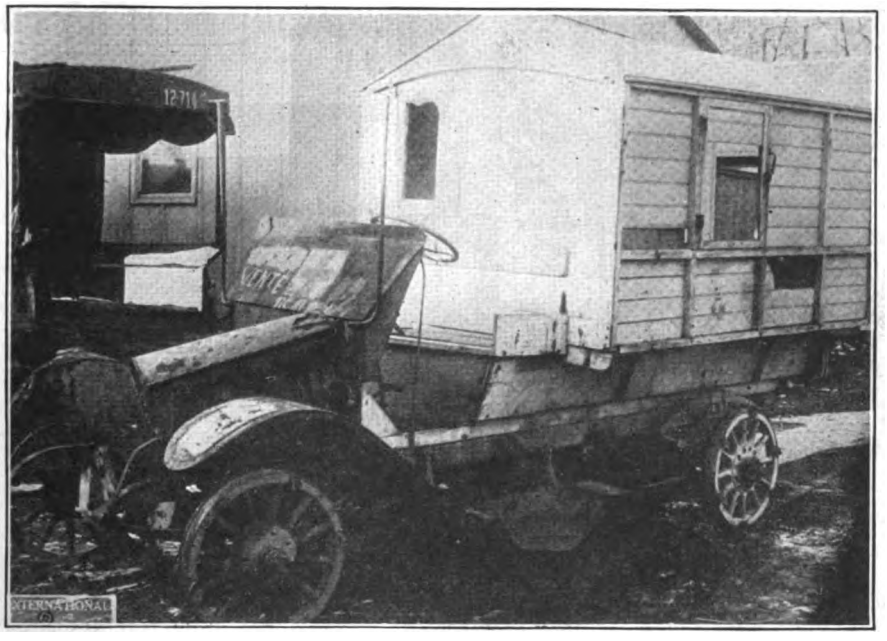
UNFORTUNATE BURGLAR

"A burglar got into my house about three o'clock this morning when I was on my way home from the club."

"Did he get anything?"

"He certainly did. The poor fish is in the hospital. My wife thought it was me."—The Earth Mover.

VETERAN AMBULANCE THAT WAS THRICE DECORATED



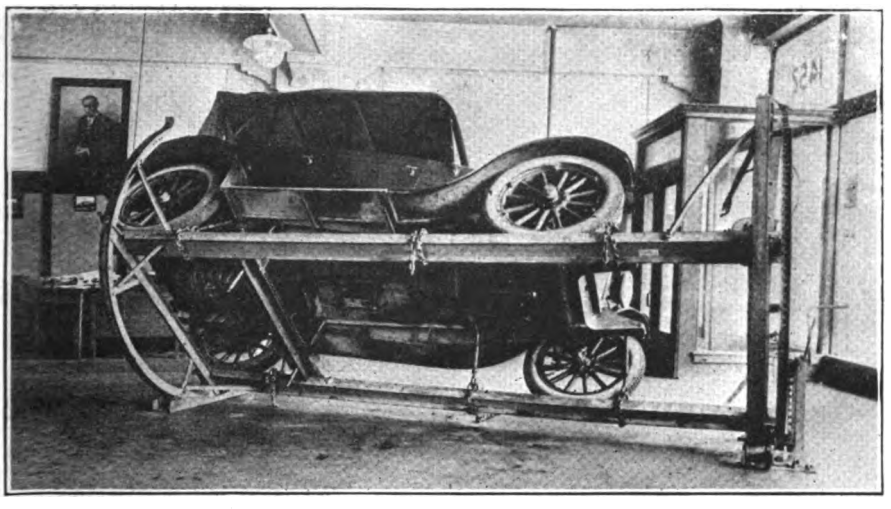
AFTER FOUR YEARS OF SERVICE AT THE FRONT, BRUISED AND BATTERED BUT STILL HANGING TOGETHER, AN AUTOMOBILE THAT RAN THE GAMUT OF EXPERIENCES FROM VICTORY TO DEFEAT AND BACK TO VICTORY AGAIN, IS ON EXHIBITION IN THE AMERICAN RED CROSS MUSEUM. THE CHASSIS IS A POPULAR AMERICAN MAKE, WHILE THE BODY, WHICH IS A RATHER RADICAL DEPARTURE FROM THE CONVENTIONAL LINES FOLLOWED IN THIS COUNTRY, IS OF FOREIGN DESIGN

To Weld Spring Steel—An experienced blacksmith has used for years the following in welding steel springs. Just before the steel comes to a welding heat he placed a small piece of Russian sheet iron—such as stove bodies are made of—on the joint; this melts and runs into the joint so that the weld is perfect.

Metal Polish—A good metal polish for gold, silver, brass, nickel, etc., can be made by taking powdered crocus and mixing enough kerosene oil with it to make a paste. This paste must be rubbed very thoroughly over the article to be polished. Then take a flannel cloth and rub lightly and rapidly until a brilliant polish is obtained.

Substitute for Red Lead Applied to Joints—As a substitute for, or in the absence of, red lead, use varnish on air or steam pipe joints. It will dry very hard and last for a long time.

GETTING AWAY FROM GETTING UNDER



THE PLEASURE OF LAYING ON ONE'S BACK AND HAVING OIL AND GREASE DROP IN YOUR EYES WHILE MAKING SOME REPAIRS UNDERNEATH, IS DONE AWAY WITH BY THIS DEVICE. THE CAR IS RUN ONTO THE TRACK, FASTENED DOWN AND A CRANK AT THE SIDE TIPS IT TO THE MOST CONVENIENT ANGLE. IT SHOULD BE A BIG SELLER AMONG THE STOUTER REPAIR MEN

Benton's Recipes

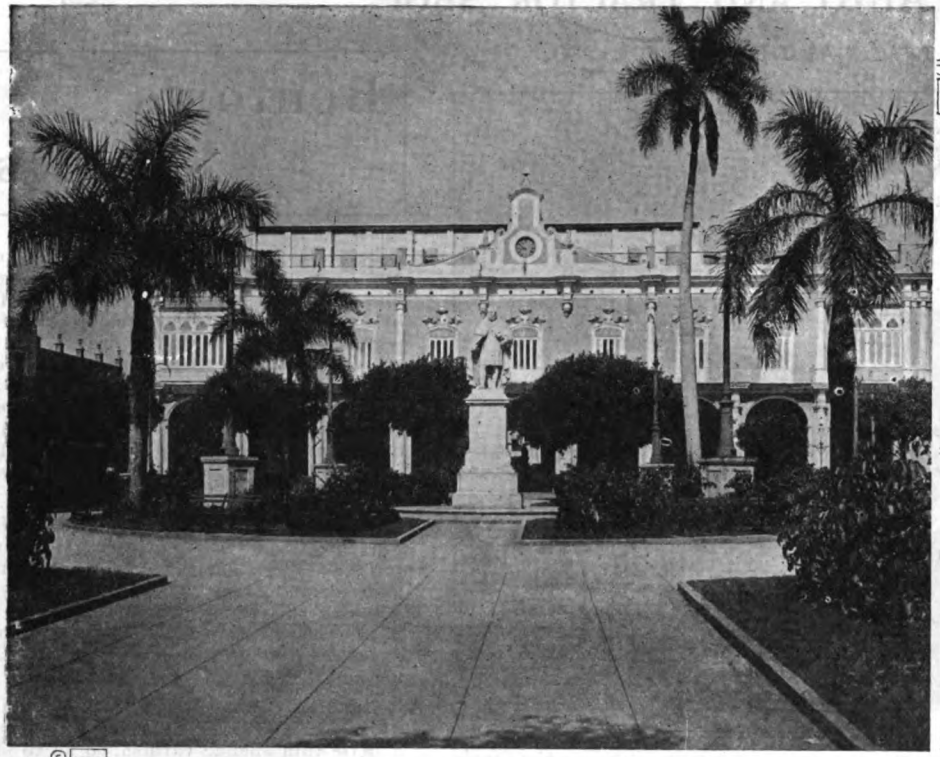
Belt Cement—Put 15 pounds of best glue in a kettle and pour over it 5 gallons of cold water. Let it stand a few hours or over night in a cold room, after which dissolve by gentle heat. Stir in on pint of Venice turpentine and add one gallon of Martin's belt cement. Cook for four or five hours by gentle heat, being careful not to boil the mixture. A water or steam jacketed kettle should be used to avoid burning. If too thick, mix with water.

Salt Bath for Heating—A salt bath is a convenient and satisfactory substitute for lead, when heating articles for hardening or annealing. Fill a receptacle with fine salt, place the article or articles in it and bring to desired heat; the subsequent treatment is same as for any other method of heating.

To Make Black Marks on Graduated Suffaces—The scale is varnished over with a little thin shellac varnish, so as to sink into all the cuts. When this is dry, a black varnish of lampblack and shellac is spread on, so as to fill all the cuts. This is allowed to thoroughly dry. When hard, the work is driven in the lathe, and the superfluous varnish polished off with the fine flour emery cloth until only that in the cuts is left. This gives a very distinct marking and fine finish to scale.

To Harden Steel Without Scaling—Articles made of tool steel and polished may be hardened without raising a scale, thereby destroying the polish, by the following method: Prepare equal parts in bulk of common salt and (fine) corn meal, well mixed. Dip the article to be hardened first into water, then into the mixture and place it carefully into the fire. When hot enough to melt the mixture take from the fire and dip or roll in the salt and meal, replace in the fire and bring to the required heat for hardening. Watch the piece closely and if any part of it shows signs of getting "dry" sprinkle some of the mixture on it. The mixture, when exposed to heat, forms a flux over the surface of the steel which excludes the air and prevents oxidation, and when cooled in water or oil comes off easily, leaving the surface as smooth as before heating. Borax would possibly give the same result, but is sometimes difficult to remove when cold.

To Temper Small Coil Springs—To temper small coil springs in a furnace burning wood the springs are exposed to the heat of the flame and are quenched in a composition of the following preparation. To a barrel of fish-oil 10 quarts of rosin and 12 quarts of tallow are added. If the springs tempered in this mixture break more tallow is added, but if the break indicates brittleness of the steel rather than excessive hardness, a ball of yellow beeswax about 6 inches in diameter is added. The springs are drawn to a reddish purple by being placed on a frame having horizontally radiating arms like a star which is mounted on the end of a vertical rod. The springs are laid on the star and are lowered into a pot of melted lead, being held there for such time as is required to draw to the desired color.



THE "WHITE HOUSE" OF CUBA

Copyright by Brown and Dawson, N.Y.

NATIONAL THEATRE

Copyright by Brown and Dawson, N.Y.

AMONG THE RESIDENCES OF THE CITY

HAVANA · CUBA

VIEW IN THE OLDER PART OF THE CITY

VIEW FROM THE OLD FORTIFICATION

THE CATHEDRAL

COLLEGE OF BELEM

Welding a Mower Wheel

By DAVID BAXTER

FOR the blacksmith who operates an oxy-acetylene welding plant, there is a profitable business in the repairing of agricultural machinery. For usually the farmers are among the average blacksmith's best customers. In fact, the majority of smithies cater to the farming fraternity, especially. Therefore, they should be prepared to handle all of the farmer's class of work, and they are not able to do this without a welding torch.

All up-to-date blacksmiths should investigate the oxy-acetylene welding process, since this wonderful invention will permit them to make repairs that can not be made in any other way. Even the old fashioned village smith, who makes no pretense at modernism, will find he is handicapped very seriously, unless he owns a welding outfit. He will awaken to find that a lot of money has been slipping past his door, once he understands the possibilities afforded by the torch welding process.

One repair that the torch welding blacksmith can make, and which cannot be satisfactorily made in any other way, is a common mower wheel, broken as illustrated in the photographs accompanying this article.

Of course a wheel like this can be repaired with straps of iron and rivets, but at best it is a crude looking piece of work and will eventually come loose to the everlasting discontent and disgust of the farmer. Once the wheel is correctly welded, however, it is as good as a new wheel. It is more liable to break in another place, than where it was welded.

The welding of mower wheels, broken like this one, require no great amount of skill, nor any particular knowledge of the torch process. It does, however require a fair understanding of certain fundamental principles. The first of which consists of knowing how to regulate and control the welding flame, and knowing its power and limitations. And second, in importance: the peculiar characteristics of the metal, its actions and reactions upon being heated and melted.

In consideration of the first item: the smithy should realize that the temperature of the welding flame is intensely hot, but that the body of heat is comparatively very small. He can heat a small portion of metal to a melting state in a few minutes, or a few seconds, but it will not stay melted very long if the welding flame is removed. In fact the melted spot is so small and shallow that it starts to congeal the instant after the torch is withdrawn. This condition may be varied by using a larger or smaller torch. If the flame is too small, the heat will be drawn away from the weld by the surrounding

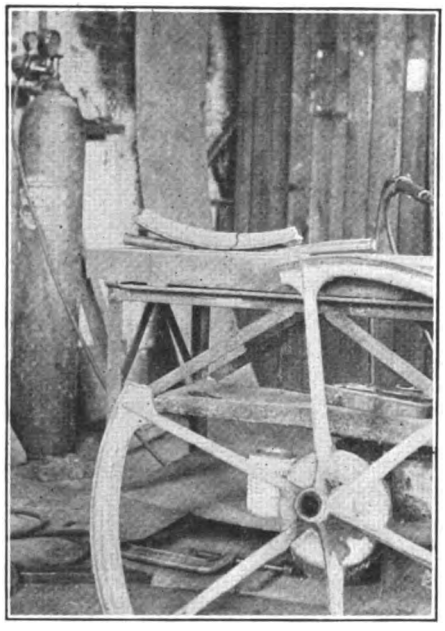


FIG. 1. SHOWING THE LOCATION AND EXTENT OF THE DAMAGE. THE BROKEN RIM IS SHOWN WEDGED UP FOR THE FIRST WELD

metal, almost as fast as it is applied, especially at the start of the welding; until quite an area of surrounding metal has become heated through conduction. Even then the operator will have great trouble in keeping enough of the weld heated sufficiently hot for it to fuse properly. He may sometimes assist it by preheating the weld with agencies other than the torch used for welding. A much easier and safer way to do this is to use a larger flame, or better still, to select a flame of the correct size for the work.

Now, in endeavoring to control his welding flame and to learn its power and limitations, the operator may go to the other extreme and use too large a flame. Although he may have better success with a flame which is too large than with one which is too small, he will probably weaken the weld by burning the metal—by destroying its life. Then too, the power of some makes of large torches is such that it will not permit the metal to be guided in a small weld. So much of the metal is blown about by the flame, that it is difficult to keep it within the confines of the weld.

Theoretically, then, the torch operator knows that there must be a certain size flame for a given weld. In practice he may find that this rule may be varied a little, either way. But he should observe the effects of different size flames and try to choose the one best suited to the job. It is almost useless to try to lay down a set of rules to follow in this matter, since so many conditions must be considered. If all operators used the same make of torch and tip it might be possible to state the exact size flame for all work. It is to be hoped, that the day will arrive when the welding flame will be standardized according to the size of the white cone. Until that time, however, we must be content with cautioning the operators to choose different tips for different welds.

In the welding of mower wheels, as well as other castings, the operator should know that the metal expands, or enlarges its dimensions, upon being heated, and then reduces its size, or shrinks, as it cools. He should take these things into consideration and endeavor to study out in advance just how and where the reactions will take place. To know the direction of the expansion, and how to overcome it, or perhaps it is better to say, how to make use of, or take advantage of the expansion. This spells success for the welder. If the operator knows in advance what part of the casting will push outward in a certain direction, and which way it will be drawn back, and whether or not something will retard the contraction, he may easily take steps to control or guide the actions.

There is not space here to discuss all of the complexities of expansion and contraction, and the way in which they effect the many kinds of castings. We must take it for

granted that the readers are more or less familiar with the principles involved. Let us therefore, pass directly to the welding of the mower wheel. An explanation of the different factors as applied to this particular job, should enable the average welder to repair other castings of a similar kind.

In Figure 1 of the illustrations will be seen the extent and nature of the damage done to the wheel. A section of the rim, between two spokes, was entirely broken out. This section was also broken in two parts, and is shown on top of the welding table in the photo. The ends are wedged up to secure the proper aligment for the first weld. All parts of the breaks were chamfered in the usual manner, according to the welding position of each. The rim welds being made from the outside and the rib welds while the wheels were flat upon the floor.

The job was divided into three general parts: the welding together of the two broken pieces; the welding of this section to the wheel, one end at a time; then the completion of the rib welds. The welding of each part was accomplished in detail as follows: first, the two broken parts were wedged up on the welding table to secure the proper curve of the rim. It was not necessary to consider the factors of expansion and contraction in welding these parts since the expanding weld could easily push the broken parts outward and as the weld cooled nothing would prevent their being drawn together. With nothing to interfere with their actions, it was not necessary to preheat the first weld.

A neutral welding flame, supplied by a medium size welding tip, was applied to one end of the fracture. A quarter inch filler rod of soft gray iron was used. The flame was revolved in small circles over one spot and gradually decreasing the motion as the groove started to melt, then it was played over one end of the filler, which was brought in contact at the proper moment. The flame was kept in continual motion over the melting groove and filler. The filler rod was fed into the bath as fast as conditions permitted. The filler was twisted and prodded into the molten weld and never permitted to drip therein.

As fast as the groove was filled, the flame and rod were gradually worked to another portion of it. The operator being careful to see that the bottom as well as the sides of the weld were in a fusing condition when the filler was added. The break was thus welded from end to end, and up over the rib. A surplus of metal being added along the weld, to lend its strength. No particular effort was exercised to hot-finish this weld since it is unnecessary on all welds of the nature of this one, except for appearance.

As soon as the weld cooled, so that there was no danger of sagging, the section was inverted to permit the operator to touch up the outer side of the rim. Then it was ready to weld in place in the wheel.

The wheel was placed on edge upon the floor and blocked to prevent turning. The broken part upward. The broken section was then held in place by clamping some

FIG. 2. WELDING POSITION AND CLAMPING ARRANGEMENT FOR THE FIRST RIM WELD

strips of flat iron beneath it. The clamps were placed outside of the partitions so they would not hinder the heat reactions. This arrangement is illustrated in Fig. 2, which also shows the operation of the first rim weld.

No attempt was made to control or regulate expansion by preheating because there was nothing to retard the pull of contraction when the weld cooled. And the weld could push the loose section away from the spoke and pull it back again when contracting.

This weld was accomplished, a portion at a time, across the rim after the manner prescribed for the primary weld. Then when the rim groove was filled from end to end, with the surplus added, the clamps and flat irons were removed and the wheel placed on its side to finish the rib welding. The flame and filler manipulation being the same for this as for he first and second welds. In neither of these welds was any particular attempt made to secure a perfectly clean weld relative to pin holes or hard spots in so far as they affected the strength of the welds. Then the wheel was once more placed in its original upright position to make the last and most difficult weld.

This position is, indicated in Fig. 3 of the accompanying photos. The preheating was done by the oil burner in the foreground. This weld was the most difficult, because the contraction was retarded by the other end of the rim section being fastened by the second weld. When the last weld cooled, the contraction of it would meet stubborn resistance if nothing was done to counteract the strain, which would no doubt result in an open crack, or at least an inner rupture. This rupture would be liable to cause a break when the wheel was put in service.

Now, to prevent this from happening, it was necessary to regulate the expansion by causing some part of the wheel to push outward—some part which could return to place in unison with the contraction of the weld. In other words, the wheel was made to expand with the expansion of the weld, so that it would follow the contraction inward as the wheel cooled. A moments thought convinced the operator that the proper place to cause the expansion was in the spoke beneath the last weld. By heating the spoke, the crack could be opened by the outward push of the expanding spoke. Then as the spoke contracted, upon cooling, it would follow the contraction, inward. To facilitate this procedure, the spoke at the other end of the broken section was also heated a little before starting the last weld and kept warm during the welding. This was to afford a sort of latteral play to the last weld expansion and contraction, and was accomplished with the welding flame. This spoke was not heated red hot but merely warmed by playing the welding flame along about two inches of the spoke.

These concerted preheatings open-

ed the bottom of the last groove about a sixteenth of an inch before the welding flame was applied to it. The spoke beneath the weld was heated red hot for a space of about three inches and was kept in this condition during the welding process. The flame of the oil burner was directed to a point a little above the center of the spoke and then inclosed in asbestos paper cage to confine the heat; which held the expansion steady during the welding.

This welding was accomplished like the others: a continuation of connected portions, thoroughly knitted together. All welds were fluxed at frequent intervals by dipping the heated end of the filler rod in a pot of flux powder and quickly returning it to the weld.

Just as soon as the last rim weld was completed, the oil burner was set aside and the wheel quickly placed upon its side to enable the operator to weld the rib and possibly to doctor the inner side of the rim welds. In this the operator had to hurry because contraction of both the rim and the spoke set in just as soon as the welding flame and preheater were removed. The idea was to get the rib weld finished before the heavy strain of the contraction commenced. Of course the welder could touch up the heat of the spoke with the welding flame from time to time in order to hold back the contraction, but it was better to have all reactions take place at once.

When the rib weld was complete the wheel was once more placed on edge to cool. In this way there was no chance for the weight of the casting to interfere with normal contraction, The weight of the welded section being downward in the general direction of the contracting pull.

A sheet of asbestos paper was then spread over the welded spots and the job permitted to cool enough to handle it. The asbestos covering was not absolutely necessary but was an extra precaution.

It may be seen from the forgoing instruction that the welder may often use expansion to an advantage by localizing the heat in such way that it will follow inwardly the contraction of the weld. There are many parts of agricultural machinery that may be handled in a like manner. And there is little doubt but what the blacksmith can get all of this work if he operates an oxyacetylene welding torch in connection with his other tools.

MAGNETO TROUBLE.

The magneto has generally been regarded as one of the most trouble-proof components of a car, and it must be admitted that given a reliable make to start with, it is very seldom that anything goes wrong with the appliance, or that any attention is required. One of the chief causes of trouble is due to the desire some people have to oil every piece of moving machinery. A magneto revolves, or rather part of it does, they argue, and consequently it should be oiled. Should any symptoms of misfiring or irregular working manifest themselves shortly after this has been done, they will generally regard them as evi-

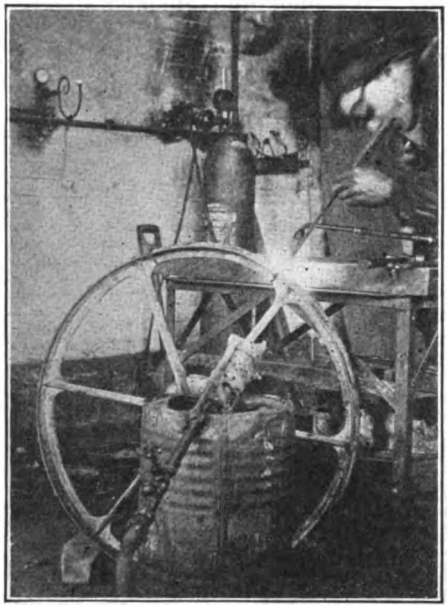


FIG. 3. SHOWING HOW THE PREHEATER WAS USED WHILE MAKING THE LAST WELD

dence that more oil is required, and act accordingly. When the magneto comes back from the repairers with the curt statement that there was nothing the matter with it except that someone had been oiling it, they are prone to believe that the trouble has been incorrectly diagnosed. As a matter of fact, very few modern magnetos require any oiling, and should this be done it is certain to cause misfiring, or internal short-circuiting, which will put the engine quite out of action until a new magneto is fitted and timed, or the existing one cleaned out with gasoline.

A magneto must be kept scrupulously dry, and where there is any possibility of wet or mud gaining access to it a rubber cover, which can be obtained at slight expense, should be used. Once, a high grade magneto which always gave trouble as soon as the car was taken over wet roads, and it was not discovered for some time that the milling under the aluminum end-piece on the sprocket side had been carried a fraction of a hair's breadth too far and had opened up a tiny crack which allowed dampness to get through to the high tension end of the armature. But given freedom from wet and dampness and the injudicious use of the oil can, there is no reason why a high-grade magneto should not last for a number of years.

Mark Meredith.

HYDRAULIC POWER IN CONSTRUCTION

Crippled transportation facilities and the shortage of coal in France has compelled many factories to move nearer the source of their raw materials, and particularly nearer to natural water supplies, for power purposes.

Already many textile factories have been transferred from the long established textile centers of Roubaix and Turcoing to the environs of Grenoble in the Alpine district. Flourishing iron industries also have changed their location.

Before the war, a project had been formed for the exploitation of the water power of Savoy Dauphine district. Its success at present seems assured. Factories employing 570,000 h. p. are now operating in the district and others are under consideration which will require 250,000 h. p.

Furthermore, a committee has been appointed to organize and exploit hydraulic power and to encourage improvements and output of hydraulic machines.

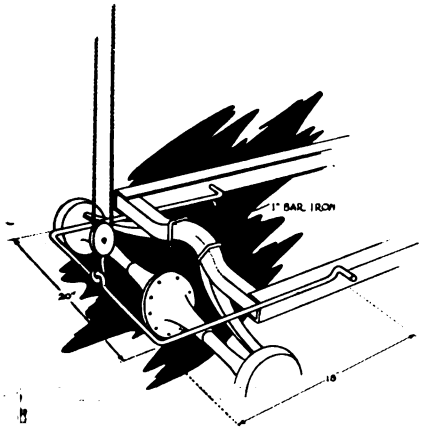
Congestion of the Parisian industrial centers is another problem that the manufacturers are facing in re-establishing their industries on a peacetime basis. The industrial population at Lyons tripled in a little more than two years. The American Red Cross, by welfare work among women and children, has done much to relieve the hardships bound to result from such an unprecedented influx.

The business man who cannot speak good English, who interlards his conversation with slang or over-energetic language, will surely impress people with his lack of up-to-dateness. The business man of today is educated, alert, and a courteous gentleman.

Some Handy Kinks for the Shop

FORD CHASSIS SUPPORT

The soap box under the running board method of supporting the rear end of a Ford, while removing the rear axle assembly, is not an altogether satisfactory method, since the box or the running board supports are apt to break and permit the car to fall and possibly do

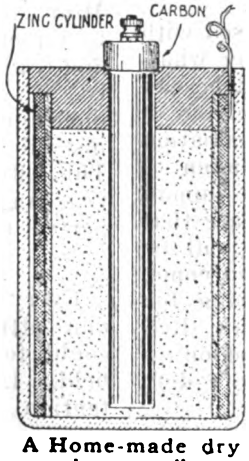


considerable damage to the body or fenders. A much safer and more convenient way of supporting the car, while the rear end is removed, is to make an iron for that purpose as shown in the adjoining illustration. It is made from a piece of 1" round stock about 6 feet long and it is bent up as shown in the cut. The ends are hooked on the inner channel of the chassis frame with the rods bearing against the rear cross member. A block and tackle or chain fall is attached to the central part of the iron, at a point where the iron is curved up slightly, so as to prevent the block from slipping to one side. The car can be easily raised to any desired height by means of the chain fall.

TO MAKE A BATTERY HAVING LASTING QUALITIES

For the person who likes to try experiments, this type of battery is a good example to try out, for, if properly constructed it will last much longer than the ordinary dry cell. The container consists of a glass jar of a size suitable for the battery. A cylinder of heavy zinc plate is coiled up to fit snugly against the inner surface of the jar, the inside of the zinc is then lined with a good grade of blotting paper. A paste is made as follows: For the liquid mix together 3 parts of water to one part of muriatic acid. In mixing acids and water, remember to add the acid to the water and slowly stir the solution while mixing. The body matter of the paste is made of 4 parts of powdered charcoal, 2 parts flour and 1 part plaster of Paris. These parts are measured by volume. Mix this powder with the acid to form the paste.

Procure a carbon from a discarded cell and place it in the center of the jar and finish by sealing with wax. After this stands for a few hours it will be ready for use.



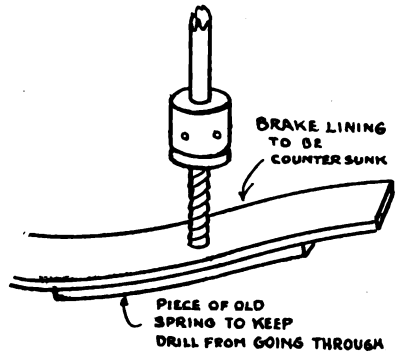
A Home-made dry battery cell

COUNTERSINKING BRAKE BAND LINING

The repair man frequently experiences the difficulty of having the drill or countersinking tool with which he is countersinking the brake lining for the rivet heads, going either too deeply or completely through the lining. This annoying trouble can be easily avoided by placing the material to be countersunk on an old spring leaf. It is best to fasten the two together with a clamp, although it is not absolutely necessary. Then, when drilling, the point of the drill will stop when it comes in contact with the spring leaf, thus leaving a countersunk hole of the proper depth to suit the average condition.

A DEVICE FOR BENDING TUBING

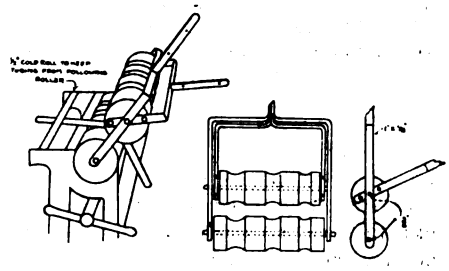
The shop that has any quantity of tubing to bend will find that quite a saving in time can be made by having a machine for that purpose. The frame of the machine is made of wood and supports two rollers, one of which is fastened rigidly to the machine. The other roller is fastened to a swinging lever which in turn is fastened to an arm concentric with the stationary roller. In this manner one lever adjusts the distance between the rollers while the other lever moves the roller over the surface of the stationary roll. The tube to be bent is inserted between the two rolls, then the movable roller is pressed against the tube while the other lever swings the roller down to any desired point thus bending the tube. There are several grooves of various sizes to accommodate the sizes of tubing most generally used.



The radius of the grooves should be slightly greater than the tube which is being bent, in that way avoiding any tendency to crush or mutilate it. A bar running parallel to the stationary roller prevents the tubing from being carried along with the movable roller.

ANOTHER JOB FOR THE TRACTOR

For the obstinate fence post, that resists other kinds of treatment, the tractor offers a sure cure. A chain fastened around the post, about a foot from the ground, and the other end to the wheel of the tractor, which has been backed up close to the offending post. By backing up, something is bound to move and



almost invariably it is the post. Posts can usually be pulled clear out of the ground in this manner without breaking them off. If the chain is properly adjusted, the first pull is upward and the final effort pulls the post over.

Be broad. Don't be a one-cylinder man. They make too much noise and travel too slowly. Cultivate diversified interests so that you can bring to bear experience and judgment upon the problems which are yours to solve.

Tractor Hitch for Two or More Mower

This hitch requires a man on the tractor and a man on the second and all following tractors; a man is not required on the one directly behind the tractor.

The accompanying Figure 12 shows the general outline for attaching two or more mowers behind a tractor. It will be observed that the first mower is connected directly behind the tractor to the tractor draw bar by means of a stub tongue and clevis; see Figure 13. It is handled by the tractor operator. The second mower is attached to the first by means of a well braced bracket, clamped to the axle of the first mower at two points as shown in Figure 14. Extending from this bracket to a flexible tongue connection is the adjustable tongue marked A in both Figures 12 and 14. This tongue is adjustable in order to accommodate different widths of mower cutter bars. The proper width of cut is maintained by means of a crank and a quadrant as shown in Figure

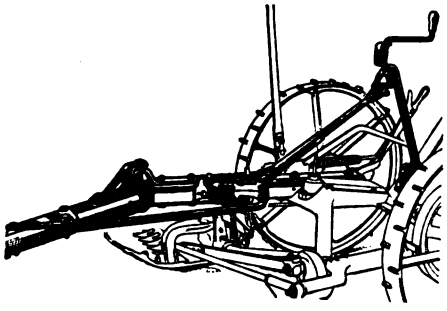


FIG. 15. FRONT VIEW OF THE STEERING TONGUE TRACTOR HITCH SHOWING STEERING CRANK, WORM, GEAR AND PIVOT

15 and which is attached to the stub tongue and the steering tongue of the trailing mower. A series of mowers connected in this manner can not be expected to turn a sharp corner, so that a non-stop run can be made.

ONE OF THE OLDEST METALS

Iron must have been familiar in the time of Moses. A wedge made of iron was left in the great pyramid by the builders, which proves that the metal was known and in use about 1,500 B. C. Besides, in the fourth chapter of Genesis, it is mentioned that Tubal Cain was a pioneer in developing the arts of iron making and brass working. Brass, however, was a very indefinite term among the natives. When spoken of in the Scriptures it is seldom to be understood to signify the alloy of copper and zinc now called by that name. The "brass" tempered for edged tools or weapons of war was a bronze, usually a compound of copper and tin.

Copper was also known to mankind at a very early period. Articles of copper were found 81 feet under the statue of Rameses the Great, which was erected 3,500 years ago. Debris has accumulated there to a depth of nine feet, and the copper articles were found, on further excavation, 72 feet lower down.

THE VILLAGE SMITHY IN HUNGARY IS WORKING OVERTIME

The Village Smithy in Hungary is laboring under a new set of surroundings and circumstances.

In the first place he is no longer doing business at his old stand, "under the spreading chestnut tree," for the reason that in Hungary today, there are no more chestnut trees, and precious few of any other kind. The beautiful shade trees that once adorned the streets of Budapest and Vienna were sacrificed one by one, for fuel as the cruel winter tightened upon the miresable, starving people. With her transportation system only a memory, and her people ravaged by famine, epidemics and starvation, only the shade trees saved the population of the once lovely and brilliant Hungarian cities from freezing to death in their homes, long ago dismantled of furniture, to make fires.

So the smithy has dispensed with his shade and is now using whatever odds and ends of fuel he can rake or scrape for his forge, and in addition to his age-old occupation of horse-shoeing, he has taken to providing footwear for the human being. And the prospects are that for this new vocation he will be kept busy for some time to come, for all Hungary is clamoring for "shoes like the American Red Cross gives out", and in fashioning these the blacksmith is more deft than the cobbler.

The shoes introduced from America by the American Red Cross to supply the world-wide leather shortage, have steel soles and felt cloth uppers. Their wearing qualities have never yet been fully tested, inasmuch as the first pair ever made,—ten years ago, is still doing duty, with no signs of giving out. They have been a Godsend to the destitute multitudes in Hungary, where leather has soared to such impossible heights that the shoe-dealers themselves predict that the day is not far distant when the only shops that will be rich enough to afford to handle leather shoes will be the fashionable jewelers. So the cobblers and the blacksmiths have gone into partnership. The blacksmith hammers out the soles on his anvil from thin sheets of steel, and the cobbler then sews on the uppers, through the holes punctured in the soles, utilizing old carpet instead of the felt which the Red Cross shoes are equipped with.

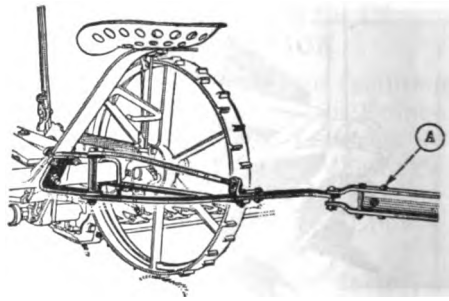


FIG. 14—REAR VIEW OF FIRST MOWER SHOWING THAT PORTION OF THE STEERING TONGUE TRACTOR HITCH WHICH IS PLACED ON THE REAR OF THE FIRST MOWER

"So the village smithy of Hungary, is running true to form, and like Longfellow's prototype,

"His brow is wet with honest sweat,
And he owes not any man."

Why should he, with business flourishing like a green bay tree.

KEEP THE FORCE BUSY

Jack's Repair Shop, Faribault, Minn., found they had the facilities to undertake twenty Ford motors and transmission jobs simultaneously. To secure this work each job done for $18.00, plus cost of parts, instead of $25 plus cost of parts. This offer was open for a limited time, and every job was guaranteed perfect in workmanship.

Every season presents some new and attractive goods which you could feature as leaders in your field. Leaders always attract attention. Are you working your own logical trade leaders for all they are worth?

Locating Causes of Tractor Trouble

By J. K. RODGERS

WHEN a disabled tractor is brought to the attention of a serviceman, the first move consists in making an accurate diagnosis of the cause of the trouble. Occasionally the owner of a disabled tractor is completely "in the dark" regarding the source of trouble, and it is up to the serviceman to make a careful examination and decide how to proceed to make the necessary adjustment or repair.

Loss of compression is one of the more common tractor ills. Loss of compression usually results from worn pistons or cylinders; carbon between valve and seat; pitted valves; broken piston ring, or valve not seating properly due to improper adjustment of tappet rods.

When an examination shows that loss of compression is due to worn pistons or cylinders, the use of new pistons will remedy the trouble. Over-size pistons are necessary when the cylinders are badly worn. When carbon or pitted valves is causing the trouble, clean and grind valves. Replacing a broken

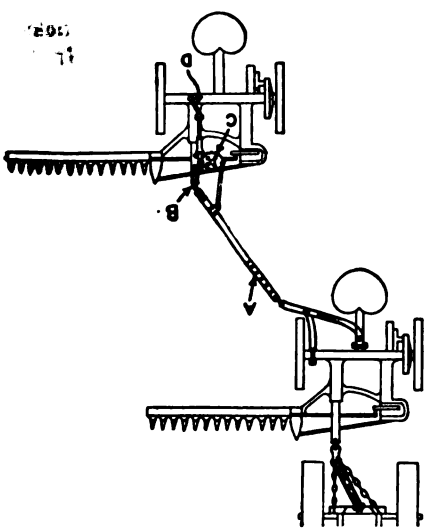


FIG. 12. PLAN VIEW OF TRACTOR HITCH FOR PULLING TWO OR MORE MOWERS. A, ADJUSTABLE TONGUE CONNECTION; B, FLEXIBLE JOINT; C, STEERING QUADRANT; D, STEERING CRANK

piston ring with a new one will occasionally renew the motor's efficiency. If loss of compression results from valves not seating properly, adjust tappet rods to thickness of an ordinary post card.

A motor which persists in missing, is a frequent cause of trouble. There are six principal causes for the trouble, viz.: (1) Distributor brushes dirty. (2) Improper adjustment of carburetor. (3) Oil level too high, causing foul spark plugs. (4) Broken porcelain in spark plug. (5) Magneto points pitted or improperly adjusted. (6) Broken wire from magnet to plug, or broken battery wire.

The above ailments are easily corrected when once detected. Look to each possible cause of trouble until the right one is found.

"My engine knocks on a hard pull," occasionally explains a tractor owner to the repair-man. There are four principal causes for the trouble, viz., Carbon deposits in cylinder, which, becoming hot, preignites. (2) Spark up too high. (3) Loose bearings. (4) Carburetor adjustment too rich. When the trouble is due to carbon, clean out deposits and grind valves. When treating cause No. 2, advise operator to run motor with a slightly retarded spark on hard pulls, increasing power as required by feeding more gas. Gasoline means power; spark means speed. When treating cause No. 3, tighten all loose bearings, then test motor to see that all parts run smoothly. The fourth cause of trouble can be quickly eliminated by shutting off carburetor until motor spits back on open throttle, then opening slightly.

"My motor starts hard," says a tractor owner. The trouble may be due to a weak spark. See that batteries are dry (where same are used.) When a tractor is kept standing out of doors, magneto should be covered with a tarpaulin, as a wet or damp magneto frequently grounds, refusing to produce a spark hot enough to ignite the mixture. A tractor starts hard when the air adjustment on carbureter is set so too much air is allowed to enter. A hot tube connection from an exhaust line to the air intake on carburetor, which insures a better mixture and gives a smoother running motor.

"My motor stopped suddenly this morning, and I can't make it go," remarks a tractor owner. Causes to look for are (1) Broken wire to plug. (2) Broken porcelain on spark plug. (3) Water in gasoline. (4) Float valves stuck. (5) Obstruction in feed line to carburetor caused by sediment selling and adhering in gasoline line. Dirt in float chamber will cause float valves to stick. Test gasoline for water by draining carburetor.

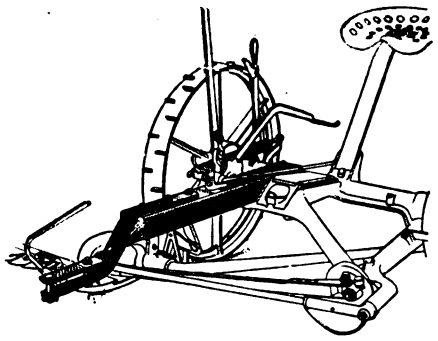


FIG. 13. STUB TONGUE TACTOR HITCH SHOWING CLEVIS FOR ATTACHING MOWER TO TRACTOR DRAW BAR

Last summer a farmer who had recently purchased a tractor, sent in a "hurry up" call to a serviceman. "My motor runs so hot the water boils," he explained. "I have a lot of plowing to do, and want to get my tractor in first class condition at once, what do you suggest?"

The serviceman found that a retarded spark had caused the trouble in this instance. He advised the farmer to operate his motor with as high a spark as would pull the load to best advantage. "Watch your motor," he explained," and you will notice that at a certain position of the spark lever it will operate to best advantage. Keep the lever in this position, and as you wish to run faster or slower feed the gas for the difference in power and speed."

Another cause for overheated motors is an obstruction in the water line. If an old hose has closed up, replace it with a new one. Drain radiator so sediment will be removed. Tractor engines are most efficient when the temperature of the water in the cooling system is just below the boiling point. If the water circulates freely in the cooling system, a motor develops more power and uses less gasoline.

Where wires are located so they are in constant bending motion due to vibration of the motor, they may become broken in the insulation. The break can be located by running thumb and finger over the wire. See that connections at the ends of wires are clean and well soldered, and that all attachments for holding wires in place are tight and making clean contacts.

Make Each Job Stand on Its Own Feet

By W. J. BRYAN

NO matter how large or small the business you are conducting may be, or whether it is a blacksmith shop or a motor repair business, or both, you should make certain that each and every piece of work done, returns you an adequate profit. The day has passed when the owner of a shop guesses at the price to be charged for a piece of work. No longer does the business man go on indefinitely without an accurate knowledge of whether he is really making a profit on each individual piece of work or on his business as a whole. He makes sure that he makes no missteps in the matter of charging, for he knows that he will not go far along the road of non-profitable prices until he falls into the pitfalls of failure that may either wreck his business completely or cause him the loss of a good deal of his capital.

Not only does the real business man of today check up his financial standing at the end of every year to see if he is really making money on his business as a whole but he checks up each piece of work and charges for it at its true worth and a figure that will net him a profit. In recent years men in this line of busines have taken a leaf from the note book of the druggist, the plumber and kindred business men. They charge for work done on the basis of the exact amount of time and material employed with a reasonable charge for overhead expenses. You should operate on the same basis.

The blacksmith cannot charge for shoeing on exactly the basis set forth above, for he has to have a schedule price for certain classes of work, but he should make certain proceeds on the above basis in arriving at the schedule of prices that he charges. He should work just the same as the druggist who has certain prices for different sizes of common prescriptions but who carefully figures out the prices to be charged by an analysis of the average cost of material and amount of time taken in dispensing a large number of prescriptions. For the blacksmith it is even a more simple proposition. He can figure out exactly the worth of material used in his work and can figure out quite accurately the amount of time taken for each job and what he should charge for it. But he should approach the matter of prices in a real business way.

The proper charging for repair work should be approached in a systematic manner. It should be made a separate transaction and show a profit in itself, based on accurate knowledge of the cost of the work to the shop. All material used should be listed first at a figure that pays the dealer for carrying the material. Then a proper charge should be made for the time taken up in doing the work. The usual method is to charge time at so much per hour, making some allowance in this for overhead expenses and lost time.

If you have a big business you should have proper job cards or forms prepared on which the workman can list the material that he uses on the job and also the time that he consumes in doing the work. This can then be passed on to you or your bookkeeper for extension.

THE TRANSFORMED BLACKSMITH SHOP

In this way each patron will pay on the basis of time and material and you will receive payment on the same basis.

It merely means the injection of real business methods into your business and this is an essential in these days when competition is so keen and profits are so small and uncertain. The path of business is beset with many pitfalls and the man who hopes to reach his goal of success must proceed with care and accurate knowledge that he is headed in the right direction and every step is carrying him forward to the goal he hopes to attain.

This means also that if there is more than one department in your business that you must make it also stand on its own feet. This will mean that it must be operated separately and not mixed up with other endeavors in a manner that makes it impossible to tell whether each is doing its proper share. Quite often one department can eat up the profits of the rest of the business and turn the whole establishment into a failure. When each department is conducted separately the offending one can be located and the trouble found out and remedied.

Many shops doing repair work also have a sales department in which accessories connected with their line are sold. It is well, if at all possible, to conduct each one separately—repair department and sales department. Each should bear its proper share of rent and other expenses of a like nature. This is the only way to operate without guesswork and guesswork has no place in the methods of the modern business man.

BUSINESS INCREASED BY AUTOS

The automobile business has made such rapid strides in the past few years that many concerns depending on the horse and vehicle have changed wholly or partly to the coming trade.

The illustration shows a modern cement block building which was originally intended for a blacksmith and wagon shop. Being located on a main thoroughfare in a business district considerable work on automobiles and trucks came in for the blacksmith. Gradually work of this nature increased while shoeing and blacksmithing declined.

It was not long, however when the manager of the company realized the future business prospects and turned the shop wholly to automobile and truck work. As a result the shop now has fourteen workmen while formerly but three were employed. Automobile painting and trimming, rebuilding of tops and bodies, also general blacksmith work is being done. Occasionally some work on wagon or carriages is done, but so infrequently it seems odd and curious to the employees.

Some people are not friendly because they are absorbed or absentminded; others are not friendly because they think themselves a little better than other people. Perhaps they are snobs. No man who is living can afford to be without friends. No man who is in business can afford to sacrifice friends. "If you would have friends you must show yourself friendly."

Practical Notes on Drilling

Principle of the Twist Drill—The origin of the twist drill was the twisted flat bar which was usually passed through large turned holes to eject the borings. If two pins are inserted at an angle diametrically opposite to one another, they represent the cutting edges of a twist drill. If now the rod be rotated on its axis and also advanced, the pins will describe a path similar in every respect to the fronts of the two wings of a twist drill, the rod representing the core. These surfaces may therefore be considered as being composed of an indefinite number of straight lines, each making an angle of 59° with the axis.

Angle of Point—The angle of the point of a twist drill is therefore 59°x2=118°, which cannot be changed without making the cutting edges concave or convex. With flat drills the point may be more acute, and is usually made 45° on each side, as in Fig. 1, which also shows a fluted drill, these being the most effective angles for penetration.

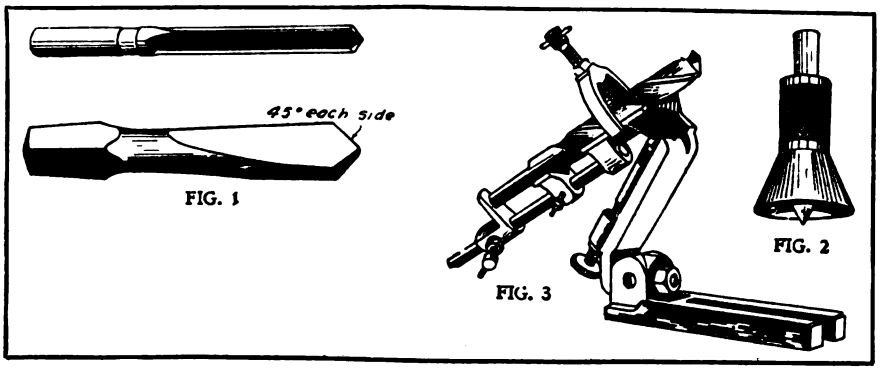


FIG. 1

FIG. 2

FIG. 3

Angle of Clearance—To allow the drill to advance into the work, the end surfaces, or "lips," must be ground obliquely, thus obtaining "relief," "backing off," or clearance. The amount of clearance given affects the solidity; strength and keenness of the edges. It may vary from 3° for drilling steel to 12° for brass, and should be greater in drills of high speed steel, which are fed more rapidly into the work than ordinary drills.

Balance of Point—It is essential that neither of the edges should be longer or in advance of the other, in order that each cutting edge has the same amount of work to do. A slight error in the direction may cause one edge to take all the work, when the drill will run unbalanced or "wobble," cutting a hole larger than its own diameter, and wearing away one of its side edges. It must be understood that the side edges of a drill should never come into operation, but should be preserved, so that the drill maintains its diameter as it becomes shortened by grinding.

The Core of the Drill—The core of the drill is unfortunately necessary to connect the two wings together. The solid nose at the drill point (representing the core) serves no useful purpose, and is the main resistance to the feed pressure. In large drills it is advisable to grind the nose on each side, so as to produce a point resembling the square centre of a lathe. The object of a leading hole is to avoid this resistance.

Leading Hole—It is never advisable where accurate drilling is necessary to use a drill the same diameter as the hole required. It is better, and conducive to accuracy, to use three or more drills for a given hole. The first one should be just large enough to clear the way for the point of the two following drills. It should not be too large, as a following drill enlarging a hole already made is apt to run with considerable vibration and damage the outer corners of the cutting edges. The finished size of a hole should always be described with the compass prior to drilling, as then it can at once be seen if the hole requires "drawing" over, that is to say, whether it is concentric with the compassed circle.

Centering—A common cause of inaccurate drilling is insufficient care in marking off, centering and setting the work. Centering for drilling, should be commenced with a sharply-pointed center-punch, used lightly at first until it is certain that the point of the punch is penetrating exactly in the center of the required hole. After having lightly center-punched, describe the circumference of the hole about this point, and then open the center out to give a lead to the drill. The Bell center-punch (Fig. 2) is used for centering round-bars, and is more accurate than hermaphrodite calipers. The final punch should form a cavity large enough to take the drill nose with certainty.

Correction by "Drawing"—When great accuracy is desired, the job may be chalked and circles scribed from the center, punch-dotting such circles. The operator is thus able to watch the widening cone formed by the entrance of the drill point, and to assure himself that it is concentric with the scribed circles. If not central, the hole may be drawn by chipping a channel in the side of the conical hollow right down to its apex. Any such attempts at drawing can only be effective before the full diameter of the drill has entered.

Lubrication—Whenever a drill runs under considerable feed pressure, a lubricant should be applied to the point, and for deep holes drills with oil channels in the wings are essential. Otherwise the work must be flooded with oil so that some may pass through the mass of borings and reach the point.

"Running Off"—A common cause of trouble is the drill running off owing to lack of alignment between the drill and the drill spindle. If the drill point wobbles, there is difficult in getting it into the center hole, and when pressure is applied the drill may start considerably out of line. There should be no reliance on feed pressure to produce steadiness. Fig. 3 shows the Crowther Reliance drill-grinding jig used for repairing the two cutting edges of a twist drill, both as regards position, length and sharpness. It may be used on the grindstone, or in the lathe. F. J. C., in Work.

Non-Rusting Soldering Fluid—To prepare a soldering acid that will not rust iron, add to a saturated solution of zinc and hydrochloric acid ¼ part ammonia, and dilute the whole with an equal quantity of water. This has been very successfully used on knitting machines in soldering kneedles to their holders where an acid with the above characteristics is essential.

Auto News from all Parts of the Globe

It costs $65.00 to register an automobile in Havana.

France has forty-seven different manufacturers of motor cars.

Four per cent of the world's automobiles are found in Canada.

Rhode Island has sixteen motor vehicles for every mile of road.

Chicago has an "Old Timers' Club" of men of the automobile trades.

Detroit ranks first in the production of low-priced motor cars.

There are no more than twelve motor trucks in Constantinople, Turkey.

The American Legion has organized a Motor Transport Club in New York City.

Since the close of the war 120 new motor truck plants have been established in Kansas City, Mo.

Motor truck freight service out of Toledo, O., has been extended to points in Michigan and Indiana.

Widespread interest was taken throughout Scotland during the recent motor show held in Glasgow.

Merchants in the province of Seville, Spain, have subscribed for $250,000 worth of American motor trucks.

Exports of automobiles and tires, including tires and engines, have in 20 years aggregated $1,000,000,000.

One automobile stage line operating out of Los Angeles, Cal., has 67 buses and carries over 800 passengers daily.

Ruppel's Circus will move about the country this year on a complete fleet of motor trucks of 2½ tons each and trailer attachments.

With 1-116th of the world's population, the United States has ten times as many motor vehicles as all the rest of the world.

The French government presented to the marshals and leading generals of that country the motor cars they used during the war.

Receipts of the automobile divison of the Pennsylvania State Highway department during 1919 reached a total of $5,090,645.69.

In some of the larger rubber tire factories in Akron, O., there are entire departments of mute persons. Their work is of a high standard.

Classed as an expert in pneumatics, Josef Hofman, the celebrated pianist, is the inventor of a shock absorber which has been patented in Europe.

Two companies are planning to operate motor lines along Broad street and adjoining traffic lanes in Philadelphia, on a five-cent basis.

The first transcontinental automobile tour was made in 63 days, between May 3, and July 6, 1903, by Dr. H. Nelson Jackson and Sewell F. Crocker.

Approximately $16,000 was realized in the recent auction sale of Government automobiles, motorcycles and trucks at Fort Jay, Governor's Island, N. Y.

The London "growler" types of horse-drawn cab-drivers are fast disappearing from the streets of the English metropolis, due to popularity of taxicabs.

Representatives from Africa, Australia, New Zealand and South America were strong bidders in the export field at the recent motor show in Chicago.

Glenn H. Curtiss, the inventor of the aeroplane, has a "motor bungalow" which in compactness and serviceability far surpasses any vehicle yet produced for outdoor life.

The State Senate of Kansas recently passed a bill to make the penalty for theft of an automobile imprisonment for from five to fifteen years. The House already had passed the bill.

Prince of Wales Highway will be the name of the road now under construction between Ottawa and Prescott, which will link up the Canadian capital with the highways of New York State.

The Massachusetts Highway Commission, with an international reputation as a leader in matters pertaining to the construction of roads and their maintenance, was formed in 1892.

Last winter during the blizzard in the East "baby" tanks and tractors were employed in New York and Philadelphia to keep the public highways clear by pulling vehicles out of the deep snow.

A new meter device which measures the load placed on motor trucks is being tested at Akron, O. It is applied to the truck and the weight of the load is registered and recorded automatically.

"Roads of Remembrance" is a new type of highway planned in various parts of the country. The scheme involved is planting memorial trees along the roads for men in the service as a national honor roll.

A movement has been started in Great Britian, backed mostly by British manufacturers, to bring pressure upon the Board of Trade to forbid the importation of American-made motor vehicles as luxuries.

During the world war the Canadians distilled a gasoline substitute from waste straw. The Greeks ran their motors on a liquid distilled from trees. In Sweden motors were operated on fish oil. Turkey moved motor trucks on mustard oil, and the Germans used a gasoline substitute not known, but which has a sickly, sweetish odor.

To determine the engine power required to displace the work of horses, a strong horse was employed to wind up weights, and it was found that 22,000 pounds could be raised one foot per minute. For fear of giving undervalue, an allowance of overweight of half again as much was given, which made a horse power 33,000 pounds per minute.

AMERICAN TIRES MAY REACH CONSTANTINOPLE

Many shipments of American goods intended for France will never be sold there, but will find a market farther east, probably in Constantinople.

Automobile tire experts who went over after the armistice felt sure France could absorb vast quantities of this product. But the salesmen found few French dealers unwilling to buy, although the need for tires exists in undiminished strength. Instead of sending their stocks back home, therefore, many salesmen are looking for other markets on that side of the water.

Constantinople offers a market for tires that many disappointed ones in France are preparing to take advantage of. Automobile owners in the eastern city have approached the American Red Cross with requests for American tires, forgetting that the Red Cross is not a trading concern.

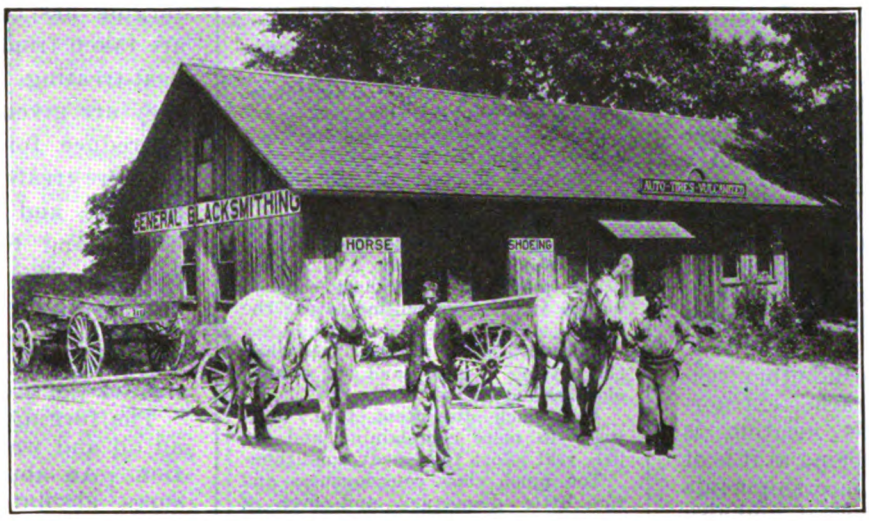
With the demand for tires goes currency able to stand up to the American dollar. Many rich Armenian and Greek merchants in Constantinople own cars, and apparently price is no consideration with them, even at unfavorable exchange.

How One Blacksmith Business Grew

By E. F. ACKER

NEAR Avon, N. Y., at Ashanter, just before you come to the Five Arch Bridge, is one of the finest beauty spots of the Genesee Valley. Appreciative tourists breathe deep in delight and the natives stop daily for a renewed glimpse.

But just at the edge of that beauty spot is a building which may be a gladder sight to the tourist than any scenic grandure. For the signs on the building read variously, Horseshoeing, General Blacksmithing, Auto Tire Vulcanizing, Gasoline, Auto Tires and the like. And "finicky" indeed would be the traveler in distress, who could not find help here. The natives too, finds the establishment a source of interest for he has watched the building grow from a little 26'x30' structure, through one addition, through two additions, to three times its original size. He has watched signs spring up—and a gasoline pump—sees hurrying automobiles where before there were only horses—and now there are further rumblings and he wonders "what Peter's going to do next."



MR. ZIFKA'S SHOP

All these changes, by the way have come in the past two years. And Peter L. Zifka, the proprietor of the shop, declares that they are logical changes—"the sort that are bound to come" So the story of his experience is likely to prove of interest to other blacksmiths who may have been inclined to adopt the slogan "Where do we go from here?"

It looks indeed as though his only reason for moving should Mr. Zifka decide "to go" anywhere, would be to escape the rush of business which which seems to be coming his way.

Six years ago, Mr. Zifka located his blacksmith shop at Ashanter, in the small building first mentioned. For four years he conducted the regular business of the smithy—shoeing horses, mending wagons, tools, etc. Then the trend of the times began to influence his business. It did not lessen the regular trade—it added something and Mr. Tifka tells how it came about.

"Our idea," he says, "has always been to fix a man up, whatever his trouble was—especially the farmers, and we had always been able to give that sort of service. If a farmer broke any machinery, he knew that we would do our best to repair it for him. So we got all sorts of jobs, and were always glad of an opportunity to help. But things began to be different. The farmers were getting automobiles, and they took to bringing their car troubles to us. Then it looked as tho we'd have to take up a new line of work if we were going to keep to our ideal of giving service. So I began to look into the car business."

Mr. Zifka smiled, "But, after all," he said, "I guess my real start came when I got a car of my own. A short time after I purchased the car, a tire was damaged, and I sent it away for vulcanizing. When it came back, with a bill for $2.65, I looked it over and decided that after that I would do my own vulcanizing."

So he sent for catalogs, and books of information, and "started in the vulcanizing business." He says now that it was not a wise method, because he had no way of testing his work, and so had occasional failures. He realizes that he needed to know more about the work. So he left his shop at dull periods to take short courses of instruction at the vulcanizing plants of the various tire companies. Now with increased knowledge, and improved machinery, he can test his work and know when it is right. He now has a successful vulcanizing business.

The next logical step was the carrying of tires, tubes, and tire accessories. He built up quite a business with a tire lining, which he backed up with convincing talk and a satisfactory guarantee.

But people made constantly increasing demands upon him. While busy with tires, he would be called upon to give information and advice about cars. At first, he said "I gave book information". But now, I can talk from my own experience and knowledge. His business is increasing accordingly. But before he made a pretence of doing mechanical work on automobiles, there were some men who were taking their cars to him for overhauling as a matter of course.

Two years ago the first addition of 24' x 26' was built. Last year, another addition 24' x 30' went on. And now he says, there is a prospect of more floor room being added, for workrooms and storerooms. There is a storage room on a second floor now for his large stock of tires and tire fillers.

Some idea of the rapid increase in business may be obtained from his figures. His first venture in stocking supplies was $1000 worth of tires, tubes, and tire accessories, and $250 in Ford accessories. His tire business for the year 1919 amounting to $4000; his repair business to about $2000.

People who know him know that his figures are likely to be accurate, for it is Characteristic of Mr. Zifka to know exactly the state of his finances, and the reason therefore. He knows definitely, almost to the cent, what has paid him and what has been a source of loss, and he isn't planning to restock in any of the latter articles. He keeps his accounts in the simplest possible form and to that end he has devised his own methods. He hhas made some of his own machinery, the idea," he says, is to re-

duce labor at every possible step."

This has been very necessary in his case, for he has been sole proprietor, and in the beginning the only workman. He keeps one man now to work at the blacksmithing, and to help him when an occasion arises, in the other part of the work. All this new business does not cause him to slight his original trade. He is still a horseshoer, and the farmer is his first friend. You are quite as likely to find him at his forge as at the gasoline pump.

Mr. Zifka is proud of his trade, and he has a helpful message for other smiths'. The blacksmith shop, he says, is the logical place for a garage, and the blacksmith is well equipped by his trade to become a successful automobile mechanic.

The good horseshoer is careful, skillful and acquainted with the value, and proper use of good tools. And teh good horseshoer is conscientious. These are the qualifications that an automobile repoirer needs, first of all. The rest will come by experience.

"And the Blacksmith", Mr. Zifka adds, "has the chance to get his experience gradually, as I did", without the financial loss entailed by "setting up a shop" with useless and expensive equipment, and without the damage to his reputation as a result of doing unskilled work. In dull times he has his trade to fall back upon.

But there seems to be other reasons for Mr. Zifka's rather extraordinary success. His location is especially fortunate, being at it is at a railroad station where shipments can be easily taken care of, and also on a state road two miles from the nearest garage. There is also no other smithy within two miles.

Still this location could be considered a disadvantage, and would be, to some. But in Mr. Zifka's ability to see and utilize the possibilities of a proposition, lies one secret of his success. He has also the fortunate ability to see and acknowledge his mistakes, as is shown by his remarks about the vulcanizing. Also, he is constantly seeking knowledge about anything pertaining to his business.

With all this, he seems to have a conscience about his business. How many men would have undertaken to give "book information" when they saw that their own knowledge was insufficient. I have heard him say a number of times "I really don't know." So that when he says he does know, people are inclined to believe him.

He says that the secret of success is "service." "Give a man good service, no matter what he wants. It may be new tires, or perhaps it is only a bolt, but if he doesn't get the bolt from you he'll go to the other fellow, and the other fellow will sell him the tires. But if he gets the bolt from you, he'll come again and more than that, he'll tell his friends to come." Mr. Zifka tells of an instance in which a friend of a customer of his came thirty miles to have him treat a case of lameness in his horse. Mr. Zifka was glad to give his afternoon to the case. Needless to say, that sort of service pays, and perhaps accounts for his popularity among his customers.

But after all, the biggest reason for Mr. Zifka's success is his great capacity for work. During all the day, and every week day, he is at the shop. You will always find him ready to talk business-but not much else than business "in hours." His accounts are taken care of evenings, and this he does himself besides, he finds time for much reading and studying of matters pretaining to his work. In his readings he finds much of inspiration also, and it is only fair to say that he considers this an important item in his success.

Don't knock your competitor. If he does poor work, people will find it out sooner or later without your assistance.

THE MATTER WITH AMERICA

WHAT'S the Matter with America" these days?

Too many diamonds, not enough alarm clocks.

Too many silk shirts, not enough blue flannel ones.

Too many-pointed-toed shoes, and not enough square-toed ones.

Too many serge suits and not enough overalls.

Too much decollete and not enough aprons.

Too many satin-upholstered limousines and not enough cows.

Too many consumers and not enough producers.

Too much oil stock and not enough savings accounts.

Too much envy of the results of hard work and too little desire to emulate it.

Too many desiring short cuts to wealth and too few willing to pay the price.

Too much of the spirit of "get while the getting is good" and not enough old fashioned Christianity.

Too much discontent that vents itself in mere complaining and too litle real effort to remedy conditions.

Too much class consciousness and too little democracy and love of humanity. Fargo Forum.

THE HEAT TREATMENT OF DROP FORGINGS

In gas welding the operator has often to weld parts which have been drop or die-forged so that the operations followed in heat treating these forgings at the factory have a significance for the man who later has to weld them.

The forging heat of the part is so far above the average critical temperature that it is necessary to heat treat the steel after the forging process to restore its physical properties; all forgings which will be subjected to severe shocks or strains, should, therefore, be properly heat-treated. Simply allowing the forging to cool from the forging heat is by no means proper heat-treatment. Heat-treatment begins after the forging has cooled. The forgings are taken from the hammers to the heat-treating department. Here they are given a preparatory heat to reduce forging strains. Next they are treated to the critical temperature and quenched and then drawn and tested to the proper hardness. This hardness is the proof of the suitability of the forging for the wear and strain of actual use. The forgings are then pickled to remove the scale.

The forging is then subjected to an oil and water quenching operation. An abundance of water insures absolutely uniform cooling and consequently a uniform hardness.

After the forgings have been heat-treated, it is necessary to heat them again to reduce the quenching strains, and prepare the metal for the machine. This is known as the "draw-heat," and is considerably lower that the critical temperature. After the forgings have remained in this heat for the required length of time, they are removed from the furnace and allowed to cool in the air.

LOOKING AFTER THE SPARE

We have said it before, but we again reiterate it: When you fit a new casing, do not carry it as a spare. Put it to work at once. A new casing on the spare is a temptation that few thieves can resist. When it is on the wheel they are not as apt to steal it.

Queries-Answers-Notes

THIS department is the meeting place where you are free to ask for information, answer questions, discuss shop matters and business conditions and any other notes you feel would be of interest to a fellow mechanic. Make use of this Department as often as desired.

Speed of Grind Stones:—What is the proper and safe speed at which to run a grindstone, At one time, I saw an emery wheel break while running at a high rate of speed and from the damage it did, I would not like to have anything like that happen in my shop.

Fred Schultz, Pennsylvania.

Grindstones used for grinding machinists' tools are usually run so that they will have a peripheral speed of about 900 feet per minute, and those used for grinding carpenters' tools are run at about 600 feet per minute. With regard to safety, it may be stated in general that with any size grindstone having a compact and strong grain, a peripheral velocity of 2800 feet per minute should not be exceeded.

Blacksmiths should be better paid:—I would appreciate having you give these lines space in your valuable columns, as I believe if the majority of the blacksmiths would give the matter a little consideration, they would agree with me. When compared with other trades, there seems little use, as far as money returns are concerned, in hammering away one's life as a blacksmith. Take for example the brick masons. They get $1.25 an hour and won't start on a job without the guarantee of at least $10.00. All of their tools would not cost $25.00. The carpenter, too, gets a dollar an hour, and in our locality most any one who can drive a nail or saw a board can get a job. We spent as much time learning our trade, as many of the professional men do, but there is a decide difference in the renumeration. I do not mean to be harsh in my criticism of the garages, but in would seem that a goodly number of them are started by persons with very limited mechanical experience. The most annoying part of it is that they seem, in spite of it all, to be getting a great many of the larger jobs, which should by rights belong to the blacksmith. The little jobs which they don't care to bother with are brought to our shops, and then if you charge them but a fraction of what the other fellow would charge, the customer will holler his head off. My experience with the garage men is that they spoil about as many acetylene welding jobs as they improve or successfully repair, all for the simple reason that the men doing this kind of work do not thoroughly understand it. Difference in metals seem to mean nothing to them and as a result of their poor work many people are prone to unjustly condemn the acetylene welding process.

We are supposed to know how to repair anything that is brought into the shop. We spend a much longer time in acquiring that knowledge than many of the other trades people, and still we seem to be paid the least. Besides that, we have to have from one to four thousands dollars invested in tools and equipment. I certainly would like to know why we can not be paid consistent prices for intelligent services.

Another point on which I would criticize many of the blacksmiths is on their policy of extending credit. As for myself, I do not keep any credit books. All work is strictly cash. A person may loose some trade but he might better loose the trade than to lose the time and the material tha is put into the job.

R. M. Adams, Nebraska.

AFTER 29 YEARS WITH HORSES HE PLANS GARAGE

A. A. Knapp, 70 years old, for the past twenty-nine years, owner of a livery stable at 814 North boulevard, Oak Park, the last of the suburb's livery owners to acknowledge the supremacy of the automobile, announced today that on May 1 his stable, which now houses but three horses, will go out of business. The building will be remodeled and Knapp will reappear in business as the owner of a garage.

"I just had to give up the old horse stable," said Mr. Knapp. "Ten years ago I stabled about sixty horses and rigs, but at present there are only three animals in the stalls. The automobile has come to stay and I am going into that business.

"In the old days every one in Oak Park who amounted to much had his horse and rig. Now the old folks have mostly passed away and the new generation wants speedy cars."

Knapp's livery is at present the only one in the suburb.

Making a three Horse set of doubletrees: We have been called on to make a three horse set of doubletrees for a manure spreader, and are at a loss as to what the measurements should be, so that each horse will be able to pull an equal amount of the load. Though we have made any number of singletrees and doubletrees, we have never been called on to make a three horse set. We would be deeply obliged for a rough sketch or in fact any information on the subject.

Adam Wetzel, New Jersey.

Editor's Note:—If any of our readers could assist Mr. Wetzel, we would appreciate it.

A Lubricant for Cutting Threads—After trying various kinds of lubricants in cutting threads on tool steel, machine steel, etc., I found that common lard (not lard oil) mixed with about one-third turpentine gave the best results. The mixture may be applied with a small brush.

Imitation Ground Glass—To make ordinary glass in windows or the camera appear as ground glass take a lump of glazier's putty and dab the surface of the glass with it. The result will be a good imitation of the real article.

Trouble With a Circular Saw—I would like to ask a few questions through your journal, in regard to circular saws. I have a woodworker with a 12″ and 14″ saw, and I do not get the service that I should from them. The belts are tight and the saw runs at the proper speed. I presume it is in the dressing. Should the teeth be swaged or not? I have noticed swages on the market and judging from their size, they seem to be intended for small saws, although the only saws that I have ever seen that really could be called swaged, are large ones. The saw seems to get hot and warp. Someone suggested that I get a heavier gauge saw. I could not do this with out getting one made to order. Would a heavier saw be better? The table is square with the saw and there seems to be ample power and speed. The trouble is that I have to press to hard to make the saw cut. I think I have enough set in the saw, although when properly set, it seems as though the teeth are to narrow to cut all the wood between the teeth. Do I need a swag, and are saw filers and guides necessary for a good job.

G. N. S., Ohio.

In answer to the above inquiry regarding brother G. N. S.'s. saw, I am somewhat at sea. However, if the saws are of reliable make, and the work being feed in with the proper alignment to the saw, I would say that the saw required more set. If the saws have been repeatedly heated they have lost the vitality that a saw should have to work properly, especially in hard wood. As to swaging the teeth, that is not necessary.

H. M. Mack, Oregon.

Offers a Thousand Dollars If You Can Beat Him—In looking through your February issue of 1917, I found an article written by a Mr. Stephen Lovejoy, who claims to be the champion horseshoer, and as all horseshoers know, that is saying something. I do not claim to be the champion horseshoer of the world, but I do say that I will place $1,000.00 with the American Blacksmith as a wager, that I can fit up, trim down and put on more shoes at a hundred percent perfect than any man in the world. I will go any place in or out of the United States. Losser to pay all expenses. The contest to be judged by not less than two Veterinary Surgeons and three Master Horseshoers. My best time on record was done at Mt. Carmel Ill., in April, 1917, when I shod a team of four year old colts that had never had their feet handled. I shod them all around with shoes having heels but no toes and completed the job in a little less than 35 minutes. Besides 22 other witnesses, Dr. E. C. Miller, Veterinary Surgeon and Dr. Sam Smuthers, Asst. State Veterinary Surgeon were present. I have been practicing horse shoeing for 47 years and in that time I have worked for 1114 blacksmiths and have drawn a salary of $25.00 a day for floor work alone. At Mason City, Iowa, I floored for four months for first class fitters. Their names are Joe. Goeltz, Dan. Hekocke and Ed. Schinstine. I am 54 years old, stand 5 ft. 5½ inches and weigh 170 pounds. If you can beat me drop me a line. I am open to the world.

M. D. Settle, Box 11, Morton, Ill.

Making a Home-Made Radiator—Please tell me, if you can what gauge metal is used for making auto and tractor radiator tubes? I am thinking of making a home-made radiator. Would zinc be a satisfactory material to use?

S. E. F., Nebraska.

Zinc is not a good metal to be used for the purpose of making radiators. In the first place, zinc is a material, which is easily corroded, which in itself makes it unsuited for that purpose, then too, it has a tendency to be brittle, has a low tensile strength, and does not possess the heat radiating qualities of either copper or brass. Its use is, therefore, disadvised. The upper and lower tanks of a radiator are usually made of brass, while the tubes, and fins, are ordinarily made of copper. The thickness of the material depending on the size of the radiator and the purpose for which it is going to be used. The usual range being from 22 gauge upward.

Tempering Plow Point—I wish to get information regarding case hardening soft center plow lays, or the best methods of tempering lays for use in sand and gravel. I have about 75 customers, whose farms have his kind of soil. A lay only lasts for from three to five acres, and then it is necessary to dress it up and temper as hard as possible. I should think that the point should last for at least 20 to 40 acres, if the right material and proper tempering methods are used. Won't some brother smith help me out?

C. C. S., Iowa.

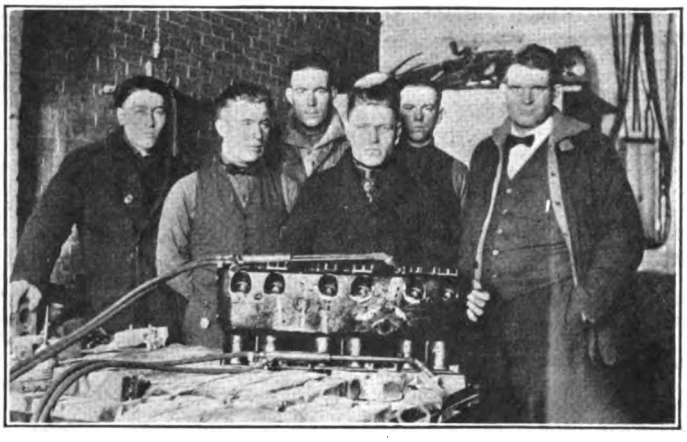
STATE COLLEGE TEACHES WELDING AND AUTO REPAIRING

Just a few lines to let you know what we are doing in the Auto Mechanics Department of our school. The course runs from September to June, but as some of the students are from the farm, they are needed at home to help with the spring work. Therefore, we have a large attenddance, especially from November until March, there being at that time about 112 enrollments. Many of the students take up tractor work and ignition, but in order to be able to do any of the common jobs that come to the garage, they are required to take up welding, as this runs parallel with the auto mechanic course. The ones who specialize in welding must have seventy hours of field work besides learning how to weld different metals and solve different welding problems. There are thirty of these problems, fifteen of cast and fifteen of mild steel, which become more difficult, as the student advances in his line of work. They also have examples in expansion, contraction, brass, malleable, aluminum and many other metals, that in some way or another pertain to the welding craft. After this is all accomplished, we study field work and handle many out side jobs which give the students experience in welding. We weld crank cases, cast or aluminum and cylinder blocks, no matter how large. We have a preheater 5′ square by 30″ high made of brick. It answers the purpose very nicely. We also do welding for two garages and one blacksmith shop. This in connection with our farm welding keeps us busy most of the time. Many of my students have secured positions and made good. I hope that in the near future there will be more schools where welding and field work can be thoroughly taught and which will as a result bring forth more first class men for this work. It certainly is absurd to hear some people tell others that they can learn the welding game in 24 hours, but take it from one who has found out the different classes of welders, and make up your mind that there is a great deal to learn in order to become an efficient welder.

One man told me that he could teach the welding game to a person in 24 hours. Well, may be he can—but I'm from the "show me State."

I would like to hear from any one who has done some new jobs of welding, through the columns of your paper. I must say that the paper is a good one, and the articles are fine, especially the ones on welding by Mr. Baxter. Let's have more of them.

R. H. Anderson, Instructor in Welding.
Brookings, S. D.



INSTRUCTOR AND STUDENTS IN WELDING. STATE COLLEGE, BROOKINS, S. D.

Preventing Cylinder Head Gaskets form Blowing Out: Can any of your readers tell me of any preparation I can obtain on the market, or make, to prevent cylinder head gaskets from blowing out. I have an engine that gives me constant trouble. I have tried chipping, using shellac and etc. —all to no avail. Also, can you tell me something that I can put in the water jackets of a marine engine to eat out the rust? This rust has swelled so that it has not only cracked the outer jacket, but it has distorted the inner walls of the cylinder as well. Could any compound or acid be put into the water jacket to eat out this rust, and still not attack the cast iron of the cylinder? I hope to hear something from the Editor or the readers on these two subjects.

J H Chiappa, New Hampshire.

We believe the cause for the cylinder head gasket blowing out, due to the fact that the cylinder head may have become warped, as the result of the motor having become overheated at some time. A cylinder head, which is in that condition, bears on the gasket only in places, instead of all over, thus leaving portions of the gasket exposed to resist the entire force of the explosion. Such a condition of the cylinder head may be readily detected by placing the head on a surface plate and observing whether or not, it lays flat.

A thickness gauge is very handy for this purpose. As when the head is laid on the surface plate the thinner blades of the gauge may be slipped between the the head and the surface plate, thus disclosing any irregularity that could not be detected from a visual inspection.

We are wondering whether this is a condition which has recently developed, or whether it is a difficulty that has always been experienced with the motor in question. If the latter is the case, it occurs to us that it may be the result of faulty design, as the cylinder head cap screws may be placed too far apart. Most probably, however, it may be traced to the former condition. No compounds of any kind are necessary to hold a properly designed and made gasket in place.

Strong Caustic soda, or a weak solution of muriatic acid should dissolve the rust in the water jackets. The condition you mention, in regard to rust, is by far the worst that has ever been called to our attention.

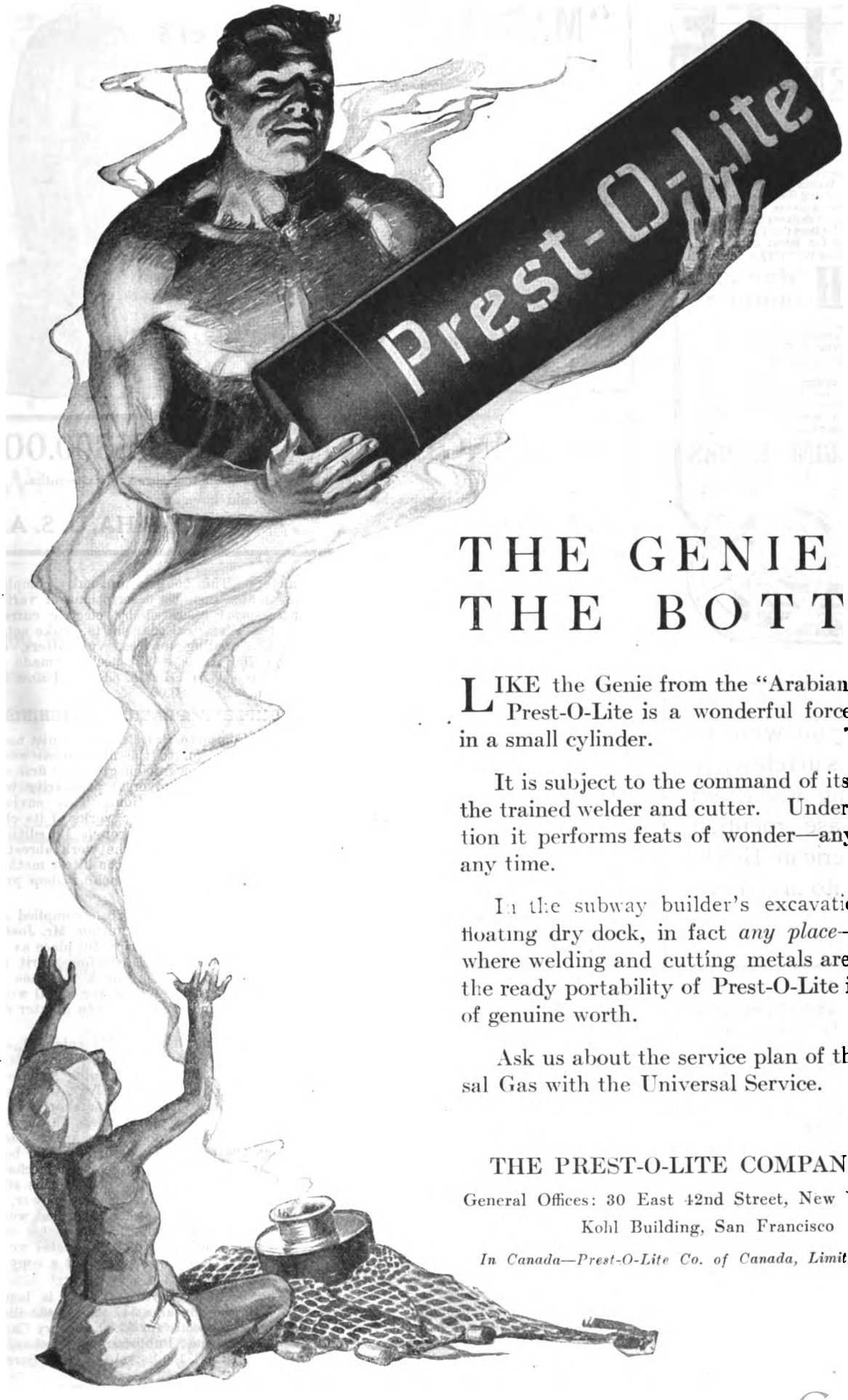
Gear Measurements:—Would you kindly tell we through your paper, the difference in the phrase diametral pitch and circular pitch, as applied to spur gears? What is the meaning of a stub tooth gear?

Alex. Moreau, Iowa.

The circular pitch of a spur gear is the distance measured along the pitch circle from the center of one tooth to the center of the adjoining tooth. It is obtained by dividing the length of the pitch circle by the number of teeth in the gear. Diametral pitch is the number of teeth per inch of pitch diameter. For example, a gear having a pitch diameter of 10″ and 40 teeth, the diametral pitch would be 4. Stub tooth is a term applied to a gear having a tooth height proportionate to a certain diametral pitch and a tooth thickness proportionate to a lesser diametral pitch . For example, the gear might have a tooth height which would be proportionate for an 8 diametral pitch gear and a tooth thickness of a 6 diametral pitch. Thus it is apparant the gear would have a short thick tooth Such gears are usuallly used in automobile transmissions.

Advertising In Verse: In a recent issue, I saw an article entitled, "Advertising in Verse" by Ernest A. Phillips, and thought I would send the ad, we run in our local paper. Business in our locality is very good. We are on the jump every minute.

Adam T. White, Maryland.



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The new plant when completed will be the most modern of its kind in existence and will afford greatly improved manufacturing facilities with increased output making it possible to give our patrons more prompt and better service in every way. For the present, and until the new Buffalo plant is completed the Fowler plant will continue to operate at Seymour, Conn., as the Fowler Division and the Union plant will continue to operate at Chicago as the Union Division, the control and management to remain as formerly.

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The book measures 5¼x7½, is bound in cloth and contains 547 pages, 432 illustrations, and sells for $3.00. Henry Carey aird & Co., Inc., Publishers of Mechanical and Industrial Books, 116 Nassau Street, New York, N. Y.

Three Generations Represented at Auto School

By D. G. BAIRD

SHADES of Doctor Osler! A man seventy-one years old is learning a new trade! Not only so, but his son, twenty-three years old, is also learning the same trade and in the same school. Further more his gradson, nineteen years old, is doing likewise and in the same institution.

"Take the sum of human achievement in action, in science, in art, in literature; substract the work of the men above forty...we would practically be where we are today." But the poor doctor has been misquoted enough and this is only one of the many cases which go to show that the age of forty is far within the age limit which measures a man's days of usefulness.

At any rate, the Detroit Institute of Technology is about to enroll in its list of graduates of the automotive school the names of James A. Watson, Montrose, Colorado; Forest Watson, his son, also of Montrose; and Albert Allman, of Washington, D. C., who is a grandson of James A. Watson.

It seems that this lively grandfather has always been progressive. Many years ago he heeded the adadvice of Horace Greeley to "Go West, young man, go West," with the result that he became a farmer near Montrose, Colorado, where he has since lived. But having heeded the advice of the great orator and gone West and grown up with the country, at the age of seventy-one he has decided that the admonition is no longer applicable to him and has come back East to begin over again.

At their home near Montrose, Watson and his son had always tilled the soil; but both of a mechanical turn of mind and when the son decided to go into the automobile business, the father likewise became interested in this greatest of all industries.

The farm, together with the stock and equipment in general, was sold and the father and son began to study the literature of the automotive schools of the country. They finally decided in favor of the Detroit Institution, located where automobiles are made, and they journeyed "Back East" to prepare for their new vocation.

Both liked the work from the first, and after they had got well started in their course they became so well pleased that their enthusiasm spread to Washington, D. C., with the result that Albert Allman, a grandson of James A. Watson, immediately became interested.

Albert was working as a grinder of optical lenses at the time, but he could not see much future in that trade. He could see a future in the automotive field, he thought, so Albert too journeyed Detroitward for the purpose of becoming a skilled automotive man.

At the present time these three men are nearing the completion of their course and are planning to go into business together. They have been unusually proficient in their studies and practice. All of them are very much interested in their work and all are anxious to "get on the job" in their own garage. They expect soon to form their own company, start a sales and service station at some place where the field is promising, and to make good.

And there is no doubt that they will "make good," for in addition to their training they will take to their new work a determination to win that cannot be daunted by the accumulating years.

The fact that these three representatives of one family should be taking the same course in the same school at the same time is, indeed, interesting and unusual; an incident the like of which has seldom, of ever, occurred before. But even more worthy of mention and admiration is the remarkable vision and courage of James A. Watson, the grandfather, a man who, after living more than his three score years and ten, still possesses youthful vigor and the desire to do things in a big way.

When most men of his age are considering themselves as past the working period of life, this young man of seventy-one, after having done one life-work and done it well, is now setting out to conquer new fields.

To look at Mr. Watson, to watch him at his work, to catch the gleam of enthusiasm in his eye, one would never suspect that he is more than fifty years of age. He is a "young man of seventy-one" because he insists on remaining young and playing his part in the great game of life.

FLUX AND ALUMINUM WELDING

It is often said a sound weld cannot be made in aluminum without a flux which will destroy the oxide. Aluminum oxide is very resistant to the action of any acid or alkali, even at high temperatures. The danger in using some kinds of flux is that an excess, unless removed in some way, will damage both the metal and the weld itself.

In the case of cast aluminum it is often advisable to thoroughly puddle it without any preparation, except wiping off the dirt and grease. There is an additional advantage in not making a V at the break in the case of aluminum, which is that the sections are generally thin and the contraction of the weld is better resisted by the piece being allowed to remain its full thickness, although of course the contraction is not entirely avoided.

In welding thick pieces of aluminum the work must be done from both sides. In this case too much of the welding should not be made on one side at once. It is better to weld, say 2 inches, on the first side, and then turn the work over and finish welding the 2 inches on the other side, then proceed along 2 inches further and again turn the piece over and weld 2 inches more on the first side. The reason for this is that aluminum is somewhat brittle near the welding temperature, and cracks are likely to develop, particularly in a long weld, if all the weld is made on one side first and then finished on the other. On account of this brittleness a weld in aluminum must be made quickly.

If you want information, a special favor, or help of any kind, get as near up to the head of the line as possible. The whipper-snapper at the door will assume the airs of grand duke. It's the big man who is kindly, interested, helpful and genuinely intelligent. That's why he is the big man.

AMERICAN BLACKSMITH AUTO & TRACTOR SHOP

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WILLIAM F. WENDT, *President.* L. J. WISCHERATH, *Editor.*

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FEDERAL TRADE COMMISSION'S REPORT ON THE GASOLINE SITUATION

The Federal Trade Commission recently delivered to Congress its report in response to House Resolution which directed the Commission to investigate the causes of the advance in prices of gasoline, fuel oil, kerosene, and other refined oil products; and to report also as to any combination or restraint of trade existing in the industry, as to profits and as to the sources of crude oil supply of the United States.

The conclusion of the Commission may be briefly summed up as follows:

1. It seems that there is greater justification in assigning the advance in price of crude oil and petroleum products to varying conditions of supply and demand in the light of emphasized and pessimistic statements as to future of supply, than to a combination in restraint of trade. The Commission has previously reported upon competitive conditions in the oil industry. Nothing has been developed in the course of this inquiry which shows a change in the conditions so reported.

2. It is probably true that the recent advances in the prices of petroleum products, (gasoline, kerosene, gas oil and fuel oil and lubricants) have been due primarily to the strong demand for such products coupled with the difficulty of many companies in getting adequate supplies of crude oil, the increased prices thereof and the increase in other expenses of operation.

3. The explanation of the men in the oil industry regarding the reasons for the advances in the prices of crude oil—namely, the strong demand for crude oil, the decline in stocks, the increasing consumption during the last half of 1919, and the decreasing production during the last quarter of 1919, the increased costs of drilling and producing crude oil and the unfavorable developments in the Mexican oil field—has substantial force, especially in 1919, but it should be noted that the conditions in 1920, appear to have greatly improved with respect to production and imports. It is also the opinion of the Commission that the phychological factors in the situation were more important than the actual statistical position, the mental attitude of the oil trade being strongly affected on the one hand by the frequent statements that there was an impending decline of production in the United States, which was aggravated by the sudden slump of North Texas output in the middle of 1919, and the unfavorable development industrially and politically in Mexico in the autumn of that year.

4. Taking the refining branch by itself, it is not possible to say at present whether the advance in the prices of petroleum products (gasoline, kerosene, gas oil and fuel oil and lubricants) were disproportionate to the advances in crude prices, because this question can only be determined from the aggregate profits of operation of refineries and the available data so far obtained are inadequate to answer the question. For the same reason it is impossible to show what the profits of the integrated companies (which have a large crude production of their own) have been in 1920, though in 1918, the profits of many of the large oil companies whether producers, refiners or distributors of oil, were large.

The following are the recommendations made by Commission:

(1) While the production of crude oil in this country is still on the increase and the present sources of supply appear to be adequate for some time to come. The probable gradual decline of crude oil in the remote future, according to the general prediction of geologists and the men engaged in the industry makes it seem the part of prudence to encourage those engaged in the oil industry in this country to develop production in such foreign counries, which have oil resources, as are most available for furnishing supplies of oil and that such enterprises should be given all proper diplomatic support in obtaining and operating oil producing property.

(2) In view of the excess of present consumption over production from domestic sources and the increase of exports despite this deficiency, it seems that the natural resources of the United States are being depleted more rapidly than would be the case were the products of these resources applied first to domestic needs and that the diminution of stocks on hand due to export, contributes to an increase in cost to the domestic consumer. We suggest that the Congress consider whether the situation does not indicate the advisability of its consideration of restriction upon the exportation of domestic crude oil and its products.

(3) Wasteful methods in drilling for oil should be a subject of special study in its technological, economic and legal aspects with a view to discovering what remedies may be possible through State legislation or otherwise.

(4) The study of more economical methods of utilization, the scientific determination of the possibilities of oil shale, and the availability of substitutes should be provided for in the appropriations to the government establishments specially conversant with these matters.

(5) The great importance of information regarding changes in industrial and commercial conditions, in the oil trade suggests the need of making provisions for having such information currently collected and reported for the use of Congress, the public and the industry; such work should be entrusted to a body equipped to deal with industrial and economic questions and possessing adequate powers with respect to obtaining and verifying reports made by the various branches of the industry.

New Punishment For Speeding—District Attorney Roman Heilman of Madison, Wis., has planned a unique campaign against reckless drivers. He proposes to fine the driver of the vehicle, but the punishment is not confined to the pilot, but extends to include the car as well. Future speeders will not only pay costs, he says, but will be compelled to give up their cars for a period of as many days as the number of miles per hour by which they are exceeding the speed limit when the arrest is made.—Motor Life.

Summary—July, 1920

Automobile Accidents

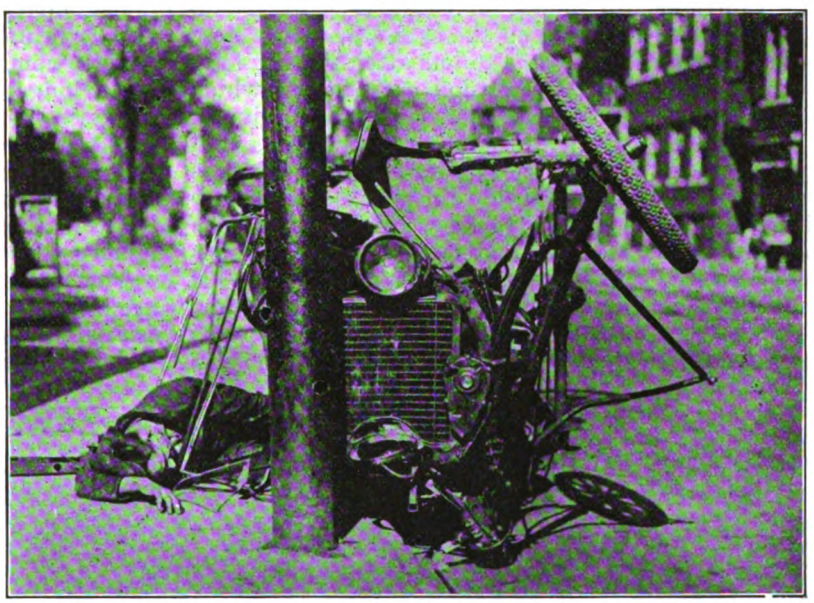
Courtesy of the Travelers Insurance Co.

The increasing number of automobile accidents is attracting widespread attention, so much so that one authority has very appropriately said that our Monday papers are used almost entirely to report the fatalities of the preceding day. The best interests of all who are associated with the automobile industry, be he manufacturer, dealer, repair-man or owner, are best served only through its safe and sane use. It behooves all of us to do our part in either removing or curbing the contributing causes.

DURING the year 1902, when automobiles first began to appear on our streets and highways, two fatal accidents were reported in the State of Connecticut. During the next year, three fatalities occurred, and the increased use of automobiles since that time has been accompanied by a corresponding increase in the number of accidents. With the growth of the traffic, many efforts have been made to insure safety both to automobile operators and to pedestrians; but the experience of recent years shows that the measures thus far taken have been woefully ineffective. There were 175 fatal automobile accidents in Connecticut during 1919. In the same period, the records of New York State showed that automobiles caused the deaths of 1,270 persons, and New Jersey reported 227 fatal automobile accidents. No accurate figures are available for the United States as a whole, but competent authorities estimate that in the entire country no less than 12,000 deaths were caused by automobiles during 1919 alone.

The lists of automobile accidents in our daily papers are comparable in length with the casualty lists that appeared during the recent war, and in certain sense they are even more impressive and awful, because our war-casualty lists represented men (and women) who sacrificed their lives in a patriotic cause and for the attainment of a noble purpose, while our automobile accidents have killed multitudes of men, women, and little children, who were engaged in peaceful pursuits with no thought of harm or danger. These deaths on the streets and highways have achieved nothing, and have brought only sorrow and suffering.

The accidents occurring outside of our towns and cities on Sundays are more numerous than those of any other day of the week, probably on account of the increased traffic on the highways. Sundays instituted and observed as a day of rest, has unfortunately become a day of eternal rest for many persons who were merely seeking innocent and healthful recreation.



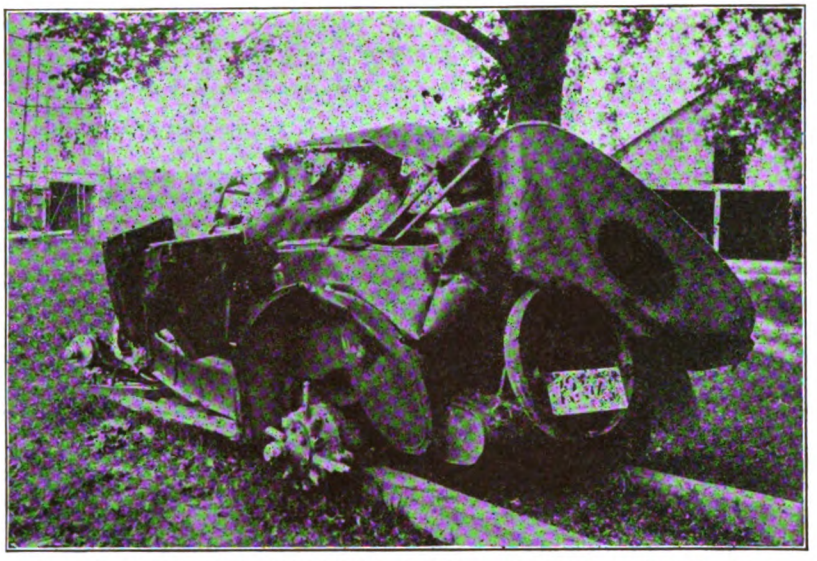
RESULT OF A COLLISION WITH A TROLLEY POLE

The man here shown was posing for the photographer, to illustrate the consequences of the accident.

The causes of this wanton waste of human life are many. The problem of reducing the death rate is a difficult one, with numerous angles and phases; and although it is now receiving serious and thoughtful consideration from many sources it merits far more attention. It is, in fact, one of the most important safety problems now before the public. In the early days of motoring, pedestrians crossing the street in front of oncoming automobiles were largely responsible for many of the accidents. Campaigns against carelessness in this respect have measurably reduced the frequency-rate from this cause, but negligence on the part of pedestrians is still responsible for many of the injuries. The reckless driver and the speed fiend are specially potent causes of fatal automobile accidents, however, and unless more stringent legislation, that will govern the issuing of operators' licenses, is enacted and enforced, automobile fatalities will doubtless continue to increase. Such legislation should not only provide for a thorough investigation of an applicant's character and fitness to operate a motor vehicle on the public highways, but should also include some adequate provision for suspending or revoking the license of any operator found guilty of recklessness on the road,—without waiting for the accident to which such recklessness inevitably leads. We are of the opinion that many of the laws of this kind that now exist need more "teeth".

The new law in the State of Connecticut compelling taxicab owners to provide a $5000 indemnity bond for each taxicab in service appears to be a step in the right direction, in affording protection to the public against recklessness.

Accidents on main highways in the country frequently traceable to recklessness or thoughtlessness



THE RESULT OF A COLLISION WITH A RAILWAY TRAIN AT A GRADE CROSSING

The automobile was struck by the train, rolling over three times before it came to rest.

on the part of a driver in attempting to pass another car at an unsuitable place, such as on a curve or at the peak of a hill. No driver should ever attempt to overtake and pass a car until he has a clear view of the road for a considerable distance ahead, so that he can be entirely sure that there is no danger of colliding with a vehicle approaching from the opposite direction. Nothing should be left to chance. A person who fails to observe this rule should be prohibited from operating a motor vehicle on the public highway.

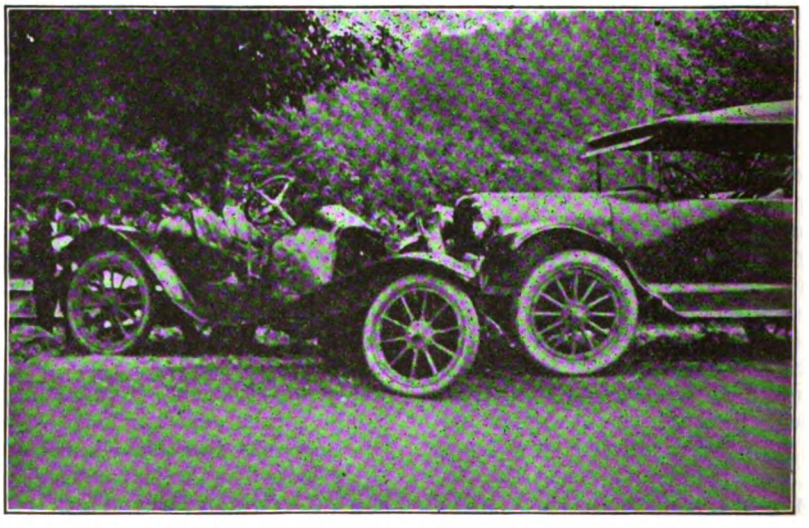
In the city, collisions frequently occur at intersecting streets because drivers do not observe the rules of traffic. Cutting corners, cutting-in-ahead, and failing to grant the right-of-way to another driver who is entitled to it, are largely responsible for these accidents. At intersecting streets the use of the so-called "silent cop" helps to prevent drivers from cutting corners.

Granting the right-of-way to vehicles approaching from the right is a good rule to follow, but any rule of this sort is suggestive only,—through its strict observance, it helps wonderfully in the event of a suit for damages! Every driver is expected to exercise reason and common sense when operating a car. First and foremost, he must avoid the accident, and in order to do this it is often necessary for him to use his right-of-way with judgment and with such limitations as the conditions may call for. One authority suggets that each driver operate his automobile as though the "other fellow" were the biggest fool on earth,—and we are not sure but this principle is a good one to follow. Where it errs, it certainly errs on the safe side. In a case that came to our attention not long ago, a collision occurred in which three persons were badly injured. Court proceedings followed, and when the driver of one car was asked if he did not see the other car coming, he admitted that he did, but stated that he did not stop because the right-of-way was his and it was "up to the other fellow to do the stopping." In this this particular instance, the brakes on the "other fellows" car failed to work and he couldn't stop.

There appears to be the usual amount of tire changing in the Spring and early Summer months, very likely because the rubber deteriorates during the Winter months, so that it can not long withstand the strain to which it is subjected, when the car is placed in service again, after being stored through the cold weather. Whether this impression is well founded or not, it certainly is common to see a car parked on the road, while the driver is busy changing a tire. When it is necessary to stop on the road to do work of this kind, or to make repairs, a driver must be careful to park his car on the right side of the road, out of the traveled portion and in such a place that he can get a clear view of the highway in both directions. Many parked automobiles have been wrecked simply because the drivers of approaching cars could not see the obstruction in the road until it was too late for them to stop.

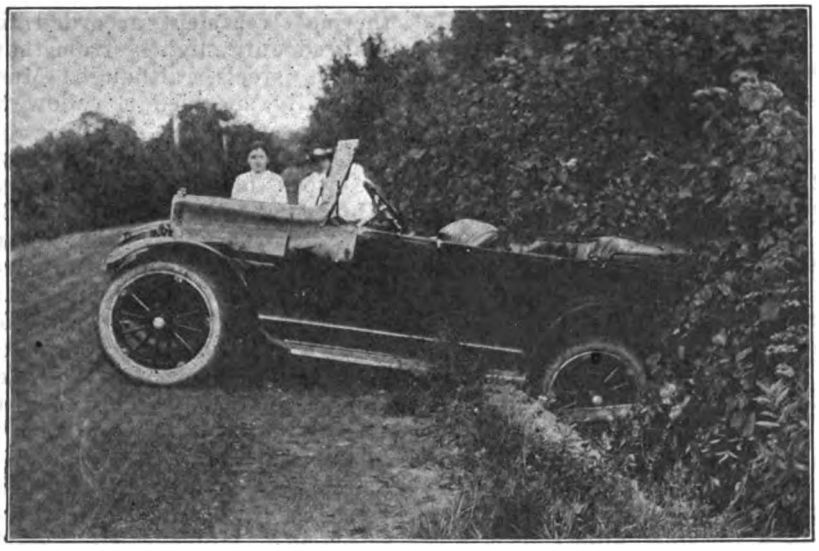
These particular accidents causes, and certain others that are perhaps equally common, have been known for a long time, and the public is well aware of the fact that they lead to serious consequences. Something also has been done in the way of inducing automobile drivers to avoid these special dangers, but much still remains to be done.

The driver and the pedestrian are largely responsible for our long list of automobile accidents, but there are certain accidents pro-



A HEAD-ON COLLISION DUE TO RECKLESS DRIVING

The car on the right was progressing at a reasonable speed, and was over on its own side of the road, as far as it could get. The other one came around a curve at a speed so great that it could not keep to the right. It swung to the left, with the result here shown. The men in the small car quickly removed their number plates and ran away; but the numbers had been noted, and the driver was afterward identified.



LOOK CAREFULLY, BEFORE YOU BACK UP

The driver of this car desired to turn around, and backed into some bushes in the course of the operation. It happened that they concealed a deep ditch, and the chassis of the car came down on the sharp edge of a stone wall.

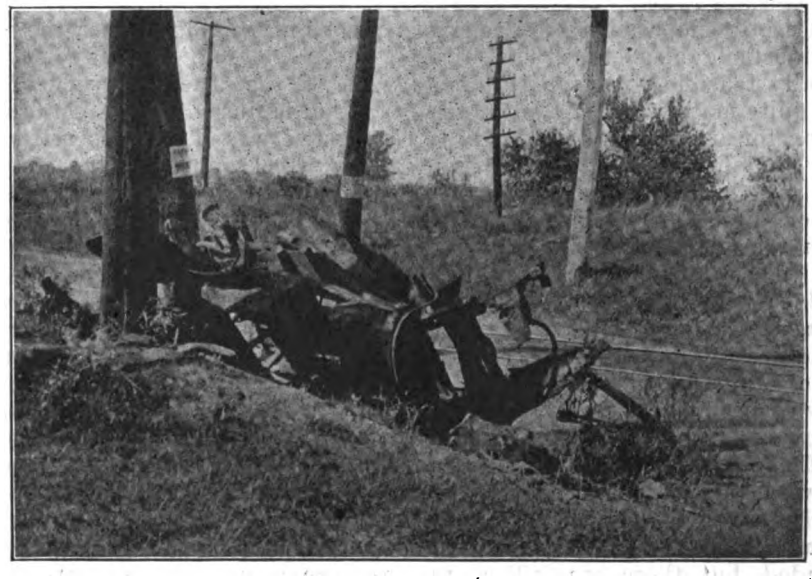
ducing factors over which neither of these persons have control. An accident is more or less likely to occur, whenever a car is moving too fast to be stopped within the distance to which the driver can see. Passing on a curve or at the top of a hill are transgressions against the fundamental principle that a driver should always keep his car under complete control, so that he cannot be caught by the sudden appearance of an unexpected danger; but there are certain places on our highways where the responsibility for accidents can not in fairness be placed wholly on the driver, because in these localities factors over which the driver has no control enter as contributory causes.

As one drives along the road, a car sometimes puts in an appearance so suddenly that it seems to materialize out of empty space, although it really came out of a cross road, the entrance of which is almost wholly obscured by a signboard, a high embankment, or a clump of trees and bushes. Not only are intersecting highways often obstructed in this way, but grade crossings with electric and steam railroads are frequently hidden from the view of the automobile driver in the same way, so that he came upon them too late to avoid danger. Our public thoroughfares are supposed to be reasonably safe for travel, but no matter how slowly and carefully a vehicle may be moving, there is a danger in approaching a crossing if the driver is unaware of its presence. All obstructions that conceal danger points of this or any other nature should be removed, or if this is impractical, the driver should be adequately warned by some efficient and unmistakable means.

Whenever possible, the objects interfering with the view of intersecting highways or railroad tracks should be cleared away, because it is always far better to remove a source of danger than to merely advertise the fact that the source is there. It is usually no great task to cut back a dirt embankment to allow an unrestricted view of both highways for some distance, and it is certainly an easy matter to cut down or thin out obstructing trees or shrubbery. It is also quite feasible, when erecting a sign-board to place it, without seriously impairing its advertising value, where it will not become a hazard by concealing either of the intersecting highways; and if this cannot be done for some special reason or other, then the sign board should not be erected by the advertiser or tolerated by the public. It would serve a far more rational purpose if it were used for kindling wood.

Now and then it may actually be impractical to remove the object obstructing the view, or to shift the highway; and in such a case conspicuous warning signs should be placed at a proper distance from the danger point, and if such warnings are strictly heeded accidents at blind crossings should be eliminated. To warn automobile drivers who are not familiar with the highway along which they are proceeding, each crossing, where the view of either side is obstructed, should be protected by a prominent sign placed at the side of the road used by approaching vehicles, and not less than 300 feet from the crossing. Such signs should be at least two feet in diameter, if circular, or if rectangular signs are used their shortest side should not be less than two feet long; and they should be painted and lettered in such a way that they will be clearly visible and legible even in deep twilight. They should also be placed so that the headlights illuminated them and make them distinctly visible to night drivers.

Having been warned of existing



RESULT OF A COLLISION WITH A TROLLEY CAR AT A CROSS-OVER

The ruins of the automobile took fire and the combustible parts were burned.

dangers, it is necessary for the automobile driver to proceed with extreme caution in order to avoid accidents. At railroad crossings the trains invariably have the right-of-way, and therefore no driver should attempt to cross the tracks until he is sure that it is safe for him to do so. In approaching a street or highway crossing, or an under pass, a driver should slow down his car and sound his horn the instant he sees the warning sign. He should then proceed slowly and listen for a possible signal from vehicle approaching from the direction of danger. If no warning signal is received, he should then sound his horn again and proceed slowly until he has passed the danger zone.

We have especially emphasized blind crossing as danger points that should receive special attention, but equal consideration should be paid to every portion of the road where the view for any considerable distance ahead is in any way obstructed. In this connection we might mention sharp turns, bridges and underpasses where the view of the highway is cut off by man made structures, necessary embankments or natural objects. It is often difficult, or perhaps even practically impossible, to remove the obstacle altogether, but it is usually feasible to lessen the danger quite materially. At an underpass, for example, the roadway may be shifted so that a driver can see through the underpass in either direction, while he is still at a reasonable distance from it; and many of our old fashioned bridges with boarded-up sides can be advantageously replaced by new structures with open trusses. In some States the authorities have taken special pains to make the highways safe by removing many of the obstructions that limit the view of the road, and have effectively posted the remaining danger points. Such action is to be commended, but there are still many places that should receive immediate attention.

RESULT OF A COLLISION WITH ANOTHER AUTOMOBILE

This accident occurred on a straight stretch of excellent road. It is said to have been due to one car not giving the other sufficient room to pass

HIGH SPEED STEEL

Mark Meredith

One of the most important features of modern machinery operations has, without doubt, been the enormous increase in the rate of cutting by the use of high-speed steels. It is impossible to estimate the boon to engineering by the progress made by the metallurgist in this direction, and with this program still being maintained, further advances in engineering practice are the subject of reasonable and confident anticipation.

Tool steels are mainly divisible into two groups according to the method of hardening, and the modern high-speed steels constitute a group of steel alloys in which hardening was effected without quenching, giving rise to the term "self-hardening." It was to Mushet in 1868 that the discovery of the self-hardening of steel containing tungsten was due. His self-hardening steel approximatly contained carbon 2 per cent., tungsten 5 per cent., chromium 0.5 per cent., manganese 2.5 per cent., and silicon 1.3 per cent., and a steel of this type of composition, and with increasing quantities of tungsten up to 16 per cent., and over, can be run at several times the rate of an ordinary carbon steel, cutting much harder material, and retains, even at the red-heat, acquired through a heavy rate of cutting, this unique hardness. In addition, however, to chemical composition, these steels require special thermal treatment in order to exhibit their maximum effects. For some time in the early history of these materials, the thermal treatment accorded them differed only slightly from that of carbon steels, although Mushet originally specified a yellow heat prior to cooling.

It was, however, due mainly to the work of Messrs. Taylor, and White at the Bethlehem Steel Company's works in 1898 that the real value of high temperature treatment was again demonstrated. They showed that the best effects with these steels only began to be realized after the "breaking down" conditions in ordinary tool steels had been passd. Thus the cutting properties deteriorate at temperatures up to about 925 deg. C., but beyond this point there is a marked improvement, and at about 1,100 deg. C. the cutting propertis are markedly superior to those attained at any lower temperatures. This method of treatment vastly increased the utility of the product, but it cannot be said that these American investigations by any means exhausted the possibilities either in the use of the more rare metals or in the most efficient thermal treatment, though their products occasioned more than a little surprise when exhibited at the Paris Exposition.

Since their work, however, metallurgists, especially in Great Britain, have never ceased to investigate.

It is not the customers you get who count most. Keeping them is the main point. Careful and persistent attention to the keeping of them will make the getting much easier.

For cutting soft metal, place two blades in the saw frame, one in the usual way and the other reversed so that the teeth will point back toward the handle. One blade will cut while the saw is pushed forward, and the other makes its cut when drawing the saw back. While one blade is dragging, it will prevent the other from taking too deep a cut in the metal.

Boiler Repairing with the Oxy-Acetylene Torch

By DAVID BAXTER

THE average jobbing blacksmith shop is usually called upon to do all manner of repair work, aside from the regular run of smithing. Among other things, the blacksmith must be able to turn his hand to boiler making, both the putting in of new flues and the patching of thin portions. For he is often located many miles from a regular boiler shop, and his customers cannot afford to ship their boilers back and forth to have them repaired. Not only is this procedure expensive, but it takes lots of valuable time; it is about the same as ordering a new boiler.

Previous to the advent of the oxy-acetylene welding and cutting torch, boiler work for the smithy was a distasteful, uncertain task. It was all a matter of hard slugging with tools, few and inadequate. But since the torch has become a recognized factor in all well equipped shops, a boiler job is no longer dreaded. Boiler work is now comparatively simple and easy for the torch-operating blacksmith. He no longer fears the hard work of cutting a piece of quarter inch boiler steel. He no longer hates the idea of knocking out rivets and replacing them with a heavy sledge and chisel. For now with the cutting torch, he can cut twice the amount in half the time. And he can weld in a patch in a great deal less time, than it used to take by the old rivet method. And when compared with the heavy grind of the sledge method, the work of patching a boiler with the torch is nothing.

The job illustrated in the photos accompanying this article is a good example of what may be done with both the cutting and welding torch in boiler repairing. To do this work in the old fashioned way would require lots of hard back-breaking work and would take a couple of days time. While with the oxy-acetyelene torch the work was done in a few hours with but little expenditure of muscular effort. The defective part of the boiler was cut out with the cutting torch and the new part fused in with the welding torch. The new part was made with the cutting torch by cutting three segments of boiler steel to conform to the curve of the boiler.

Boiler welding differs from the welding of castings in several ways. The chief of which is the tendency of sheet steel to buckle or warp. In other words to take on a wavy or corrugated effect as the welding progresses, or in the finished weld. And unlike cast iron, the steel has a tendency to overlap or draw together. As an illustration, where two sheets are

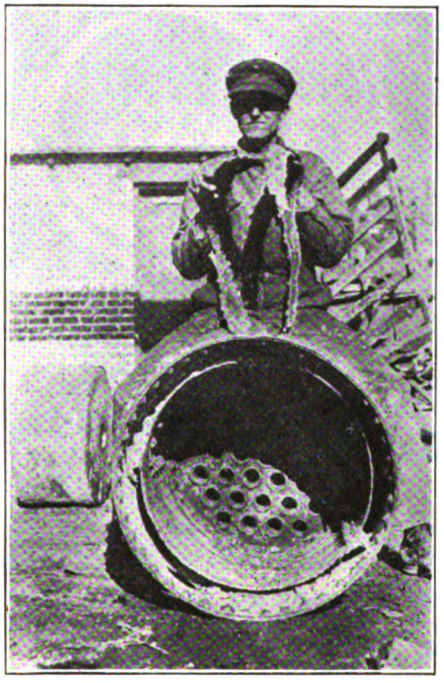


Fig. 1. THE EXTENT AND LOCATION OF THE CUTTING. THE RAGGED EDGES ARE THE RESULT OF THE SEDIMENT INTERFERING WITH THE PROPER ACTION OF THE CUTTING TORCH

welded together, starting at one end, they will gradually pull together until one is on top of the other when the other end of the weld is reached, providing both ends are free. If neither end is free, as in the case of a crack, then the sheets cannot overlap; but the seam will warp up and down to produce the wavy effect.

However, both of these reactions are overcome or controlled by making due allowance, and taking certain steps to counteract them. To prevent overlapping, where the sheets are free to move, one end of the line of welding is spread apart, so that when the last portion of the weld is made, they will meet evenly. To prevent warping, where the parts are not free to move, the usual custom is to start welding ahead several inches and weld back to the first end, then skip a portion of the crack and weld back again to the start of the first weld. Another method sometimes employed is to pry apart the crack in advance of the welding, but this is probably not as good as the first method. Other means will suggest themselves when the reactions are more fully understood.

Another difference between the welding of steel and iron is the ease or rapidity with which the latter either burns or is oxidized. If the welding flame is applied a little too freely, or if it is not regulated exactly right, the steel will fly away in the form of bursting sparks. This being in fact the principle upon which the cutting of steel by oxy-acetylene operates. A heavy percentage of oxygen in the flame causes all of the steel with which it comes in contact to fly away in the form of oxide sparks. In the actual cutting practice an auxiliary jet of oxygen is added to the welding flame, which makes the rate of oxidization much higher.

In consideration of the above statements, the blacksmiths welder must therefore look out for creeping or warping metal when welding boiler jobs; and be careful not to burn the steel when applying the flame. The former he need not watch in other metals and the latter only in steels and wrought iron; mainly in jobs allied to boiler work. There are several ways of controlling or preventing either of these troubles. They will be explained in connection with instructions for repairing a boiler as illustrated in the accompany photographs.

Let us then take this particular boiler and see how each of the different steps in the process or repairing were executed. The lower part of the boiler, sometimes called the mud ring, was packed so full of scale deposit that there was no longer any water space. This scale had become so hardened, that it was impossible to dislodge it in the usual way. The lower end of this section was so badly corroded as to render the boiler dangerous.

These conditions meant either a new mud ring or discard the boiler. It was decided to let the torch welder try his hand on the job.

He removed the old mud ring with the oxygen cutting torch and welded in a new one with the welding torch about as follows:

The removal required two parallel cuts clear around the boiler, which were made by first cleaning as much of the rust and dirt from the steel as possible along the line of cutting. This was done with scrapers and wire brush for the purpose of facilitating the cutting, since the torch will not cut well through rust or slag. The scale on the inside of the shell gave a lot of trouble. In fact so much that it was not possible to make a smooth even cut. The operator was forced to stop several times to knock loose and scrape out the scale.

A medium size cutting torch was used. The following explains in detail how it was manipulated. The welding flame was lighted and regulated neutral, or very near it, then applied to one spot in the line to be cut, until the metal started to melt. Then the high pressure oxygen was admitted to the flame. This high pressure jet immediately attacked the molten spot and turned it to oxide, blowing the flame clear through the sheet of steel. As fast as the steel was turned to oxide, the flame was moved onward to another portion of the line. As fast as the flame heated the metal the oxygen forced it through the sheet in the shape of oxide. Thus the torch kept steadily moving along the line of cutting around the ring. The outside diameter was cut first, then the inside. Whenever the torch kicked back or sputtered, the operator used a hammer and chisel to gouge loose the offending bits of scale or rust.

Figure 1, of the illustrations shows the extent of the cutting and the location of it. The ragged edges of the cut out pieces which the man astride the boiler is holding, indicate the trouble encountered on account of the scale. However, no attempt was made to obtain a smooth cut, since the edges required but little dressing before welding. The cutting torch was moved sidewise along the cut as fast as the steel was oxidized. The boiler being rolled along the ground to facilitate the work.

Where it is essential to make a clean sharp cut in boiler metal, the torch must be held at one certain height above the surface during the process. And it must be moved forward at an even rate of speed, which is governed mainly by the rapidity of the cutting; the flame must be moved as fast as the metal is blown out. And to keep the edges of the cut from being ragged the flame must not waver sidewise. If the torch is held stationary for a few seconds without shutting off the flame it will cause a rough spot. It is almost impossbile, however, to follow these rules on old rusty metal, but on new clean metal a cut may be made that rivals a saw cut.

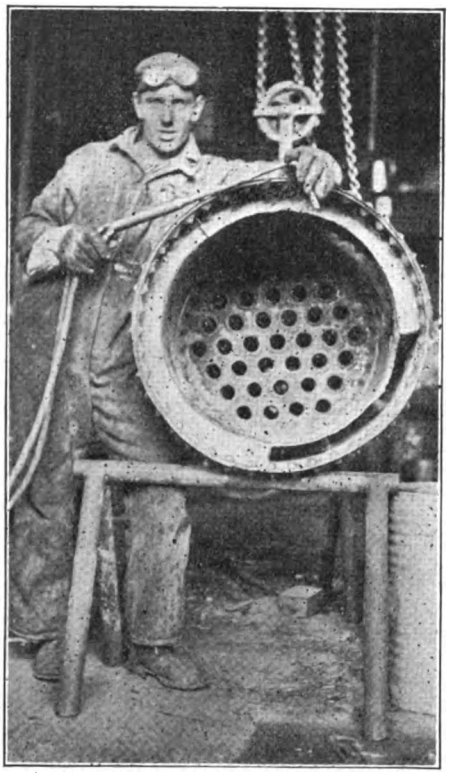


Fig. 2. READY TO WELD THE LAST SECTION OF THE RING

The old mud ring was, therefore, cut out without taking much pains to obtain a smooth cut. One edge was cut close to the rivets of the outer shell, while the other was cut farther up on the inner shell. This made it necessary to put in a flat ring so no attempt was made to remove the rivets.

After cutting out the ring, the edges of the cut on the inner shell was cleaned of all oxide and scale deposits with a hand chisel. The outer shell was also cleaned of all roughness. Especially the parts along the line of the cut, were cleaned thorough. This was to prevent any foreign matter from interfering with the melting weld.

The next step of the process was the making of a new ring. The inner and outer diameters were marked off on a new sheet of boiler steel and cut in the manner perscribed above. However, this new ring was made in three pieces instead of a solid ring. The purpose being to permit a free play of heat reactions during welding. There would be less tendency to creep or lap than would be the case with a solid ring. Even then, it was necessary to exercise considerable ingenuity as will be explained later. Allowances were made in marking of the new ring sections to permit them to fit end to end in the boiler. The outer edge of the ring resting on the shell of the boiler and the inner edge coming flush with the inner shell.

For the welding, the flame used was the standard neutral flame, provided by a torch of more than medium size. This rather large size flame furnished heat to keep the weld molten, and at the same time replaced any heat lost by conduction to the colder parts of the boiler. The large flame made the danger of oxidizing the boiler metal greater but this tendency was counteracted by the proper manipulation of the torch. The flame was kept continually in motion by swinging in short arcs over the corners of the weld. This swinging motion kept the flame from concentrating long enough in one spot to burn the metal.

The filler metal used on this job was quarter inch Norway iron, which furnished a tough ductile bond so essential on boiler welds. It was applied to the weld with a saw like movement to mix it with the boiler metal. The filler was never allowed to drip into the weld but was kept feeding beneath the molten surface. No flux was employed so it was not necessary to remove the filler rod from contact with the weld, except as referred to later on. Thus the filler was continually in touch with the weld, and was fed into it as fast as it could be used up. But at no time was the filler melted unless the weld was ready to receive it.

The welds were made in sections on both the inner and outer walls. Each of these sections being about six to eight inches long thoroughly fused together. Or, in other words, the three parts of the ring were welded in place one at a time in sections six to eight inches in length. These sections were welded alternately on the inner and outer edges of the ring. First, six or eight inches of the inner diameter was welded, then the flame was moved to the outer diameter where

the same approximate distance was welded. Then another section of the inner edge was welded, and again the flame was transferred to the outer section. Thus the first part of the ring was welded in alternate sections.

Then the second part of the ring was wedged in place, until it was welded in alternating sections like the first. After which the last part of the ring was treated like the first two. Figure 2 shows the weld ready for the last part of the ring. This picture shows that the parts of the ring were not equally proportioned; a fact immaterial to the results.

As each part was welded, the boiler was turned to keep each weld section nearly horizontal. The turning being accomplished on a pair of metal trestles with a chain block. As fast as each weld was made the boiler was shifted a little.

Now, a peculiar part of this job was the fact that each welded section was made just opposite to the usual method. Or perhaps I should say, in a manner directly opposite to what one would naturally suppose. The weld was commenced on the inside seam at a point six to eight inches away from the end next the operator and worked toward him. Then the outside seam was treated the same. Then the welder skipped six or eight inches of the outside seam and welded back to the end of the first section, after which he swung over to the other seam to repeat the performance.

The drawing accompanying this article graphically explains the method of alternately welding and changing. The welding was started at point 4 continued until point 3 was reached. Then the flame was shifted to point 2 and the seam welded to a point indicated by point 1. Then it was welded from 5 to 4 and from 6 to point 2 and so on all the way around.

The reason for changing from one side of the ring to the other, was that the lapping might be controlled; keeping the welds even on both sides kept either side from overlapping. The cooling and contraction of one weld pulled against the cooling and contraction of the the other so that they counteracted each other, so to speak neither could creep over the other.

The seeming backward welding also helped to neutralize the lapping, since it furnished but little space in which any tendency to lap could occur. Had the welder started at one end of a weld and completed the work to the other without changing, the ring would have been pulled entirely out of round, or would have overlapped the inner shell, until it would have been impossible to finish the weld. Had he welded the outer circle first, the ring would have warped out of shape long before reaching the other end. But by welding backward alternate sections, it was possible to secure a flat even ring upon completion. The outer weld in effect held back the creep of the inner weld.

The weld between the ring parts were what is termed butt welds. That is they were made without flanging, which is often the case in sheet metal boiler or tank work. Where the weld is flanged these flanges are melted down to furnish filler metal. While in butt welds the ends are melted and joined together with filler rod metal.

These end welds were accomplished in detail by revolving the flame over them in tiny circles until the metal melted and joined. At the same time melting and stirring in the filler metal. Care being taken to see that the metal was melted only hot enough to flow together as there was danger of a collapse if too large an area should become heated so that it would flow. During the process of making these welds the boiler stood on end to keep the welds horizontal.

The corner formed by the inner shell and inside circle of the ring was melted together with the addition of but little filler metal. The outer ring weld was made stronger with a liberal fillet of surplus metal, this being added a little at a time as the weld was made. It was essential that all welds be thoroughly fused as they must hold under steam pressure when the boiler was put back in service.

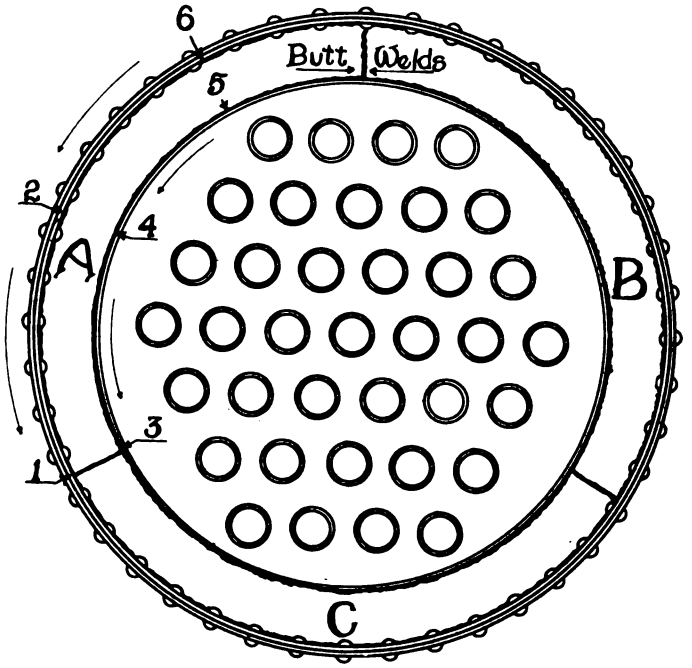


Fig. 3 A SKETCH OF THE BOTTOM OF THE BOILER SHOWING HOW THE WELDING WAS SHIFTED FROM ONE SIDE TO THE OTHER TO PREVENT LAPPING AND BUCKLING

RAINCOATS FOR WINDOWS AND ROOFING

Raincoats are comparatively unknown in the devastated areas of France. When it rains the philosophical peasants do as they do in Spain—and get wet. Noting this phenomenon, the American Red Cross decided to distribute some left-over slickers, intended for the A. E. F. But despite this accession to their wardrobes, the peasants continued to go out in the rain without protection. Not a slicker was ever seen on the backs of those who had so joyfully received them. What had become of them, every Red Cross worker wondered. At last the mystery was solved. Visiting a refugee family one day, a welfare worker noticed with interest that the window panes were made of rubber. Glass overseas is so scarce and high priced that oiled paper has long been used in France as a substitute, but the rubber was something new. Closer inspection revealed that the "window" was a converted army slicker.

Subsequently Red Cross Workers discovered similar garments doing duty as roofing material, serving to patch shell holes and rents torn in the walls by bombs, while other enterprising housewives had converted them into oilcloth table covers.

Bill Learns the Cheer Up Game

By D. G. BAIRD
Illustrations by Art Helfant

SAY, whadda you think of the boob what drapes his count'-nance in mournin' and glooms around all the time and don't have nothin' to say and when he does say it, he growls like a homeless houn' dog instead 'uv chirpin' like a well-fed canary, and then he growls some more because he ain't doin' a million dollar business? Say, can you beat it? Huh?

W'y no less a oldtimer'n Cap'n Noah of the good ship Ark long ago wrote the lines: "Grin, and the world grins with you; Growl, and you growl alone," and more or less famous folks have been repeatin' the same idea with variations ever since.

Folks just naturally don't like a grouch, but on the other hand everybody loves a cheerful bird. A customer'll go miles outa his way just to trade with a gent what cheers him up and takes a little o' the gloom outa life for him.

But in spit 'uv all this worldly wisdom there's some folks still tryin' to do business on the theory that all they've gotta do's hand out the goods what the customer calls for and ring up the change on the recorder and look solemn and all.

Bill Lockler, f'rinstance, was guilty of this misdemeanor in the first, second, and third degrees. That 'uz before he'd consulted me and obtained my expert counsel on the subject, o' course. Afterwards —Well, I guess I'd as well begin at the beginnin' and tell you all about it.

You see, it all come about this way. One day last fall I come perambulatin' along in my usual high spirits and trip blithesomely into Bill's tinkery and salute Bill like a long lost brother and inquire about the rapid rise of his bank account and all; and Bill shows his gratitude for my interest in his welfare by deliverin' hisself of the remarkable statement: "Wumph!"

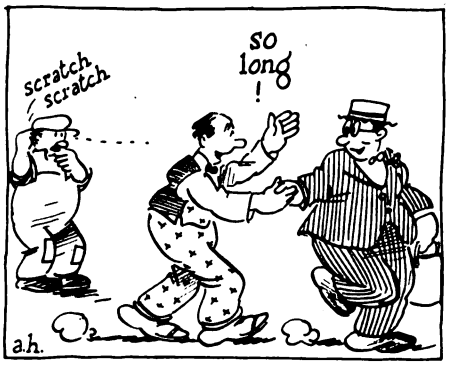
But I'm well posted on Bill's reputation for bein' a tireless talker and I see I've gotta say my say if I'm to have any share in the conversation, so I interrupt him after about five minutes profound silence and get in some o' my brilliant repartee.

"Bill," says I real cheerful, "anybody been buried lately?"

Bill catches up with his starin' at a knot-hole in the wall after a while and says in his usual pleasant tone: "Guess so. Hiram Watson died week afore last."

"Doubtless, then," says I, "he's been buried by now, although there's more'n one dead 'un around this here town that ain't been buried yet.

"And that reminds me, Billy," I ramble on cheerfully, "Why don't



you go into the undertakin' business?"

"Me?" Bill grunts without takin' his eyes off'n the knot-hole.

"The same," says I warmin' to my subject. "Come to think of it, Willum, you're about the best qualified man, in the way of natural ability, habit, custom, training, and inclination, that I know of. W'y just think of it! You wouldn't have a thing to do except when somebody died—which wouldn't be more'n once or twice a year in this burg—and you'd have a day or two's warnin' then before you'd be called upon to exert yourself unduly, and—"

"Say! Where'd yuh get that stuff?" Bill butts in, seemin' to lose interest in his knot-hole.

"Innocent desire to be'uv service to my friends and the community at large I assure you," says I airily 'Just say the word, Willum, and I'll have out a petition—"

"Aw, yuh gimme a pain!" Bill interrupts somewhat impolite.

"Beggin' your pardon, Bill," I rejoin, "while there's no doubt about your havin' the pain, I fear you've incorrectly diagnosed the case. Now, there's such a thing as a ingrowin' grouch penetratin' as far's the spleen and makin' the sufferer exceedin'ly spleenetic and—"

But a customer steps in just here, and as this is a private matter between Bill and me, I postpone the remainder 'uv my lecture till such time as the said customer should have taken his anatomy homeward or elsewhere.

Well, as I said a customer comes in, but Bill don't even stop measurin' the dimensions 'uv his knot-hole with his eye to look up and see if it's Henry Ford or Bill Spivins. Instead he just sets there till the customer's shifted around from one foot to another for about a minute and at last musters up courage enough to ask Bill if he can get ten gallons 'uv gas, then he says "wumph" and afterwhile gets up real reluctant-like and ambles out to the pump and gives the gent the gas and takes the remuneration without a word.

Well sir, this inhuman way 'uv treatin' customers aggravates me somethin' dreadful and when Bill drags hisself back into the shop I proceed without delay to give him some gentle hints as to the how and the why 'uv conductin' his business accordin' to the rules of the game.

"Say! you gloomy old owl you," I begin real dignifiedly, "maybe you can give some interpretation, explanation, elucidation, or exposition of your intents and purposes in your manner 'uv dealin' with the well-known species of animals commonly known as the public?"

Bill looks at me in a way that shows very clear he don't follow my drift, so I further elucidate: "What I want to know is, in plain words, this; What is the reason, cause, occasion, or foundation for your peculiar conduct in the matter of disposin' of your goods, merchandise, wares, commodities, or stock in trade?"

"W'y I give him the gas, didn't I;" says Bill in a grieved tone o' voice.

"O sure! You give him the gas! And chances 're ten to one it's the last time you'll ever give him anything. Who do you suppose wants to do business with a clam? Or keep company with a natural-born un-

dertaker? Or a gink with a perpetual grouch? Or a brokendown old duffer—"

"Just a minute," Bill butts into the middle of my lecture, "do you by any chance mean anything personal by them remarks?"

"Personal? I should say not! I'm rehearsin' a speech to be delivered before the Society for The Prevention of Cruelty to Angle Worms! I was merely referrin' to the well-known habits of laughin' hyenas! W'y a man of your remarkable conversational ability couldn't possibly infer that I was hintin' anything in his direction in the least! As to—"

"If I know anything about the rules 'uv—" Bill puts in, but I cut him off forthwith: "But you don't, that's just the trouble. You don't know the first principles 'uv dealin' with the human race. Why don't you crawl into that knot-hole you're always starin' at and die? Your business 'ud be better off without you and—"

"That'll be about all from you!" Bill growls takin' his eyes off'n the knot-hole and beginnin' to act like he's alive after all. I'll thank you—"

"No you won't, either! That's just the trouble—you don't thank nobody. You never think 'uv sayin' 'Thank you, call again' or anything else that might be misconstrued as a effort to encourage the said customer to call at your own shop again the next time he needs a pint 'uv grease or a gallon 'uv gas.

"Now here comes a customer,"

I continues as I see a fellow slowin' up his flivver out in front; "you let me deal with him and you watch how it's done—see." And with this I steps forth radiatin' good cheer like a furnace radiates heat and greet the gent in the car.

"Hello! Smith, old man," says I real cheerful, "how's the boy? Hitch your steed and come into the fire. How's the old Packard runnin' these days? Glad to see you again." And I usher him in and give him the best seat by the stove and proceed to put him at his ease, and he's grinnin' real friendly all the time, clearly provin' that I've adopted the proper attitude in dealin' with the public.

But my intellect ain't idle, so with a bare moment of thinkin' just what'll be best to say next I go right on with the conversation: "Fine day, eh Smitty?"

"We-ll," says Smith somewhat hesitatin'—like, "there's a mighty raw wind blowin' and I think my radiator's froze and—"

"Sure!" I hasten to interrupt, knowin' that the dealer should do most 'uv the talkin' under such circumstances, "that's just what I was sayin' to Bill here when I saw you comin' down the road. It oughta be a fine crop year for farmers hereabouts though, don't you think?"

Well, sir, you can believe it or not, but there was a lot more conversation just as brilliant as that. I rummage around in the desk and find some old dry stogies that Bill's got hid away, and we light up and discuss the league o' nations and the price 'uv gas and the latest film that's running at the movie house and the various and sundry objections against the multitude of politicians that's runnin' for office and the prospects for a good crop next summer and—well, this 'll give you an idea of how I was teachin' Bill the cheerup game.

In the meantime the men are thawin' out the tin lizzie, and when it's all O. K. the gent buys a gallon 'uv anti-freeze and when I suggest that maybe his grease cups 're dry, he agrees with me and I sell him some grease and some gas and a new inner tube and some cement and patches and a up-to-date pump and he promises to come in Friday and leave the old gal to have her valves scraped and the engine timed and a few other little things that I've forgot.

When he's ready to go, one o' the men cranks his wagon and I shake hands with him and give him a friendly pat on the back and tell him "so long" and he goes on his way rejoicin'.

Well, I went on my way too, after givin' Bill a few more words 'uv good advice, and I ain't seen Bill since. But lemme tell you who and what I did see a few days ago.

I was down at Maplewood, a little village about thirty miles from Woodruff where Bill has his establishment, and one day a fellow has a blow-out right in front 'uv a garage and gets out and stops to fix it hisself, and I stroll up and offer my assistance and we get real chummy while we're tryin' to patch up the old tire that's had so many like experiences there ain't nothin' much left but patches.

Well, I see the bad condition of the gent's hose and I suggest real polite that he should invest in a

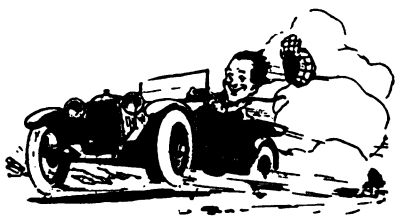
new wind bag. And whadda you reckon he said? W'y he said he'd been intendin' to do that very thing for quite a spell, but it hadn't been handy for him to get around to his regular dealer's and he wouldn't trade nowhere else if he could help it. And his regular dealer was Bill Lockler!

"Yep," the gent says when I question him at some length, "I allus do all my tradin' and repairin' and all with Bill. I don't know that I get any better price, or any better service either for that matter, at Bill's but Bill's got a way about him that just naturally makes everybody like him; always jolly and takes a interest in a feller's troubles and makes him feel like they ain't quite so bad after all and you go away thinking' the sun's shinin' and the birds is singin' and all when's a matter 'uv fact it's the worst day 'uv the year and all —Yep, Bill's a mighty fine feller. Oughta meet him some o' these times."

And I promised him I'd make it a point to meet Bill.

Be brave, for there is much in the conditions of the world today which calls for bravery. It is brave to give other men and women the square deal. It is brave to be honest in word and act. It is brave to stand for the right when the right is in life and in business.

High Spots



Expiation—"What do they do to a woman in this country when she kills her husband?" asked the foreigner. "Oh," replied the American, "they sentence her to six weeks in vaudeville or a year in the movies."—Cincinnati Enquirer.

Welcome Relief—"Look 'ere—I asks yer for the last time for that 'arf dollar yer owes me." "Thank 'evins!—that's the end of a silly question."—Blighty (London).

Honk!—"Who was it that wrote the line: 'A little learning is a dangerous thing'?" asked the old Fogy. "Must have been some man who was trying to run an automobile for the first time," replied the Grouch.—Cincinnati Enquirer.

The Place For It—"Willie!" "Yes, Pop." "Can you carry a tune?" "Certainly I can carry a tune, Pop." "Well, carry that one you're whistling out in the back yard and bury it."—Ex.

Convenient Chaperon—"I don't know what we can make of Ethel," said the mother; "she sleeps so much." "I know, mamma," said Tommy. "Make a chaperon of her."—Yonkers Statesman.

Reason Enough—"Why did you strike the telegraph operator?" asked the magistrate of the man who was summoned for assault. "Well, sir, I gives him a telegram to send to my gal, an' he starts readin' it. So, of course, I ups and gives him one."—London Tid-Bits.

Huh!—The absent-minded professor was buried in a large volume in which he was deeply interested. Downstairs the baby was yelling at the top of his voice. "What is the baby crying for?" asked the professor, as his wife passed through the room. "He wants his own way," replied the wife. "Well, if it's his, why don't you let him have it?" said the professor, as he resumed his reading.—Cincinnati Enquirer.

Nothing to Fall Back On:—"You must give up coffee and—" "I never drink it, doctor." "And stop smoking." "I don't smoke." "Humph! that's bad, If you haven't anything to give up, I'm afraid I can't do much for you."—Boston Transcript.

His Position—"What is your position on this great question?" "My position," replied Senator Sorghum, "is somewhat like that of a tight-rope walker. I don't want to stop to argue or show off. What I want to do is to get across to solid ground." Washington Star.

Not to be Beaten—An Alabama darky, who prided himself on being able to play any tune on the banjo after he had once heard it, perched himself on the side of a hill one Sunday morning and began to pick the strings in a workman-like manner.

It chanced that the minister came along. Going up to Moses, he demanded harshly, "Moses, do you know the Ten Commandments?"

Moses scratched his chin for a moment, and then, in an equally harsh voice, said:

"Parson, yo' don't think yo' kin beat me, do yo?' Jest yo' whistle the first three or four bars, an' I'll have a try at it."—Harper's.

Right—"When water becomes ice," asked the teacher, "what is the great change that takes place?"

"The greatest change, ma'am," said the litle boy, "is the change in price."—Our Dumb Animals.

Wicked Sheep—The captain had ordered his men not to forage. That night he met a corporal coming in with a sheep over his shoulder. "Forget what I said this morning, Corporal?" "Well—well, no, Captain, but no blamed sheep can bite me and get away with it."—The American Legion Weekly.

He Knew the Signs—Daughter—Oh, father, how grand it is to be alive! The world is too good for anything. Why isn't every one happy? Father—Who is he this time?—Tar Baby.

Her Role—"Now we'll play zoo," said Willie, "and I'll be the elephant." "That will be fine," said Aunt Mabel. "But what shall I be?" "Oh, you can be the nice lady what feeds the elephant with buns and sugar," explained Willie.—Blighty (London.)

Victim of Environment—"Jack told me he loved me, but I don't know whether to marry him or not." "Don't you think he tells the truth?" "I've no doubt the dear boy tries to, but you see he works in the Weather Bureau."—Boston Transcript.

Misery loves company, but it is apt to be a case of unrequited affection.

The promise of an early spring isn't always indicated by girls in bloomers.

One good turn deserves another, especially when you turn the other cheek.

There may be plenty of room at the top, but some men, like some fish, are bottom feeders.

When a woman fishes for a husband she makes him feel small enough to go through the net.

It's easy enough to make a woman happy. Just give her an opportunity to say "I told you so."

It may cost something to be an optimist, but it's worth it. Nothing is so cheap as cheap cynicism.

You never can tell. Money makes the mare go, but we can't always find out which way she is going to be headed.

The man who makes a fool of himself is thoroughly imbued with the idea that what is worth doing at all is worth doing well.

There is plenty of room at the top, provided you get in on the ground floor.

March is the braggart of the year. He never does anything without blowing about it.

You never can tell about a woman's troubles. They aren't graded according to sighs.

The best memory in the world is the one that enables us to forget our troubles.

The difference between a blooming idiot and a century plant is about a hundred years.

Even when they apply for Pullman reservations some women want to exercise berth control.

No, Maude, dear; the turning point in our lives doesn't necessarily indicate that we are all cranks.

The postal service isn't altogether responsible for the fact that even after you mail a letter it is still stationery.

In the Street Car—Small Man—Have you plenty of room, madam? Fat Lady—Yes, thank you. Small Man—Well, then, give me a little, please—Cornell Widow.

Discouraging—The Colonel—I'm playing Mr. Smith tomorrow. Caddie—He canna play at all. The Colonel—Then I'll beat him. Caddie—No, ye wunna!—John O'London's Weekly.

Pointed Question—Some medical fiend claims to have discovered that bee-stings are a great cure for rheumatism. Pity the hesitating rheumatic patient, timorously muttering: "To 'bee' or not to 'bee'—that is the question!"—Passing Show (London).

Just So—"Pop, what are the duties of a campaign manager?" "Principally, my son, to count chickens before they are hatched."—Judge.

Safety First—"You ought to be ashamed of yourself, Effie. I've a good mind to spank you."

"If you won't spank me, mother, I'll promise to be awful ashamed."—Life.

When Insomnia Sets In—"Do the trolley-cars keep you awake?" "Never," said Mr. Crosslots. "It's when there's a threat to stop 'em that I get nervous and can't sleep.—Washington Star.

Didn't you shudder, Rastus, as you cut down those Germans, man after man?" "Man after man? Yessuh, when that live man got after this man Ah shudduh'd three miles."—Home Sector.

"Flattery," said Uncle Eben, "is generally a scheme foh easy money makin', wifout even goin' to de trouble of fixin' up a gold brick, or a satchel of green goods."—Washington Star.

A Phenomenon—"Why did Jinks rush out of the office so excitedly?" "His wife had just telephoned—" "Some accident at home?" "Well, something like that. She said their year-old baby was asleep, and Jinks went to see what it looked like that way."—Judge.

Time For It—"You no longer invite Dr. Pounders to ride in your flivver."

"He hurts my feelings although I'm sure the good man didn't intend to do so."

"How did that happen?"

"The last time I offered him a lift we hadn't gone a block before I discovered him praying fervently on the back seat."—Birmingham Age-Herald.

Small Talk—"I'm going over to comfort Mrs. Brown," said Mrs. Jackson to her daughter Mary. Mr. Brown hanged himself in their attic a few weeks ago."

"Oh, mother, don't go; you always say the wrong thing."

"Yes, I'm going, Mary. I'll just talk about the weather. That's a safe enough subject."

Mrs. Jackson went over on her visit of condolence.

"We have had rainy weather lately, haven't we, Mrs. Brown?" she said.

"Yes," replied the widow. "I haven't been able to get the week's washing dried."

"Oh," said Mrs. Jackson, "I shouldn't think you would have any trouble. You have such a nice attic to hang things in.—"Tid-Bits.

Reciprocity—Did the doctor pay a visit?" "Yes, and the visit paid the doctor."—Boston Transcript.

Benton's Recipes

Solder Preparation for Aluminum—The most successful solder preparation for soldering aluminum yet secured is made up in the following manner. Melt together 64 parts, by weight, of tin, 30 parts of zinc, 1 part of lead, and a small amount of rosin. All parts, of course, must be mixed together very thoroughly while in molten condition. When thoroughly mixed the alloy should be run out in bars of desired sizes. Clean the surfaces thoroughly and apply the solder. No chemical is required, the rosin used being sufficient to cause adhesion, although it is advisable to heat the parts to be soldered gently to assist in making a good adhesion.

Etching Fluid—An excellent fluid for etching steel, either for making a beautiful frosted effect, or for deep etching of names and trade-marks, is made up as follows: Mix together ¼ oz. of powdered table salt and 2 oz. of copper sulphate with ½ pt. of vinegar and 40 drops of nitric acid. The parts not to be etched are covered with paraffin or beeswax. Deep etching or frosting is effected by leaving the article to the action of the fluid for a longer or shorter time.

To make a permanent cement to be used for stopping leaks in steam-pipes where caulking or plugging is impossible, mix black oxide of manganese and raw linseed-oil, using enough oil with the manganese to bring it to a thick paste; apply to the pipe or joint at leak. If the pipe be kept sufficiently warm to absorb the oil from the manganese, in twenty-four hours the cement will be as hard as the iron pipe.

Mottled Effect on Hardened Metal—To secure a mottled effect on case hardened work, it is recommended that instead of dipping the part to be hardened all at once in the hardening-bath, the dipping should be done jerkly. The result is that a series of mottled bars will be shown across the work, each bar denoting the position at the touching of the bath as the article was momentarily arrested in the plunge.

Welding Steel to Iron.—Make a flux compound consisting of iron or steel filings 100, sal-ammoniac 10, borax 6, balsam of copaiba 5. Steel heated red, carefully cleaned of scale, the composition spread on it, and the iron applied at white heat and welded with hammer. In the case of welding steel to cast iron, the steel after being shaped to correspond to the cast iron, should be heated cherry red, and then have borax applied to the surface. Then both steel and cast iron should be heated to welding-heat, and strong pressure applied.

Hardening a Scratch Awl.—A good method of hardening the point of a scriber is to heat the point over an alcohol lamp, leaving the extreme point out of the flame to avoid the danger of overheating. Hold a thin piece of ordinary soap in the hand over a cup of water, and when the scriber has reached a cherry-red color push it down through the soap into the water below. The temper should then be drawn to a dark straw.

By using soap and water on an old oil stone, as a substiute for oil, a smoother and finer edge can be given to knives and woodworking tools.

Repainting Carriage Running Parts—As a rule, these parts do not get as much thorough attention as they deserve. "A lick and a promise" is too often made to suffice. However, such parts of the carriage really are exposed to the hardest sort of service. Vibration, oscillation, divergent pressures, and so on, are imposed upon the running parts. Washing operations, deleterious substances, and bad, rutty roads, also destroy the paint and finish on the running parts.

To overcome these destructive agencies by the best possible painting and finishing should be the aim of the painter. First, the parts should be sandpapered until a hard, secure foundation is reached. A solid foundation is the first necessary thing. Next apply a coat of good mineral or earthen pigment containing, in the case of badly perished surfaces, one part raw linseed oil to two parts turpentine. For surface less worn and perished use one part oil to three parts turpentine. Let coats of this nature dry thoroughly. Next with hard-drying putty face up the badly fractured and fissured parts, putty cavities, etc. After 24 hours sandpaper this putty and facing putty. Follow with another surfacing coat, if necessary. If not, then apply color. then varnish-color, and so proceed to take care of the running parts in a manner that will give them a good, durable finish.

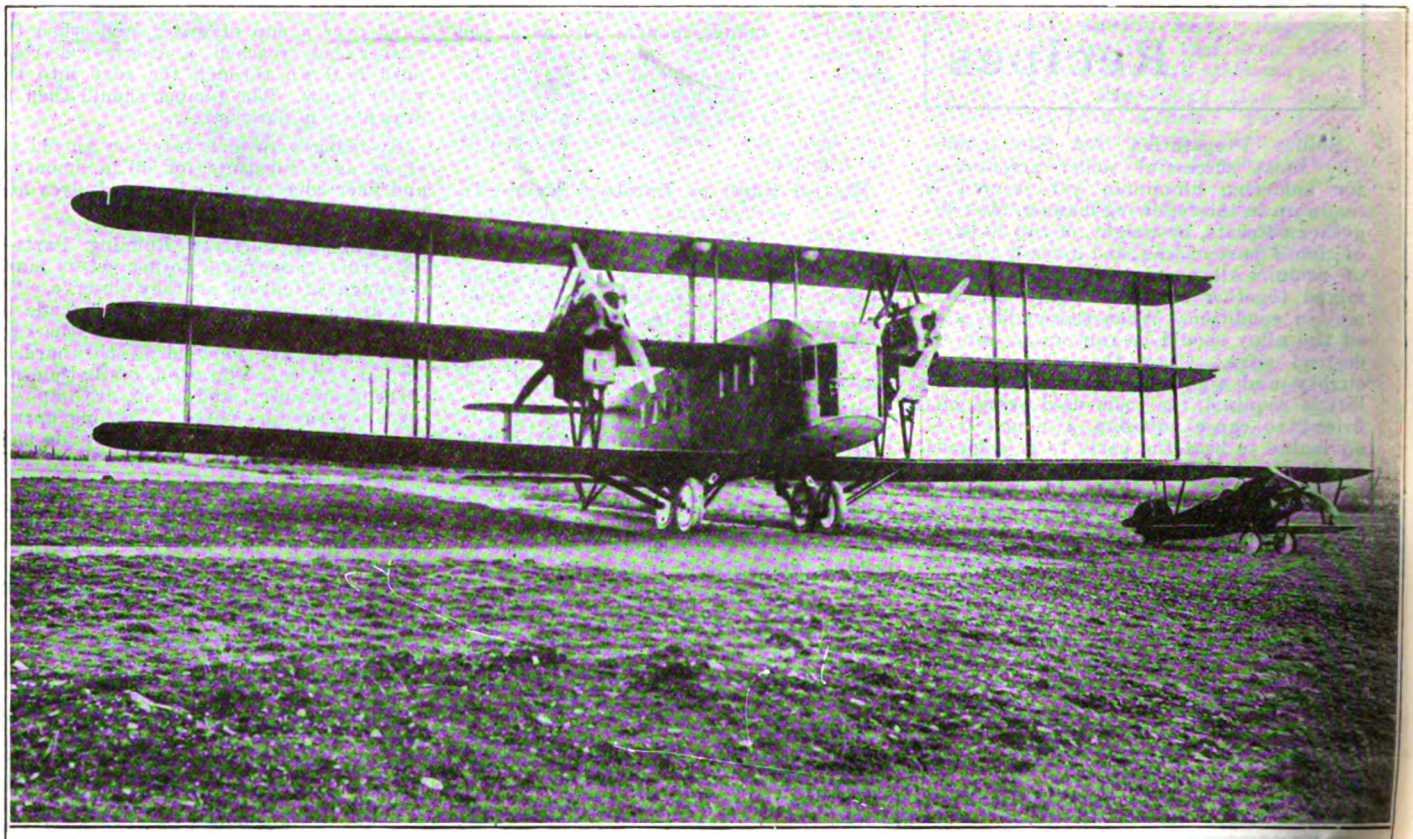
To Toughen and Surface Harden Cast Iron—To toughen and surface harden small cast iron machine parts, which are subjected to wear, such as small gears, cams, etc., heat to a dull red and quench in a saturated solution of cyanide of potash and water which should be kept as near the boiling point as possible. This can be accomplished best by putting the solution in an iron pot near the fire in which the parts are being heated.

For Gluing Emery to Wood or Metal—The following is a good receipt for gluing emery to wood or metal and I have used it with success where other cements have failed. Melt together equal parts of shellac, white rosin and carbolic acid (in crystals) adding the carbolic acid after the shellac and rosin have been melted. This makes a cement having great holding power.

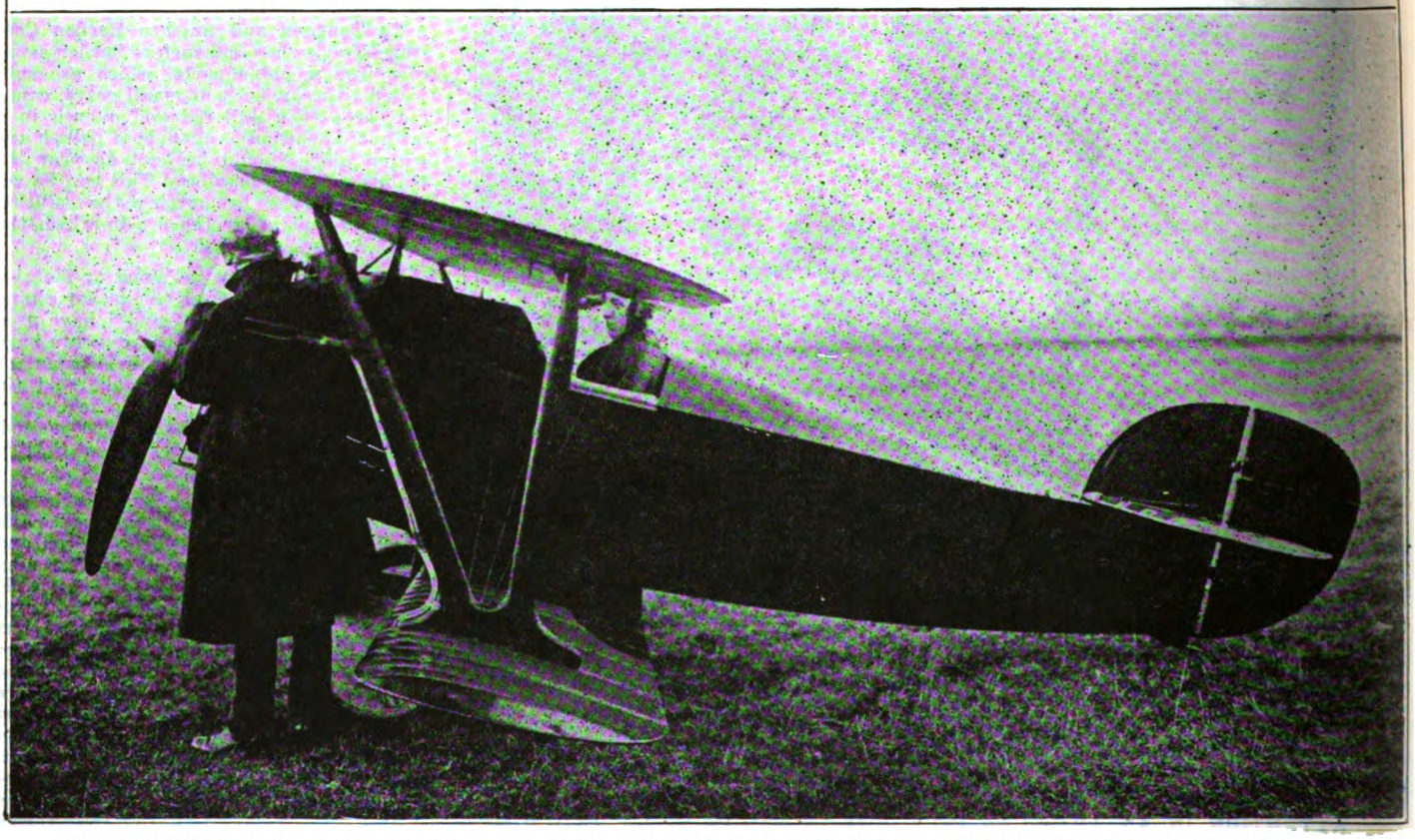
Cement for Attaching Soft Rubber to Iron or Other Metals—A cement which is effective for cementing rubber to iron and which is specially valuable for fastening rubber bands to bandsaw wheels is made as follows: Powdered shellac, 1 part; strong water of ammonia, 10 parts. Put the shellac in the ammonia water and set it away in a tightly closed jar for three or four weeks. In that time the mixture will become a perfectly liquid transparent mass and is then ready for use. When applied to rubber the ammonia softens it, but it quickly evaporates, leaving the rubber in the same condition as before. The shellac clings to the iron and thus forms a firm bond between the iron and the rubber.

SHOEING BUFFALOES

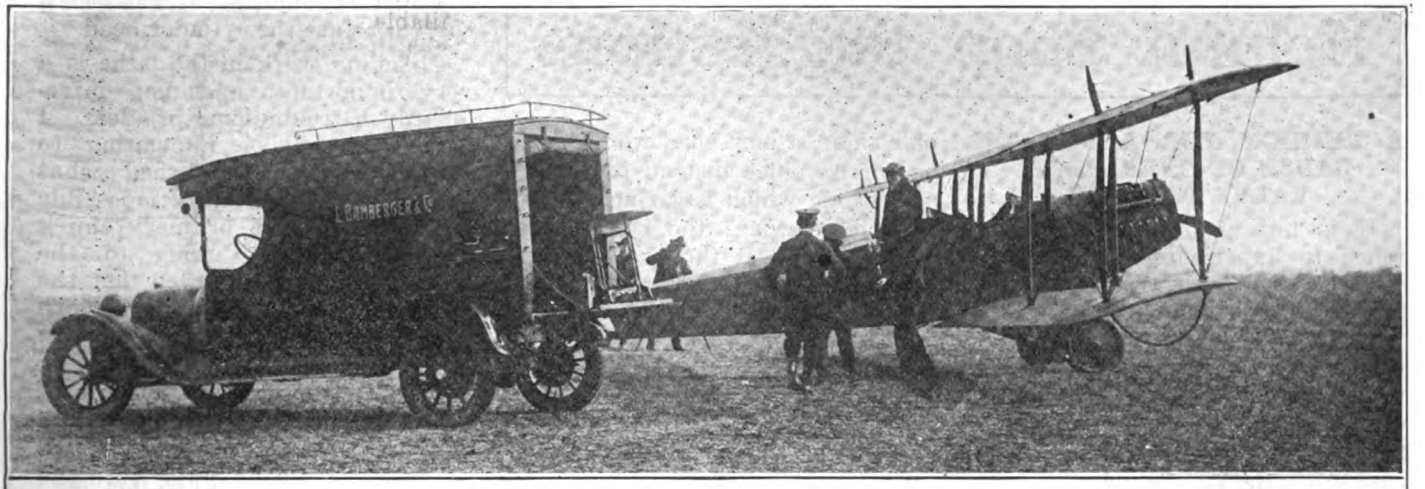
A SCENE LIKE THIS WOULD PROBABLY ATTRACT A GREAT DEAL OF ATTENTION IN AN AMERICAN CITY, BUT IN TARUS, SYRIA AND SOME PARTS OF TURKEY, SHOEING BUFFALOES IN THE STREET IS AN EVERY DAY OCCURRENCE



THE BRISTOL PULLMAN TRIPLANE OF 1640 HP. AND THE BRISTOL BABE BIPLANE 40 HP. THE LARGEST AND SMALLEST AEROPLANES IN THE WORLD IN ACTUAL SERVICE



BRISTOL BABE HAS A SPEED OF 85 M. P. H., CAN BE HANDLED BY ONE HAND AND HOUSED IN AN ORDINARY GARAGE



MOVING FURNITURE FROM NEW YORK TO SUBURBAN POINTS BY AEROPLANE

Copyright Keystone View

INTERIOR OF BRISTOL PULLMAN—CAPACITY SIXTEEN PERSONS

Helpful Shop Suggestions

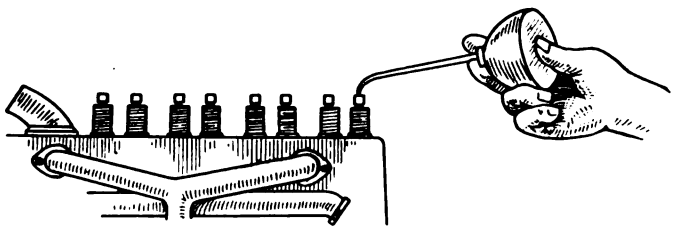
A REMEDY FOR A COMMON CAUSE OF OVER HEAD VALVE TROUBLE

It is not an infrequent occurrence to experience trouble with exposed over head valves, as the result of their tendency to stick. A goodly portion of this trouble can be traced back to the liberal use of oil on the rocker arms. The surplus oil runs down the valve stem and offers an excellent inducement for the dust and dirt, encountered especially in country driving, to lodge there. Assisted by the heat of the motor, this mixture forms a stick paste which considerably retards the valve action, and in some cases even cause the valves to stick open. Sluggish action of the motor, burned and pitted valves, loss of power and waste of fuel are some of the common results. However, it is a condition which can be very easily overcome. A little kerosene oil, squirted on the valve stems while the motor is running will correct the difficulty, provided the valves have not been run in that condition so long that damage to the valve faces or seats has resulted.

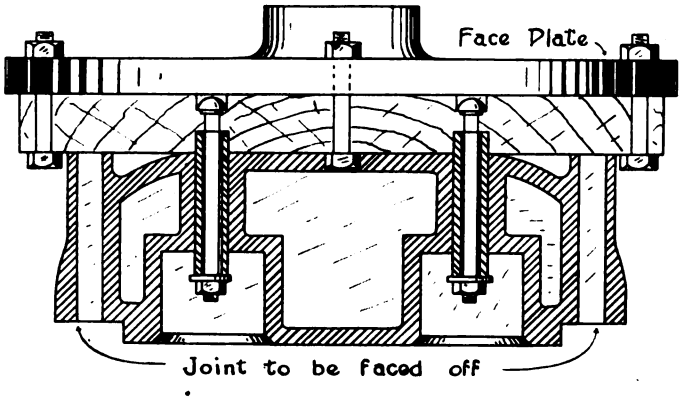
REFACING A WELDED CYLINDER HEAD

With the farm and road tractor coming into more general use through the country, it naturally follows that the blacksmith in the rural district, is the man who should handle the bulk of this repair work. Some additions to his present equipment will be necessary to facilitate the completion of some of the jobs. Among the equipment that he will find especially useful is the lathe.

The foregoing article shows how a cylinder head was repaired with the assistance of a lathe and a little ingenuity. Otherwise, the damaged head merely would have helped swell the pile of useless old iron so conspicuously displayed in front of the average general repair shop; a new head would be in use in its place instead of the repaired one which is giving equally as good service; the repair man would have lost the profit of the work and the owner would have suffered the delay and expense of procuring a new one.



During the past winter the water in a tractor was frozen, as a result the cylinder head burst. The broken parts were welded with the oxy-acetylene torch. Unfortunately the heat necessary to preheat and properly fuse the metals, resulted in a slight distortion. To insure against a leakage of gas and water at the gasket joint, as the result of this condition, it was necessary to reface the cylinder head.



Chucking work in the lathe is a very important, and not infrequently a troublesome problem. I believe it will be interesting to state how I accomplished what seemed to be an almost impossible job, with only an ordinary chuck available. On referring to the sketch, it will be observed that the head is conical. Both valve guides project an inch above the head. To overcome this, a piece of wood 2" thick was drilled so that the guide bosses would fit snugly into the hole and allow the head to rest against the wood. These two projections in reality did the turning, and to insure the proper rigidity so essential in this class of work, 2-3/8" bolts were passed through the valve guide, countersinking the heads in the wood so that they would clear the face plate. The board was then laid off with concentric circles from the center and 4-5/8" holes were drilled through it so that it could be fastened to the face plate. Dividers were used in laying out these circles so that when the work was fastened to the face plate, it would run true.

Chucking work is a very important step in doing any lathe work. It is hoped that these suggestions may help when this class of work is attempted. By making slight variations jobs of this nature, which come to the auto and tractor smith, can be advantageously handled. Geo. Abrey.

MAKE A DOLLAR

Have you ever racked your brain figuring out a solution to some puzzler around the shop? Your solution may be a big help to some other fellow, who is up against a similar problem. You can make a dollar by telling us how you did it. A brief description and a sketch, so that we will know how it works, is all that is necessary. We'll do the rest.

USING BROKEN AND WORN-OUT DRILLS

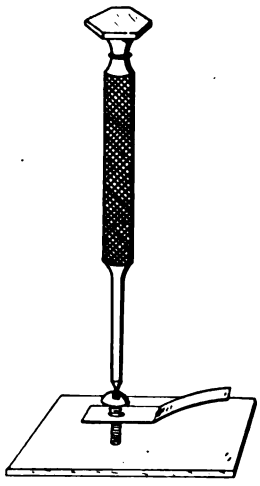
Discarded drills of any size can be successfully used for end-milling and bottoming out keyways; in fact they may be used anywhere an end-mill will serve. They will cut better than the regular end-mills generally used. Grind the end same as a bottoming drill and relieve the spiral flutes of drill to a cutting edge. The drills must be short and stubby. Round-shank drills can be used in a taper sleeve with a straight-bored hole and slit in at least three places. An assortment of bushings cut in halves completes this equipment, so that when the tapered sleeve is driven into the spindle it will grip the shank firmly.

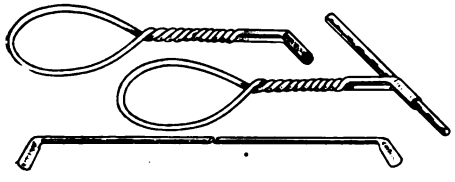
STARTING SMALL SCREWS

Very often considerable annoyances is caused by trying to start a small screw in some inaccessible place. The small parts of a magneto, carburetor or electrical systems present some aggravating problems. The magnetic screw driver has its disadvantages because it will not work where brass screws are used, and is as a rule ineffective when used around much of the electrical equipment. Grease used on the end of the screw driver to hold the screw until it can be entered, is at best a sloppy manner of getting around the difficulty. A way that seems to meet all the requirements very nicely, is to punch a hole through either a thin piece of brass shim stock or a fairly heavy piece of paper. The screw is inserted through the hole and held by this strip until it is started, after which the paper is simply torn off.

A HANDY WELDING ROD HOLDER

A welding rod holder that has given great satisfaction and one that can be made in a few minutes, I believe would interest the smiths who do oxy-acetylene welding. For several years I have been using the one I made, and I wouldn't want to do without it. It is made as follows: about 3 feet of 3/16" coil spring is uncoiled and straightened. About 2 inches from both ends the rod is bent at an angle of 45 degrees. These both ends are then flattened out and then hollowed together for a distance of 3 or 4 inches, as shown in the drawing. The jaws are then adjusted so that they will be parallel and have the proper tension to hold the welding rod. The welding rod is slipped between the jaws and is fed down simply by tapping the back end of it against the work. A rod can be used almost to the very end, there is little heat at the handle from convection; the hands are kept away from the heat; there are no springs or delicate parts to get out of order and the holder is practically unbreakable. These are some of the advantages claimed for this simple welding rod holder.





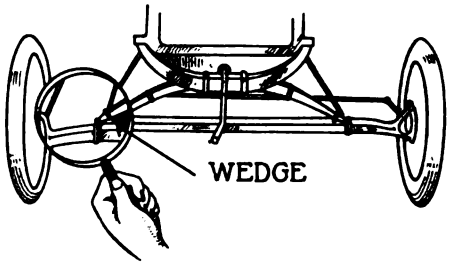
Frank P. Schaaf.

REMOVING FORD SPRING SHACKLES

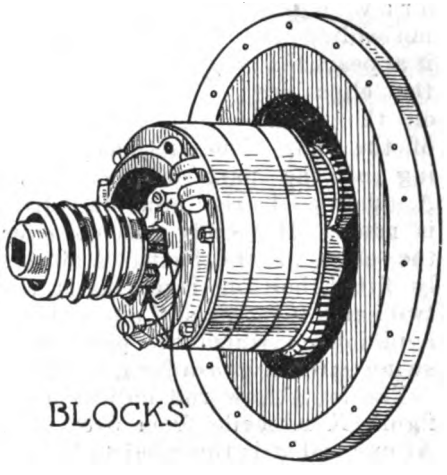
When removing either the front or rear Ford spring shackles, a much easier method than to jack up the chassis or body of the car, is to drive a hard wood wedge between the axle and the end of the spring. The wedge should be narrow enough so that it can be driven under the spring without binding against the side of the shackle to be removed. In replacing the shackles, it will be found that this kink is a wonderful help as it holds the spring in a position so that the new shackles can be readily entered and jointed together, without having to pry the spring either one way or the other, as is usually the case where the body is jacked up.

DISASSEMBLING THE FORD TRANSMISSION

In disassembling the clutch on the Ford transmission, a very handy little kink is to block up the clutch spring rather than to remove it. This can be done by placing 3 small hard wood blocks between the driving plate and the thrust collar. The spring is pried back with a heavy screw driver or short bar and blocks 1¼" long are inserted as shown in the accompanying drawing. The driving plate screws can be more readily removed as there is no tension on the part of the clutch spring. Then again in assembling the transmission, this kink will be found particularly usefull, as the driving plate can be placed directly against the end of the transmission brake drum. In this way the slight projection on the driving plate can be entered into



the recess for that purpose, in the brake drum and the transmission driving plate screws can be tightened without having to overcome the tension of the spring while so doing. Not infrequently it occurs, that in tightening the driving plate, the mechanic discovers that the two parts will not go together readily. He continues tightening these screws, until in many cases,



the lugs on the cast iron brake drum are either cracked or broken.

Earl C. Pratt.

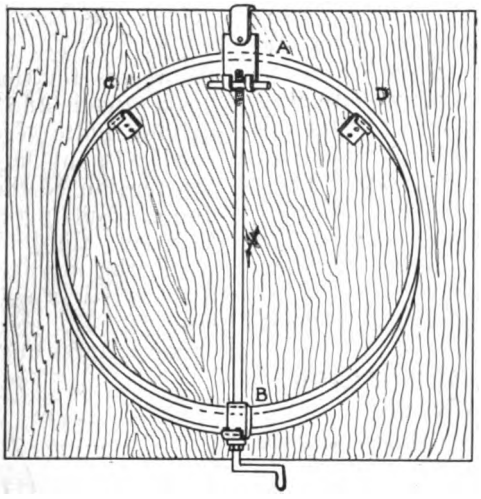
WELDING BOILER FLUES

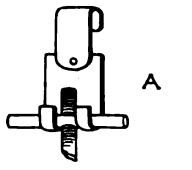
This job can best be accomplished if you have a power blower, the first necessity being to see that the flue is sound and clean. Next cut the end to be welded off square, then cut the tip or piece to be welded on square and hammer it to a short bevel edge. Bevel inward, then bevel the tip outward so that you get about one-half an inch top, then place your swedge block or any piece of iron back of your fire for a butt block.

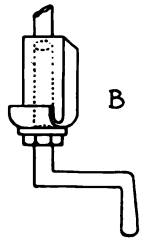
Proceeding, heat both pieces and drive them together tight, and place them in the fire with the end of tip against the butting block; then slowly bring up to a welding heat.

AN EASILY MADE SPLIT RIM CONTRACTOR

A split rim contractor that can be very easily made by any smith is shown in the accompanying illustration. What is usually termed scrap material can be used in its construction and when completed it will prove quite a time saver. On a platform 2′ 10″ square, the clips C and D are placed 17 inches apart from edge to edge, and set in such a manner that they will conform to the edge of the rim. They catch the lower outside of the rim. The drawing was made to show the shape of these clips, for that purpose the rim was cut away. At first glance the drawing is misleading as it appears that the clips are on the inside of the rim. The detailed drawing of the part designated as A, shows clearly how the part is made. It merely catches over the edge of the board. A loosely fitted bolt or rivet holds the two parts together and also acts as a pinion on which the parts may swing laterally to afford freedom.







The long draw rod indicated by figure X is made from 5/8″ rod. At one end it is threaded so that it will screw into a short piece of round 2″ stock which in turn is caught by the clip A. The detailed drawing shown as part B, shows how the other end of the rod is completed. A clip, which catches the opposite side of the rim, is so made that it will slip freely over the draw rod X. A nut which acts as a shoulder is welded to the rod X. A washer is placed between the stationary nut and the part which catches the rim. The end of the rod is bent up in the form of a handle of suitable length to give the desired leverage. When the handle is turned, the rod is screwed into the short piece of shafting shown in figure A, thus drawing the rim together.

James Baldwin.

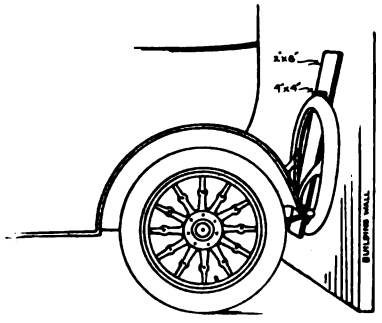
PROTECTING THE REAR OF THE CAR FROM DAMAGE

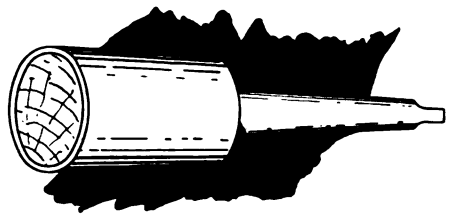
In the crowded garage, the rear of the car as well as the fenders can be safe guarded from danger of backing against the wall, if the car carries a rear tire carrier, as most large cars do. A board on which is fastened several blocks to hold it in place, is placed on the tire in such a manner, that when backing up, the board will come in contact with the wall before the other parts of the car. While this will not entirely protect the car against reckless backing, it will suffice, when reasonable care is used, to stop the car from running against the wall with sufficient force to damage the fenders, and still not injure the tire carrier.

A HANDY DRILL PAD

When any amount of drilling is to be done in a lathe, a drill pad that will fit into the tail stock, will be found to be very handy. One can be made very easily from a piece of steel and a plug of hard wood. The solid piece of steel is turned, so that it will have a taper that will fit the tail stock. It is then welded to a piece of pipe 2″ or 3″ long and of convenient diameter. The hard wood plug is shaped, so that it can be driven into the open end of the pipe, after which the wood is turned off, so that it will protrude slightly beyond the end of the pipe. The drill pad is then complete.

F. W. H.



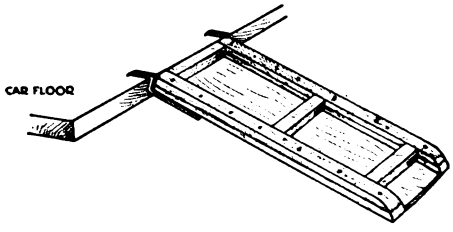


SKIDS FOR UNLOADING TRACTORS

We recently made a pair of skids that worked very nicely for getting tractors off of the flat cars on which they were shipped. They were made from four pieces of 3″ x 12″ x 18′ plank. Two pieces were bolted together. A 2″ x 6″ cross piece was used in the center and at both ends. One end of the planks were rounded off so that the tractor would be more easily run to the ground, while at the other end, the skid was held to the car floor by means of the irons shown in the drawing. A horse place in the center precluded any possibility of it breaking.

A QUICK REPAIR ON A FORD CRANK CASE

Every day brings forth a crop of new ideas, purporting to the advantages of owning this popular light car. In being able to treat it much after the fashion of the old time bicyclist, who used to stand his machine on the handle bars and saddle while making a repair, we candidly believe that the man who owns a twin-six will admit, after all the annoyance that he has expressed about these cars getting into his carburetor, that they possess at least one advantage over his.



"In our country, with its rough rocky roads, it is not an infrequent occurrence for the Fords to hit a high spot in the center of the road. When they do, the drain plug is either broken completely off or else dented so badly that it leaks. It is a long job to disconnect the motor and take off the crank case, so we have devised a way of getting around that difficulty. We simply turn the car over on its left side, and while in that position, it is very easy to get at the damaged plug and effect a temporary repair by

Connecting Rod Installation and Alignment

By N. WARD GUTHRIE

In this article, which is treated in the author's usual thoroughness, some suggestions as to the proper installation of the connecting rod, as well as some valuable criticism on many of the methods in common use, are given.

THE subject of proper connecting rod installation, rather a dry glossary of facts and don'ts, would be of little interest to the reader of fiction or to the literary critic. In this respect the connecting rod is unique, in that it is fully capable of doing its own knocking when not properly handled; and quite as audible as any disgruntled critic, we might add.

Fig. 1. SHOWING THE PROPER WAY TO HOLD THE PISTON WHILE REMOVING THE CONNECTING ROD

Having neither the ability or the disposition to satisfy those people with literary inclinations, in the language of our readers, the shopman, we might as well "hop to it."

Unfortunately, in a great many instances, the connecting rod is regarded by the repeair-man, merely as one of the component steel parts of the automobile engine; having a bearing at both ends and designed to connect the piston to the crank shaft. As long as the bearings fit properly, that is about all that is to be expected from any self respecting connecting rod. This is true in a certain sense. As far as he goes, his analogy is correct. The trouble arises from not going far enough. There is one mighty important requirement that a connecting rod should possess, aside from having good bearings, if quiet, efficient and uninterrupted service is to be expected from the motor; it must by all means be straight, have no offsets and above all, the wrist pin and crank end bearing must be parallel. It is in detecting the reverse of these conditions that the mechanic frequently errs. He is too prone to take for granted that these parts are alright, and in spite of the good bearings, he may have fitted, shortly after the motor is put into operation a strange noise develops. Many theories are advanced as to its cause, and finally after considerable time is wasted in diagnosing its cause, it is discovered that one or more of the connecting rods are sprung or twisted.

Many cases of sprung rods are traced directly to the manner in which the rods have been handled, or if new bearings have been installed, the way in which they were scraped may be responsible. Other cases of sprung rods escape the attention of the mechanic, because the method used in checking up the alignment does not in reality disclose whether they are straight. The methods of testing for alignment will be taken up later on in its respective place. We will begin with a few pointers in regard to the wrist pin and its bushing.

Fig. 2.—SHOWING THE WAY NOT TO DO IT

Before removing the piston from the connecting rod, it is a good plan to see whether there is any play in the wrist pin bearing. For this purpose the connecting rod is grasped firmly in the vise at a point directly below the piston. Then by taking hold of the piston with both hands, it is a very easy matter to determine whether the wear has resulted in any play or looseness at this point. There should be a liberal amount of end play but no up and down movement; if there is the piston should be removed and the difficulty corrected.

Like every other operation around the engine, there is a right and a wrong way to remove the piston. Figure 1 shows how it should be done, while Figure 2 shows an excellent way how not to do it. Most wrist pins being hollow, a bar should be passed through it, and the piston held in this manner while removing the set or clamp screw. In this way any possibility of twisting or springing the rod can be avoided, whereas with the method shown in Figure 2, trouble is very apt to result.

The most popular type of construction, is to place the wrist pin bushing in the connecting rod and to fasten the wrist pin securely in the piston by means of a set screw. Another type of construction is to fasten the wrist pin rigidly to the connecting rod and to place the bushing in the pistons. The former has the advantage, that the bushings can be more easily removed, while it is claimed for the latter, that greater wearing surface is afforded. Some designers use a combination of both, but such construction is so rare as to merit little attention.

In removing the bushing from the connecting rod, a large vise in the absence of an arbor press, works very nicely. The bushing should be pressed out, not driven out. Driving mutilates the end of the bushing and is apt to spring the rod. A piece of round stock slightly smaller in diameter than the outside diameter of the bushing is placed against the end of the bushing. An old bushing with a hole sufficiently large to allow the bushing which is to be pressed out, to slip into it, is placed on the opposite side. The two are pressed together

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brazing it. It is a good plan to have something handy to put out a fire, should the oil in the crank case start to burn. If reasonable care is used and the job cooled as soon as the brazing is completed, no damage will be done to either magnets or coils. In this way a repair can be effected in thirty minutes or less, whereas if the engine was dismounted a whole day's time would be consumed."

Old Timmer.

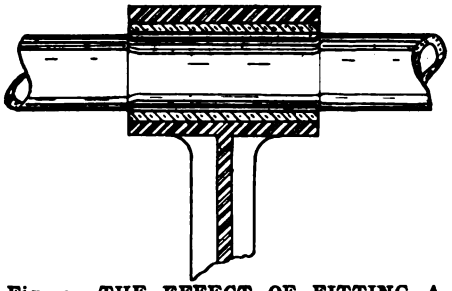


Fig. 3. THE EFFECT OF FITTING A NEW BUSHING TO A WORN WRIST PIN. IT APPEARS TIGHT BECAUSE IT BEARS ON THE EDGE

between the jaws of the vise and in this way the bushing is removed without danger of springing the rod. Before pressing the new bushing in place, it should be observed whether an oil tube from the crank end of the rod lubricates the wrist pin, in which event the necessary oil holes should be drilled in the bushing. The new bushing is then pressed into place, not driven in, for the same reasons that the old bushing was pressed out.

The bushing is now ready to be reamed; but before doing so tne wrist pin should be inspected to see whether it is worn or out of round. A pair of 1" micrometer are a big help, as a visual inspection will disclose only bad cases. If worn or out of round a new pin should be used. The practice of fitting new bushings to worn pins is bad. The result is shown in figure 3. It will be observed that the new bushing bears only at the edge of the worn part of the wrist pin, and it is but a matter of a few minutes running before the parts are as loose as before the repair was attempted. Then too, the bushing must be reamed so that it will slip over the largest part of the pin and when it gets into running position all its former loosenes will be observed. Before reaming the bush to fit a new pin, it is a good practice to see that the pin fits the piston snugly otherwise a knock will develop at this point. The bushing should be reamed so that it will fit snugly, but without binding. It should be so fitted that it can be slipped from one side to the other without a great deal of effort. Tight wrist pins bind when the motor becomes hot, because of the tendency of bronze to expand, and almost invariably a piston slap results. A pin that is a little too tight can as a rule be loosened up by inserting the pin in the bushing and then tapping the outside of the connecting rod with a hammer until it is loosened up. Using emery cloth on a stick to lap out tight bushing is a poor practice, because it is most apt to cut the bushing out of round. Some mechanics attempt to shrink slightly worn bushings, rather than to replace them with new ones. They remove the bushing, tin the outside and then press it back into place. The bushing appears to be tighter, it is true. But what really happens is that a few high spots are forced up on the inside of the bushing. These spots rapidly wear down and conditions are soon as bad as ever.

In removing wrist pin bushings which are located in the piston, care must be exercised that the piston is not damaged by either cracking it or springing it out of round. In pressing out these bushings, a special made block such as shown

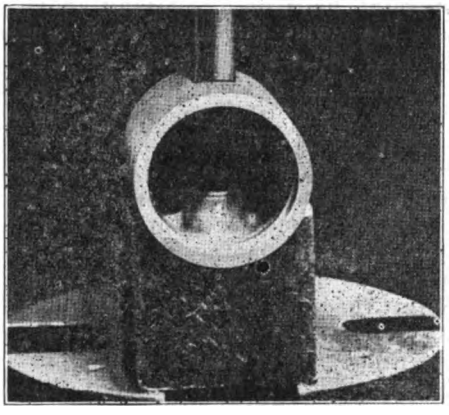


Fig. 4. PRESSING OUT THE WRIST PIN BUSHING WITHOUT DANGER OF SPRINGING THE PISTON OUT OF ROUND

in figure 4, is used. The bushings are always pressed outward, against the block and new bushing are started from the inside and are likewise pressed outward. When such equipment is not available, a jig that will answer the purpose very nicely can be made by placing a heavy washer of smaller diameter than the bushing, against the inside of the bushing. A bolt is inserted through the bushing and washer. Then on the outside of the piston a large bushing is placed around the bushing to be removed. Washers are placed over the end. Then by means of a nut, the bolt is drawn up which draws the bushing along with it. New bushings can be replaced by merely reversing the process. No attempt should be made to drive this class of bushing either in or out, as a sprung or cracked piston is very likely to result. In reaming new bushing, a special pilot reamer should be used so that the bushings will align properly. If the ordinary reamer is used trouble will be almost certain to result and when entering the wrist pin, it will be discovered that the two bushings do not align.

As a last consideration, the wrist pin should have ample end play. This is important, as it gives the connecting rod an opportunity to adjust itself, either slightly one way or the other, when fastened to the crankshaft. If necessary, the amount of end play can be increased by dressing off the bosses on the inside of the piston. The piston should be inspected to see that the wrist pin is securely fastened. If not, there is danger of it working loose and scoring the cylinder walls. The piston should also be inspected to be certain that when the connecting rod and wrist pin are slid from side to side, that the ends of the wrist pin does not project over the edge of the piston.

So much for the wrist pin end of the connecting rod. Now let us give the other end our attention. Before any attempt is made to fit or adjust the connecting rod bearing, the crank pin on the crank shaft should be thoroughly inspected. It should be round and smooth. A pair of micrometer are a great help in checking up the roundness, as they establish beyond doubt the exact amount that the pin may be out. Pins out of round in excess of .0015" should be trued up. There are several devices on the market for that purpose. Through their use it will not be necessary to regrind the offending pin, in fact few shops are equipped with crank grinders. Some mechanics resort to the file and emery cloth method but such practices are to be avoided, except in emergencies. However, shafts which are slightly grooved can be dressed up, so that they will give satisfactory service, by wrapping a piece of emery cloth around the pin and revolving it by means

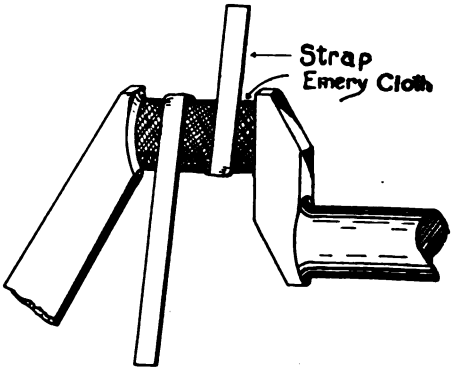


Fig. 5. SHOWING THE MANNER OF SMOOTHING A ROUGH CRANK PIN

of a strap. Figure 5 shows how it is done. Either kerosene or lubricating oil applied to the pin will assist in making a smoother job.

Another way to detect a crank pin which is out of round, if no micrometers are available, is to tighten the rod slightly and then swing it around the pin. When the low spot reached, it will be observed that the rod can be removed much more easily.

The first and most simple type of rod, which we will discuss, is the one in which the babbitt is an integral part. A connecting rod of this type is illustrated in figure 6. The average mechanic is only too familiar with the manner of scraping and adjusting. However, there are just a few points that should be called to the attention of those of limited experience. First, a rod which has been removed from the motor, and is found to have a good bearing surface, should not be scraped. The surface is burnished through wear and scraping, no matter how skillfully done, will not add to its wearing qualities. There are no oil grooves used, and lubrication is provided through what is known as the splash system. However, to facilitate lubrication, the edges of the bearing halves, where they meet, are chamferred at 45 degrees. In that way a place is provided for the oil to enter. When new rods are installed, it frequently is necessary to relieve the radius at the ends of the bearing, so that the rod will have a little end motion. This also assists in the lubrication and sometimes where this precaution is overlooked, bearings have been known to burn out for sheer lack of oil. In old motors or in overhaul jobs, where new rods are not used, it will seldom be necessary to relieve the rods, as they will be found to have worn fairly loose.

The most generally used type of connecting rod bearing is one in which the babitt has been cast into a bronze sleeve or shell. This is cut in half and is held in the connecting rod proper. They are sometimes referred to as, as removable bearing. There are some suggestions, which if followed, will not only facilitate their installation, but which will avoid many of the possibilities of unsatisfactory service after the completion of the work.

These bearing halves, like the bearing caps, should not be removed from the connecting rod until they have been marked like the connecting rod caps. It is important that they should be returned in their same relation one to the other, otherwise it may be discovered that they will not fit properly and considerable time may be wasted in getting them back in their original position.

In regard to scraping, the same instruction for these bearings, as well for as the last mentioned type, holds good. They should not be scraped unless it is necessary—unless the bearing is not fitting properly or has been partially burned. In the majority of cases, an adjustment is all that is necessary. Many mechanics have a misguided idea about scraping. They are like the small boy who got a new saw for Christmas, he wants to use it on everything, and none of us believe that the appearance of the piano is improved as the result of his activities. So it is with scraping; unless the bearing actually needs it and you know how to do it, let it alone. Bearing scraping no matter how skillfully done is bound to leave, instead of the burnished hard surface, a soft surface covered with minute high spots. These high spots wear down after the motor is placed in operation an a slight looseness is bound to result.

Should the inspection of the bearing disclose that a new bearing is needed, the first thing to do is to fit the halves to the connecting rod and cap before any scraping is attempted. The rod and cap are cleaned off with gasoline, then blued with Prussian blue, after which the bearings are fitted. By trying the bearing into the rod, it can be readily seen where the high spots are; and these should be dressed off with a mill file to insure a good fit. Any attempt to force a new bearing into a rod, without first seeing whether or not it fits properly, should be avoided, and likewise the bearings should be filed very carefully as the reverse effect of having them loose is equally as bad. The next step is to see that all oil holes through the bearings are properly drilled. Bearings, which are lubricated by means of a scoop which dips into the oil, will require a hole through the lower bearing halve, while those which are lubricated by the forced pressure system, as a rule have an oil tube carrying the oil up to the wrist pin. A hole in the proper place will have to be drilled in the upper halve of bearings of this type.

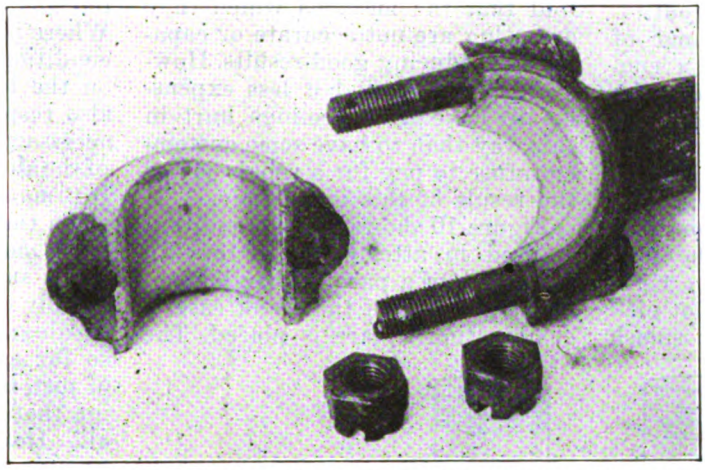


Fig. 6. AN EXAMPLE OF THE PLAIN CONNECTING ROD BEARING, IN WHICH THE BEARING PROPER IS AN INTEGRAL PART OF THE ROD

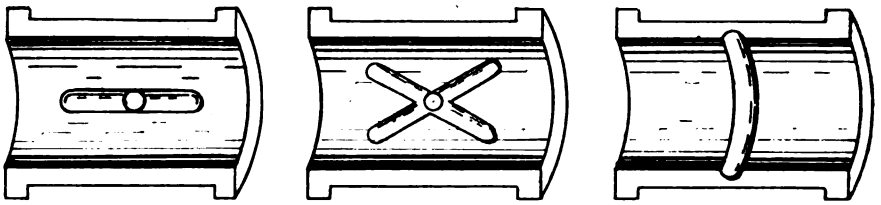
Next, to insure a free distribution of oil to the bearing surface, the oil grooves are cut. Figure 6, 7 and 8 shows the usual manner of cutting these grooves. Figure 6 shows the usual oil channel which is used where the pressure system of lubrication is employed. The oil being fed through the crank shaft, is fed out into this groove from whence it continues on up to the wrist pin. With this type of bearing, it is important to see that the two grooves meet evenly, otherwise the circulation of oil is impaired. On all connecting rods where the pressure feed system of lubrication is used, the use of shims, unless very carefully fitted, are disadvised, because they are apt to keep the two bearings halves separated, and through this opening the oil escapes, instead of continuing on up the tube and lubricating the wrist pin.

In replacing bearings of this type, especially where the one which is being replaced has been burned out, it is a good practice to examine the oil ducts through the crank shaft. When the bearing burned out, it is not improbable that some of the molten babbitt may have gotten into the tube and unless such obstructions are removed, it is more

than likely another bearing will be burned out. One should not be deceived into believing that the oil duct is clear simply because gasoline can be forced freely through the lubricating system. Not infrequently it occurs that a piece of babbit will lay at the bottom of the tube, apparently offering an obstruction to the gasoline, yet when the motor is placed in operation, the pressure of the oil assisted by centrifugal will move the foreign matter directly over the opening, in which position it will be held by the pressure of the oil. The oil thus being shut off; and very shortly it will be another case of "get out and get under." There are plugs at the sides of the crank throws, which give access to the oil duct. These plugs should be removed and the oil ducts thoroughly cleaned out.

Figure 8 shows the manner of cutting the oil grooves in a connecting rod that is lubricated by means of a scoop which dips into a trough of oil. A hole through the lower half of the bearing admits the oil. In replacing bearing caps using this style of lubrication, it is highly important to see that the opening of the scoop faces in the right direction, otherwise it will not pick up the oil, but will merely splash through it, and a burned rod, for the want of proper lubrication, is most likely to result. The oil groove in figure 9, is also used, as well as what is known as the "H" type of groove, which is as its name implies, the shape of a letter "H".

Now, we come to the most important and least understood part of the connecting rod installation; that of proper alignment. It is apparent to even the casual observer, that unless the piston runs parallel to the cylinder wall that excessive wear is going to result to the cylinder wall, piston, connecting rod and wrist pin bearing. Unfortunately many of the methods used in checking up piston alignment are of little or no account, for while they will show whether the connecting rod is bent, they will not show if the rod has been twisted so that the wrist pin is no longer parallel to the crank shaft. It may incur the displeasure of some readers to be told that the methods which they are using are not accurate or capable of producing good results. However, they will find it less expensive to have their feelings hurt in this way than to have some customer refuse to pay for a repair job as the result of this inaccuracy.



Figs, 7, 8 and 9, SHOWING SOME OF THE MOST COMMONLY USED STYLES OF OIL CHANNELS IN THE REMOVABLE TYPE OF CONNECTING ROD BEARINGS

Figure 10 shows one method that is used in attempting to line up pistons. On a parallel bar laid on the upper face of the crank case, a combination square is placed. The edge of the square is brought up against the side of the piston at the wrist pin, and it is observed whether the piston is parallel to the edge of the square. If they are found to lean either one way or the other, the connecting rod is so bent that the piston will stand straight. This method is some what of an assistance to be sure, because it eliminates at least one difficulty. Nevertheless, there are two very serious difficulties that escape detection when this method is used. First, it is impossible to discover a twisted rod, or a rod with an offset. The first condition is dangerous, particularly if the rod is badly twisted, because when the motor is placed in operation the rod attempts to straighten itself at every revolution, thus subjecting the rod to a constant twisting motion. An offset rod does not support the piston directly in the center and thus when the explosion occurs the piston has a decided tendency to tip. Where bad offsets exist, besides the conditions mention, the rod bears on the bosses of the piston and is also responsible for placing an unnecessary wear on these parts. Any of the above conditions are most likely to manifest themselves by a knock when the motor is running. Sometimes more pronounced than others, to be sure, but in any event it is usually clearly audible and difficult to diagnose. Some authorities go so far as to condemn this method of piston alignment altogether, saying that it is worse than nothing at all. However, that is hardly true, because simple bends in the connecting rods can be detected and corrected by this method, but in using it, its shortcomings should be borne in mind.

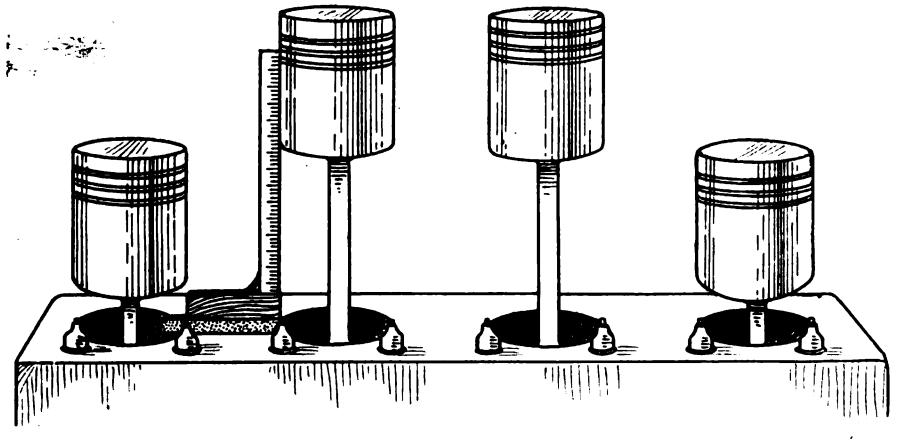


Fig. 10, ALIGNING PISTONS WITH THE COMBINATION SQUARE IS AN INACCU- OIL CHANNELS IN THE REMOVABLE TYPE OF CONNECTING ROD BEARINGS

There is another practice in common use among many mechanics for attempting to line up pistons. It is to lay a straight edge over the top of the pistons after they have been assembled to the crank shaft. This method is resorted to largely on the type of motor where the cylinders are cast en block and form the upper half of the crank case. It would be virtually impossible to use the combination square, as there is nothing on which it could be satisfactorily placed. The common practice is to turn the motor over, standing it on its head. The connecting rods are then assembled to the crank shaft from the bottom of the motor with the pistons sticking out where the crank case should be. The crank shaft is turned to the quarter, that is midway between the head end and crank end of the stroke. This

brings the pistons all to the same height. The connecting rod bearings having been tightened slightly, no difficulty is experienced in keeping the pistons remaining in any position in which they are placed. With the pistons all at the same height, a straight edge is placed on the piston heads. It can readily be observed whether or not the piston head is parallel with the straight edge. If not, the connecting rod is bent so that it will be. About the same advantages but mostly disadvantages can be claimed for this method as the one discussed directly before it. Its use should be resorted to only in the absence of proper equipment. Figure 11, shows the straightedge being used to align pistons on the type of motor where the cylinder block can be detached from the crank case.

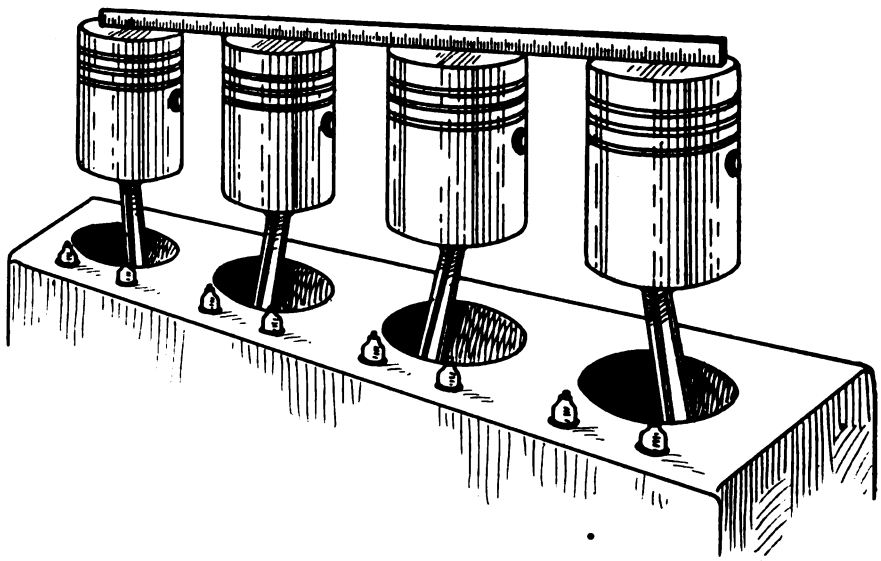


Fig. 11. ALIGNING PISTONS WITH A STRAIGHT EDGE HAS THE SAME POSSIBILITIES FOR ERRORS AS THE COMBINATION SQUARE METHOD

Sometimes the mechanic in replacing a burned-out connecting rod bearing realizes that on account of a great deal of scraping, which may have been necessary in fitting the new bearing, that the rod and piston as a result may be tilted slightly to one side. His suppositions are correct; but the manner he uses to determine the existence of such conditions are a long ways from being dependable in every sense. Before replacing the connecting rod, the rod with the piston attached is placed on an arbor, as shown in figure 12. A square is used and if the piston is found to be leaning either one way or the other the rod is bent so that the necessary alignment is secured. This method like all of the foregoing will not disclose a twist or off set. It is just as probable, if any amount of scraping was necessary, that it may have been done so as to produce the effect of having slightly twisted the rod; as that the scraping caused the rod to lean either one way or the other.

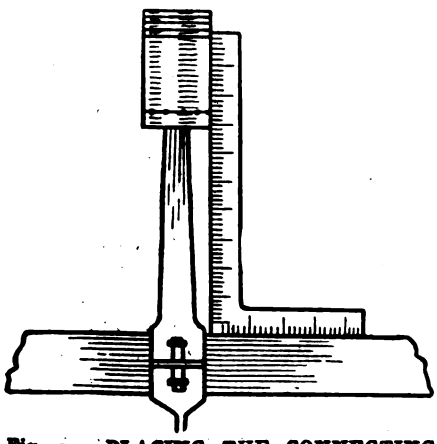


Fig. 12. PLACING THE CONNECTING ROD ON A MANDREL AND THEN USING A SQUARE WILL NOT SHOW WHETHER EVERYTHING IS ALL RIGHT

There are several ways in which the connecting rod may be accurately checked up for alignment and any shop doing any amount of this kind of work will find it decidedly to their advantage to investigate their present methods and to install equipment which will preclude the possibilities of errors arising from inaccurate methods.

Figure 13, shows one type of a jig for testing the connecting rod. The rod after having been scraped is mounted on an arbor the size of the crank shaft. A disc with a lug the size of the wrist pin is fastened to the other end of the connecting rod. This is done by slipping the lug into the wrist pin bushing. The rod with the disc attached is then swung against a stationary disc which is square to the arbor. If the rod is straight both dics will be parallel, otherwise the discs will be closer at either one side or the other. Should the rod be bent, the discs will be either closer at the top or the bottom according to the direction in which the rod is bent, and if the rod is twisted the discs will be closer either at one side or the other. Since the arbor on which the connecting rod is being swung is provided with a shoulder against which the connecting rod bearing rests, it is only necessary to observe the distance between the discs and then reverse the connecting rod to determine whether or not the rod has an off set. A thickness guage is a big help, as a blade of the proper thickness can be selected and when the rod is reverse, it will be observed that the distance between these two disc should be the same.

In straightening rods which are found to be sprung, it is safer to remove them from the jig and do the straightening in a vise, otherwise the jig unless very rigidly built, is apt to be sprung. It is evident that such a condition will only further complicate matters.

Another type of connecting rod straightening jig is to fasten the connecting rod by means of the crank end bearing to a stationary arbor. The wrist pin is inserted in the wrist pin bushing and the rod swung against two steel blocks fastened so that they will remain constantly in the same relation to the arbor. These blocks are absolutely square with the arbor and at such a distance from it that when the rod is swung against these blocks, the wrist pin will rest on them. It can be readily observed whether the wrist pin is square with these blocks and if not the necessary corrections in the rod can be made. The blocks are made shaped after the fashion of a step. The horizontal plane being used to check for a twist in the rod while the vertical side will show if the rod is bent. A thickness guage used between the wrist pin and the blocks will quickly show any discrepancy.

There is still another method used in checking up connecting rod alignment that should have been taken up previously, but before closing a few words in regard to its use, might not be entirely out of place. It is the manner of checking up the rods by assembling them without the pistons and then

Some Simple Combination Lathe Tools

THE proprietor of the general shop often finds use for special tools, but perhaps he uses them so infrequently that the expense is hardly justifiable, and as a consequence he is compelled to make tools sufficiently good and accurate with the means at his disposal, which generally means the purchase of materials only.

The accompanying illustrations show means of making in a very cheap way most of the tools necessary for drilling, milling, counterboring, slotting, etc., of a small nature, the only material to be bought being a small quantity of bar steel of various qualities.

To enable the scheme as a whole to be adopted, it is necesary that the holes in the headstock spindle and tailstock barrel be uniform as regards taper and truly concentric. If this is not already the case the modern lathes are always made so —the writer recommends as an initial proceeding that, if this be at all possible, the owner of such a lathe take the necessary steps to get uniform center holes. This can be accomplished on any lathe having a slide-rest capable of being set over for turning tapers. The hole on the spindle would be bored out with a single-point tool, well stoned (oilstoned) and as keen as possible. The cutting edge of the tool must be strictly on the center line—neither above nor below—to produce a true cone. If a Morse taper-shank drill is at hand, this could be used as a gauge, with the advantage that taper-shank drills could be then chucked direct in the spindle, and of course in the barrel of the tailstock when this is also corrected. To correct the hole in the latter it will be necessary to mount one end—the end opposite the center end—in a chuck as truly as possible, a bell chuck would serve admirably and the other end in a stay. In the absence of a proper stay, a piece of wood could be bolted to the bed, and a hole to fit the barrel produced by a drill mounted in the chuck. The hole would then be bored as in the case of the spindle.

This having been done it is possible to use centers as indicated in the illustrations. It will be noted that these centers (see Figs. 1, 2, 3, and 4) are tapered (same taper) at both ends so as to be reversible. This makes it possible to use both ends as some form of tool, and the tapers in the headstock and tailstock being uniform any of these tools may be used in both.

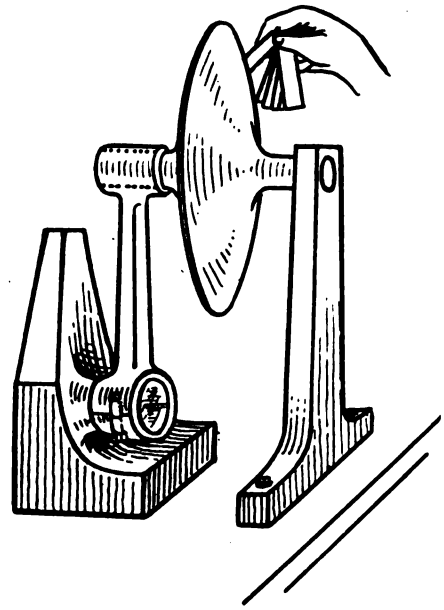


Fig. 13. A JIG ON WHICH THE CONNECTING ROD CAN BE ACCURATELY CHECKED UP

Fig. 1 shows how the opposite end of the usual center is used as a chuck to hold a center drill and countersink of the Slocomb type. To enable these centers to be removed, two flats are filed, in such a position as to be available whichever end is being used. It will be noticed that the end having the center point is rather shorter than that carrying the drill, so that when using the latter, the center—now a chuck—has not quite so good a hold in a barrel or spindle as the case may be. In actual practice of the writer this was found of no consequence, as the duty is always most severe when turning work in the centers. A screw is provided to hold the various tools, and the screw-hole is coned out to prevent mutilation of the center holes.

When hardening centers do not harden the whole of the body, but simply heat the point, chill the end, and allow the temper to draw. By this procedure distribution is prevented.

Fig. 2 shows how a "cut-away" center is used also as an arbor for a slitting saw, small emery wheel, or milling cutter. Just here it would be well to remark that the holes for carving tools should be finished in position with a single point tool. To facilitate getting the holes parallel, they are recessed to a larger diameter towards the bottom. This recess removes the part which is apted to be tapered, and which might consequently allow a straight shank to jam at the bottom. Several chucks should be provided, having holes different in size to take standard tool-steel bars purchasable from any tool dealer.

The "cut-away" center, the purpose of which is to allow a bar mounted between centers to be ended up without "digging" into the center, is of rather novel form, much stronger than the usual type having nearly half of the point cut away. The method of making this form of center is shown in Fig. 2. The cutting away part is machined by a small milling cutter in the position shown by dotted lines. The ending tool is shown by longer dots, showing how it is possible to run the tool clean past the center countersink. If no facilities for milling are at hand take out the metal with a chisel and finish with a file. Of course, it is possible to remove the bulk of the metal by drilling.

Fig. 3 shows a double-ended chuck having its center hole of two different diameters to accommodate tools having similar shanks. It is used here as an arbor or mandrel for holding a quantity of washers by means of special bolt, or it might be used also for carrying a small milling cutter, etc.

Fig. 4 shows a convenient ordin-

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using a long arbor through the wrist pin bushings. The rods are assembled to the crank shaft which is turned to the quarter. The rods are then all the same height. The mandrel or arbor is slipped through all the wrist pin bushing and if any of the rods are either bent or twisted the mandrel will not enter. The objection to this method is that the mandrel being long and seldom more than 1" in diameter is very liable to be sprung if carelessly handled, and then too, there are slight variations in the diameters of the wrist pin bushing. Therefore a slightly undersized mandrel is necessary. The mandrel being undersize, it is difficult to tell whether the mandrel goes straight through the bushing or whether it is slightly cross wise. For all around purposes the connecting rod straightening, or rather testing jig, is hard to beat.

ary and square center combined in one. Reducing the ends in this way facilitates truing up.

Fig. 5 shows a chuck pure and simple, of which several different sizes should be made. The screw at the back end is for preventing tools being forced back under heavy cuts. This screw is adjustable endwise, so that tools of comparatively short length may be used.

Figs. 6 to 12 (drawn to a larger scale) show various tools adapted for use in the chucks Figs. 1, 2, 3, and 5.

Fig. 6, shows a drill fitted to a shank. Great care must be taken in drilling the hole to take the drill shank. It should of course, be drilled in position. In case of any small inaccuracy in the outer part, the flat will insure it being always replaced in the same position. After drilling, clean the drill shank and hole. Tin the drill shank with solder taking care not to allow the heat to run up the drill and soften it. Heat the shank, press the drill in and allow to cool. Note that the larger hole in this shank is cored out. This will allow it to be used, reversed, as a female center for comparatively large work.

Fig. 7 is an end mill or reamer, and combines a cupping tool for soft (say copper) rivets.

In Fig. 8 the right-hand view shows a combined ordinary and square center. The left hand view is a combined ordinary and female center. Instead of using a drill for opening out the latter and preventing the bottom of the countersink pressing against the extreme point of the work a center punch might be used to give the necessary clearance as shown in Fig. 9, intensified somewhat to show up more clearly.

Fig. 9 shows a combined female center and boring tool. Note the spiral confirmation of the cutting edge. The cutting edge is ground back as shown by the dotted lines in the end view, the bottom rake remaining constant owing to its spiral conformation. The cutting edge may, of course, be ground with a back rake if to be used for mild steel or soft cast-iron. For brass it should have no rake. As the cutting edge is ground back the cutter is rotated bodily on the holder to keep the cutting edge constantly parallel or at the given rake with the lathe bed. For this reason a groove is turned in the center of the shank, instead of the flat surface, as shown in the shank of Fig. 6. This form of tool properly shaped is admirable for screw-cutting, in which case it would, of course, be fitted into a special holder to fix on to the slide-rest. Used in the tailstock, these tools are suitable only—unless made to a definite size—when it is provided with a sliding motion for tapers, the cross fed being obtained by sliding forward the tailstock.

Fig. 10 shows a double counterbore very cheaply made from nickel steel. Fig. 11 shows a T- slot-milling cutter and screwed mandrel for use in facing nuts, etc., or for holding many of the small cutters which are sold with tapped hole.

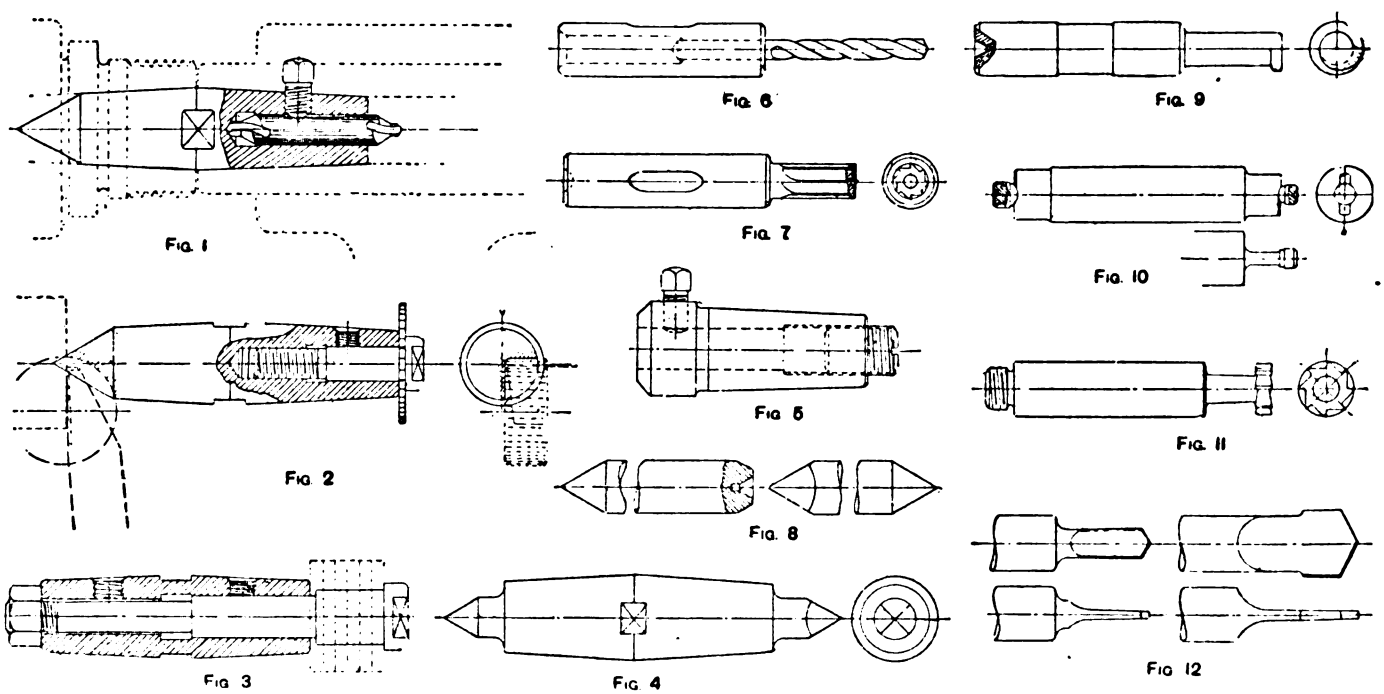
Fig. 12 shows how drills smaller and larger than the shank diameter are made. Properly made and ground, these drills retain their size until worn out. They are slightly tapered (about five-thousandths of an inch) on the edged of the blade or cutting part. They should be ground on the end or cutting edges only. The opposite ends of these drills may, be utilized as other tools, or two drills combined in one.

Work

POSITIVE AND NEGATIVE

Generally, the positive post of the battery is marked with a cross and the negative with a dash. If in doubt, dip both wires in a glass of water to which has been added a tablespoonful of salt. There will be bubbles on the negative wire.

If the wires are stuck in a raw potato, there will be a green-back deposit where the negative wire entered the potato.



SOME SIMPLE COMBINATION LATHE TOOLS. Fig. 1.—Reversible Lathe Center Drill Chuck. Fig. 2.—Center Used as Arbor for Circular Saw. Fig. 3.—Reversible Drill Chuck used for Chucking Small Articles by their Bore. Fig. 4.—Double-ended Center (One End Conical, the Opposite End Square). Fig. 5.—Simple Drill Chuck to hold Tools (Figs. 6 to 12). Fig. 6.—Adapter for Small Drills. Fig. 7.—End Drill and Cupping Tool Combined. Fig. 8.—Conical and Female Centers Combined. Fig. 9.—Boring Tool and Female Center. Fig. 10.—Double-ended Counterbore. Fig. 11.—T slot Mill and Screwed Arbor Combined. Fig. 12.—Double-ended Flat Drill.

SPEAKING OF GASOLINE AS FUEL

Has Plenty of Heat Units But Not the Kick That Motor Car Owners Most Desire

The Auto Era

EVERY little while the story starts around that we face an oil shortage and hence a shortage of gasoline. But L. B. Colby, editor of Petroleum Age, in a recent Saturday Evening Post article denies any such outlook. There is no cause to fear a fuel shortage.

Mr. Colby calls attention to such facts as these:

One hundred billion barrels of crude oil, potential gasoline, are locked in vaults of shale in our Western mountains.

Utah and Colorado hold vast storehouses of oil, 3,600,000,000 gallons or about 88,000,000 barrels.

Wells drilled in Pennsylvania fifty years ago are still producing. There are still new possibilities in the old fields, as one well yielding 1,200 barrels a day was recently drilled in this state.

In November, 1919, there were 600,000,000 gallons of gasoline above ground and manufactured. This is 250,000,000 gallons more than were accumulated at the same time one year ago.

Of the 514,919,358 gallons of gasoline on hand the first of last August, a total of 154,954.793 had gone into storage in the Atlantic Seaboard. Another 129,640,278 gallons held in Texas close to seaboard. This leaves something like 230,324,000 gallons in storage in the rest of the country.

We are adding to our yield of petroleum about 20,000,000 barrels of production a year. In 1909 the production of the country was 183,000,000 barrels. This year the production promises 370,000,000 barrels as a conservative estimate.

We are just beginning to realize the possibilities of deeper drilling in two wells that were struck at a depth of more than 4,600 feet, one in Texas and the other in California.

In addition to the new Texas field, additional wells are being uncovered in Northern Louisiana. Wells are coming in fast there, several a week, each making 10,000 to 24,000 barrels a day.

Outside of the United States there are immense possibilities in Central America, South America, Mexico, Canada, Alaska and Siberia. They are drilling gas wells in Siberia and in one small valley there is a great lake which no white has ever seen, which is reported to be of strange black oil.

There are wells in India still good which have given up oil for centuries and others along the Caspian Sea. Casinghead gasoline made not from oil but natural gas, is another large source of supply. In 1911 the quantity produced was 7,429,839 gallons and in 1907 it was 217,884,000 gallons.

Benzol, a coke by-product blended with oil, also has possibilities as a fuel and is now being produced by the millions of gallons.

During the war the Canadians distilled a near gasoline from waste straw piles. Greeks ran motor cars on a liquid distilled from forest trees. The Danes and Norwegians found that an internal combustion engine could be made to go on fish oil. Australians learned that alcohol made from sugar and molasses would do in case of necessity.

The origin of petroleum, like the origin of electricity, is undiscovered, and Mr. Colby says it is possible that vast quantities are still being created under ground.

Notwithstanding these facts, the National Automobile Chamber of Commerce in a recent bulletin announces that "our representatives have been meeting with the oil people and with government officials who insist that the time is at hand when motor car manufacturers must begin to preach economy in the use of gasoline.

They say that from 1909 to 1918 there was an increase of 95 per cent in the production of crude oil; 560 per cent in the production of gasoline and 1,7000 per cent in automobiles, aside from other engines that use gasoline.

"The officials of the Bureau of Mines at Washington asked members of the N. A. C. C. committee to urge a campaign of education of automobile drivers on the possibilities of a more efficient use of fuel. They suggest that manufacturers can help materially in this by giving more attention to the subject of greater mileage per gallon, besides supplying educational data on the use of gasoline in their catalogs, instruction books, etc."

That education is needed because gasoline today is not the gasoline of a few years ago is emphasized by an editorial in the Boston News Bureau, which discusses "fuel value" as follows:

"It is not generally known that the so-called low grade gasoline now on the market has more fuel value than the high gravity gasoline. The factor which determines the power produced from gasoline is the number of calories or heat units which it contains. It is a scientific fact that low grade, low gravity gasoline contains more heat units than high grade, high gravity gasoline; and kerosene contains more heat units than low-grade gasoline.

"So that there is more actual power in present-day gasoline than of ten years ago. Any difficulty with the modern fuel is not due to its lower power content but to the mechanical difficulties of carburetion and combustion—it is more difficult to vaporize and to burn up completely than the more volatile gasoline we used to have."

And that, as every motor car owner knows, is the truth. Gasoline today is but little more volatile than hard coal and evaporates about as rapidly as liquid glue. Indeed this condition is so emphatic that most car owners are less concerned about a possible shortage of this fuel than they are of the danger of having today's "gasoline" gum the pistons and cause them to freeze solid in the cylinders.

Seriously, however, the problem is one of quality rather than one of quantity. The question of better gasoline belongs properly to the refining industry, not to automobile owners, dealers and makers. Is the refining industry doing its duty, or doesn't it care?

Remember that the individual who just comes in to look around a little is the one who has been reading your advertisements and is really interested—but doesn't want to appear too interested. Treat that person with every consideration and courtesy, and you are doing some first-class follow-up work that you will see results from sooner or later—and usally sooner.

SPARK-PLUG TESTER

A way to prevent getting a shock while testing out spark plugs is to provide an insulated handle to a device carrying two wires that will be made terminals by the contact plates and touching the spark plug and the engine head. The two wires are brought up through the insulation and the ends bent in close to each other, or the same as the terminal wires of the spark plug. Such a device is very handy to keep in the tool box or bag of an automobile or motorcycle.

Queries-Answers-Notes

THIS department is the meeting place where you are free to ask for information, answer questions, discuss shop matters and business conditions and any other notes you feel would be of interest to a fellow mechanic. Make use of this Department as often as desired.

The Tractor Vs. the Horse:—A farmer from this district visited the United States, and on his return, lectured to our Progressive League on what he saw. In regard to the farm tractor, he said, "It was a failure." One manufacturer said he made them only because he had to. They reared up, fell over, and will never take the place of the horse. It is proving very hard to get the tractor into use in this country, and such speeches of course will not help. The Forson Tractor retails for $1,650 here, and so far is getting very little use. I heard of a trial a few weeks ago, in loose soil on a hillside. It was reported a failure and no sale resulted. Is it that the vendors do not know how to use them properly? Your country and England use lots of tractors. Why do visitors report them to be failures? Why do they not make way here? Will you tell New Zealanders what they will or will not do?

G. W. Dash, Chairman Progressive League, Waimate, New Zealand.

Editor's Note:—Not infrequently some casual observer reports the failure of a tractor assigned to do some particular work. In many instances the failure, either real or imaginary, is immediately picked up, without regard to the contributing causes of the alleged failure, and immediately misconstrued as showing its independability. Such sweeping assertions as "the tractor is a failure", are quite as ridiculous as the prognostications of the man who foresees the entire passing of the horse within the next few years. The judgement of both seem lacking the happy medium of a working average.

Reliable data from the Bureau of Agriculture indicates that there are some 200,000 tractors in use in the United States, which if any credence is to be placed on the assertion that the tractor is a failure, would lead us to believe that there are nearly that number of farmers who at least are very poor business men in knowingly continuing in the use of a device of such questionable accomplishments.

There are arguments both pro and con, it is true, purporting to the success of the tractor over the horse and vice versa. It can not be denied that there are conditions under which the tractor works at a disadvantage, and where it would prove more profitable to use the horse, but such cases by far prove the exception rather than the rule. If the tractor manufacturers are producing them merely because they have to, as our informant would have us believe, then there must be some hundreds of manufacturers engaged in a line of work merely for the amusement which it affords. This hardly seems consistent with reason.

Recently in passing editorial judgment on the draft horse situation, the Scientific American made the following observation, which seems fair to all parties concerned. In part, they said as follows: "The tractor in its present state is a means of supplementary or auxiliary power rather than a substitute for the horse. It has made no appreciable dent in the number of horses on our farms. In spite of this, the very definite consensus of opinion among the farmers and their representatives is that the tractor is a good investment. This is because the tractor makes it possible for them to do work that they never before undertook, and to operate on a larger scale. In other words, instead of replacing the horse, as a person without special information would naturally suppose that it must do to justify its existence, the tractor supplements the horse and extends the scope of the farmer's operations. It helps out in the things that the horse does well; and in doing these things it amply justifies its existence, without any question of whether it has put the farm horse out of business or ever will do so."

Would Shun the Auto Altogether:—Have read your paper for a long time and am almost lost without it. But one thing that I do hate to see is so much advice for the blacksmith to change to an autoist or garage man, which is to my idea a very wrong thing to do. I have tried it and found that it is the worst thing a good blacksmith can do. Then later on, I thought that it was just my case that worked that way. Last Summer, I sold my place just to get rid of the garage, and with the subject fresh in my mind, I went traveling, first around here in Montana, and later on in the latter part of August, I went East. I went through North Dakota, Wisconsin, Illinois, Iowa, Nebraska and Kansas. I visited nearly every shop in all the towns in which I stopped, and I dare say that I visited not less than 150 shops.

It was one of the greatest experiences of my life, for in the 15 years preceeding that time, I had not been over sixty miles away from my shop. Every shop that had been a blacksmith shop, and was then a would be garage, could be easily distinguished, for instead of getting a burly hearty hand shake at the anvil if you stood and looked for a minute, you would see a dirty hollow eyed guy crawl out from under some rattle trap of a car, may be he would say "hello" or just "Howdy" and then almost run over you and everything else to see what kind of a car that just passed.

Now, you may laugh and say that may have occurred once in a while, but the same thing occurred not less than twenty-five times on my trip. I paid particular attention to all of them, and fully fifty of the men I met were arguing with customers over some work that had been done on their cars and which had not given satisfaction, or that the tire which they bought was no good, or that the spark plugs were defective, and all the while they were wasting their time arguing, there were plow shares laying around in stack, waiting to be sharpened.

At one place where I stopped, a man drove up in a car and asked the blacksmith if he could fix a tail light bracket. He laid down his job of plow pointing and went to work on the auto. Pretty soon along came the farmer, and seeing that there was going to be a fuss over his work not having been done, I said "I will sharpen your plow points for you." I finished my job and collected $8.75 for the work, and found my friend still working on the car. When he finished, after soldering up the radiator and making a few other minor repairs, he got just $3.50 for his work and thought he had done well. I can take the old hand hammer and forge and make more day after day than the best mechanic ever dreamed of, at least, I have pounded out about $20,000 to the clear and I don't know of any car men of that class. You stand up and work like a man, instead of getting into grease up to your neck, until your not fit to be seen out of the shop.

Now, this is probably too strong to appear in your paper, but it is a fact in about seventy-five cases out of a hundred so I don't care what you do with it. But if you should publish it leave my name off, because some people may not like my ideas.

F. H. C., Nebraska.

Editors Note—It seems almost unnecessary to comment on the business ability of a man who will turn down an $8.75 job in order to do another which will net him $3.50. Such conduct is a matter of individual taste, and we will reserve our opinion. We hardly believe that the blacksmiths in general have such a poor conception of business ethics as to pull many "bone heads" like the instance cited and still stay in business. Nor, do we believe that it would require a great deal of mental arithmetic on the part of the shop owner to see that a more substantial profit could have been made, if both jobs had been done instead of either. Some shop owners may like to see business driven away from their shop, but it hardly seems probable.

Statistics show the automobile industry to be the seventh largest in the country, and it also gives the interesting information, which is not generally known, that the farmers own and operate more motor trucks than all the commercial enterprises combined. It seems only logical to assume that the blacksmith, particularly in the rural districts, should be greatly benefited by the resulting repair work. There are many jobs on both automobile and trucks, such as spring work and welding that the blacksmiths are far better equipped to handle, than any distinctively garage man could ever hope to be, and they will find that class of work quite as renumerative as any other class of blacksmithing. It is this class of work that we have urged our readers to go after, rather than to pass up a $5.00 blacksmithing job for the sake of accommodating some motorist for $2.75. We hope that we have not been misconstrued as countenancing such "get poor quick" schemes.

Making Washers for Pumps: — I am getting up an auto tire pump and would like to know if there is any better material to be used in the plunger than leather? What kind of leather is best suited for

this work? Does fibre make a good washer for this purpose?

R. L. A., Illinois.

From your letter, we assume that you have in mind making a hand pump, in which case we would advise the use of a leather washer for the plunger. A fairly close grained leather answers the purpose very nicely, but it will be necessary to have the washers cupped out so that they will conform to the walls of the pump, and be held there by the pressure of the air. It will be necessary to have dies or templates on which to form the washers, if any number are to be made. Unless it is intended to make a large quantity of these washers, it will be found cheaper to buy them already made. Any automobile or bicycle supply house can furnish all standard sizes. Fibre is not a desireable material from which to make these washers, as it lacks the fundamental quality of flexibility. Washers of this material are used successfully in pumps handling heavy oils and grease, in fact for this purpose it is found to be better than leather. Power driven air pumps use pistons and rings not dissimilar in general appearance to those used in automobile engines. The heat generated during the rapid compression of air is very destructive to leather and, therefore makes it unsuitable for that use.

Charges for Sharpening Road Scraper Blades:—Some time ago I read the experience of one of our brother smiths who has been charged with profiteering by the County Officials. It seems that they believe he charged them to much for sharpening a road scraper. I use to charge 5c an inch for this work but have raised it to 7c. This same class of officials thought I was charging too much for the work, so instead of drawing and sharpening the blades, I had them ground on the emery wheel. This process is cheaper, but the blades will not last nearly as long, so in the long run sharpening seems to be the cheaper of the two. A sharpened blade last much longer, as the hammering makes the edge hard, whereas grinding leaves a soft edge that wears much more quickly. All smiths know this to be a fact, but our County Officials are worse than the fellow from Missouri, because they can't be shown. A road scraper blade that is ⅜″ to ½″ thick requires a good three hours of work, 16 to 20 heats and a bushel of good coal and about half the time you can't get any helper. Recently I sharpened one and had to hire a helper for that particular job. He charged me $1.50 for his time and when I was through, I don't believe I had made any money. From my experience, it is perfectly immaterial to me if this class of work is not brought to my shop.

E. D. Pendleton, Ohio.

Removing Broken Studs—In one of your recent numbers I read the inquiry of a brother smith in regard to removing broken studs. I have tried a good many ways of doing this work but almost invariably, I come back to a method that I have used for a good many years and which has given very good satisfaction. Take for example the task of removing a ½″ stud. I drill two 3/16″ hole clear through it. A hole is drilled on each side of the center. First I drill one hole and then plug the hole with a spike or some other piece of round stock that will slip into the hole. This is done to prevent the drill from slipping into the hole already drilled. These holes weaken the stud which as a rule is very easily removed after this has been done simply by jarring it out with the end of a screw driver or a cold chisel. For the larger sized studs I use correspondingly larger drills, being careful of course not to drill into the threads. It is important to have the drill sharpened properly so that it will drill straight and will not run off to one side. Glycerine and turpentine or lard makes a very good lubricant.

E. D Pendleton, Ohio

It wasn't Profiteering—In the May issue a brother smith from Nebraska asks if he was profiteering when he charged $8.00 for sharpening a road scraper blade 8′ long and ½″ thick. I would state most emphatically that this is not profiteering in any sense of the word. After you deduct from these charges something for your time the cost of your coal, your helper's pay and a dollar or two for your self for knowing how to do the work, then what have you left on which to place a charge of profiteering? It would seem that many of the Officials regard the blacksmith as some kind of an unskilled laborer, possessing no intelligence and not even credited with the ability of the ordinary mechanic. The blacksmith is the last man of the farmer's list of creditors to be paid and when he is they invariably growl about the bill, then to smooth things over the smith foolishly deducts a dollar or two from the bill—sort of lets his heart run away with his head. I know what I am talking about, because I am one of this class of laborers called a blacksmith, commencing when I was twelve years old and am now over fifty and haven't got any sense yet. But at that he has greatly more "hoss sense" than the man who accusses him of being a profiteer when he raises his prices slightly to keep abreast of the times.

James Baldwin, Indiana.

Knives for a Disc Sharpener:—In the May issue I saw an article in regard to making disc sharpener knives from carbon steel. There may be .75% carbon steel that can be tempered to sharpen discs, if so I would like to know how. I use high speed steel that costs 35c to 45c an ounce. This is self-tempering and care must be used in grinding to get the proper edge.

E. G. H., Illinois.

Carbon steel with a carbon content running from .75 to 1.25% may be used with a certain degree of success on the work mentioned, depending of course upon the hardness of the material upon which it is to be used. For turning very hard metal or where there is a fairly high rate of speed used better result can be obtained from steels in which the carbon content run from 1.40 to 1.60%. It will be observed, however, that in all cases where carbon steel is used more or less difficulty is experienced, if the work runs fast, from the cutting tool getting hot and loosing its temper. In that respect high speed or self-hardening steels are much superior, as the annoyance of tempering it and the possibility of getting it either too hard or not hard enough is entirely removed. Although high speed steel is very much more expensive, its good qualities offset the added cost. It is our opinion that after using high speed steel, you would not be satisfied to go back to carbon steel even in view of the saving it might effect. In tempering carbon steel, the piece to be tempered is heated to a red heat for a short distance back from the cutting edge. It is plunged into an oil bath and worked up and down to prevent a water line. When the cutting edge is sufficiently hardened the tool is removed from the bath and the heat from the heavier portion is allowed to run down to the hardened part until the desired color shows, when it is quenched to prevent it from running any lower.

For a Wood Bruise—To take out bruises in furniture, wet the part with warm water, double a piece of brown paper five or six times, soak it and lay it on the place; apply on that a hot flatiron till the moisture is evaporated. If the bruise is not gone, repeat the process. After two or three applications, the dent or bruise will be raised level with the surface. If the bruise be small, merely soak it with warm water, and apply a red-hot poker very near the surface; keep it contiually wet, and in a few minutes the bruise will disappear.

To Coat Iron with Copper—Polish the iron by rubbing it well with cream of tartar, and afterward with charcoal powder, and place the metal in hydrochloric acid diluted with three times its volume of water, in which a few drops of a solution fo sulphate of copper is poured. After a few minutes withdraw the iron and rub with a piece of cloth, then replace it in the solution, to which add another portion of sulphate of copper.

VILLAGE SMITHY'S SERVICES NEEDED TO REPAIR AUTOS

Well Known Chestnut Tree Horseshoer Finds New Field of Endeavor in Blacksmithing "Horseless Carriages"

When Henry W. Longfellow indited the poem anent the village blacksmith performing his menial tasks beneath the spreading—and shading—boughs of the chestnut tree, little did he think that the successor to the village iron worker, who also doubled as a horseshoer, would be required in the repair of "horseless" carriages.

But today the blacksmith shop is no small part of a modern garage—one fitted for every kind of repairs from "bugs" to five-ton trucks.

The blacksmith shop of the McEldowney garage is one of the many departments of the big plant in which H. E. McEldowney takes a considerable pride. Frequently, in the repair of passenger cars and trucks the services of an ironworker with a full complement of blacksmith tools is called for and instead of sending out to the nearest smithy to have his work done, Mac merely has it turned over to the blacksmithing department.

The knight of the forge is particularly handy when it comes to making new springs.

The spring department is closely allied to the blacksmith shop and, if the desired size of spring is not in stock, it is a comparatively simple matter to make one. Calls are constantly being made on the McEldowney shop for extra springs, some of which are of irregular size.

Owners of big trucks are also speedily finding that the truck repair facilities of the tide flats garage, together with the adequate room it has, are of the best, the increasing number of trucks which are brought in testifying to their owners' belief in the ability of the garage to do the right kind of a job.—Tacoma, Wash., Ledger.

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WILLIAM F. WENDT, *President.* L. J. WISCHERATH, *Editor.*

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METRIC SYSTEM OF WEIGHTS AND MEASUREMENTS?

We are wondering how many of our readers are aware that a vigorous campaign is being waged to have our system of weights and measurements changed to the metric system. It is urged that Congres adopt the plan and make the adoption of this system compulsory. We are wondering how many of our readers have given the matter any serious thought either as to the consequences or the advisability of such procedure.

Propaganda for the change from our present system is not of recent origin. It has been going on spasmodically for a number of years. However, it has been given greater impetus this year than at any time heretofore, due to the efforts of the World Trade Club of San Francisco. Their reasons for such ardent support of the metric system remains more or less in the dark.

Proponents of the metric system have set forth various arguments, which on the surface would seem to prove that the metric system is in universal use outside of this country and Great Britain. Some have set forth the claim that it would be a simple matter to change from the English system which we are using, to the Metric System, though others who advocate the metric system do not go so far, but, on the other hand acknowledge that it would require several generations before the change would be complete. Should the change be made, we would face untold confusion for years to come, as we would have a dual system until the old standard had been entirely eliminated—and it is highly questionable whether the old system would ever be entirely eliminated.

It is needless to recount the expense and confusion that would be caused manufacturers in changing their equipment to meet the demands of the new system. To even the public in general, this method would convey no meaning unless compared with the standard to which they had grown accustomed. An interesting example may be drawn from the Commerce report issued recently by the United States Department of Commerce by Consul General Ravndal on the "Use of the Metric System in Turkey".

A MESSAGE FROM EARLIER DAYS

"There are persons who constantly clamor. They complain of oppression, speculation, and the pernicious influence of accumulated wealth; they cry aloud against all Banks and Corporations, and all means by which small capitalists become united in order to produce important and beneficial results.

"They carry on mad hostility against all established institutions. They would choke the fountains of industry and dry all streams. In a land of unbounded LIBERTY they clamor against oppression. In a land of perfect EQUALITY they would move Heaven and Earth against privilege and monopoly. In a land in which property is more evenly divided than anywhere else, they rend the air shouting about agrarian doctrines, and in a country in which the wages of labor are beyond parallel, they would teach the laborer he is but an oppressed slave."

From Daniel Webster's Speech
U. S. Senate 1833

Some quotations from this report are of timely interest to the general public in view of the present agitation for the metric system in this country. From the report it appears that the Turkish Government adopted it as the official standard in 1915. This date in interesting in itself when we remember that at this time German influence was paramount in Constantinople.

We quote: "It appears to be the object of the Government to make this the exclusive system of weights and measures, but so far, outside of official circles, the metric system is little used. In fact, in the interior, the system is practically unknown, and it is doubtful if it will be popularly accepted for many years to come, if at all. The people find the new system very much simpler from a mathematical point of view, but its units are meaningless to them until converted into the units of the old system, for the decimal system as applied to potatoes and sugar cannot be kept constantly before the mind as can the decimal system as applied to money. It is therefore infinitely more difficult to learn, and the attempt to introduce it has been productive of no little confusion."

The question may be asked: How can the people find the system much simpler if to them the new units are meaningless? We notice that the "adoption" of the new system is by no means equivalent to its "introduction". Emphasis is laid on the long transition period; the words "if at all" sound rather hopeless. The difficutly of becoming sufficiently familiar with the system, in order to use it, is brought out and the confusion caused by the use of the two systems is emphasized.

The picture thus drawn by our Consul presents an excellent object-lesson to metric advocates in this country where the difficulty would be infinitely greater because of our highly organized industries. Their contention that Turkey is metric cannot be upheld in the face of testimony of an official of the Department of Commerce.

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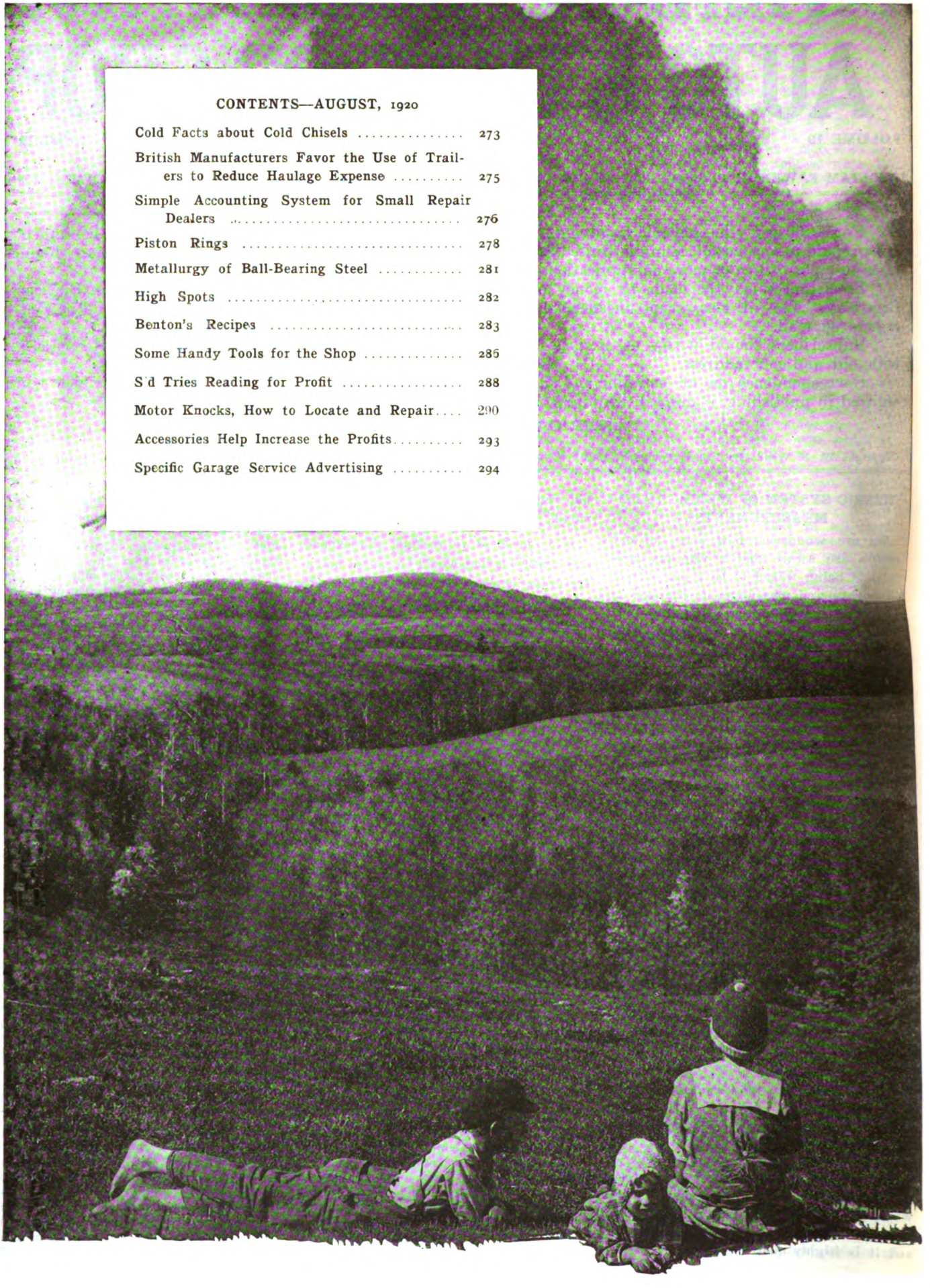


Cold Facts About Cold Chisels

By WILL BISHOP

COLD chisels, one of the simplest, most used, and most abused tools known to the fraternity of iron bruisers. A tool so simple and homely and common that most smiths just take it for granted, so to speak; never giving it consideration enough to learn how to make it—or to know that it can be made one of the master tools. A good cold chisel is indeed a master tool, when forged and hardened right; and is a poor makeshift when made by guess and by gosh.

In this article it is my aim to outline the proper method for the making of a real tool out of the common or garden variety of cold chisel. A tool that will stand up under the many hard uses to which the busy smith puts it, without snapping off or battering up the cutting edge, tough, hard and long lived.

The first consideration in making a good chisel is the steel. A steel containing a tool high per cent of carbon, or one containing a too low per cent are about equally useless. Neither will take the proper temper for a battering tool—a tool that has to withstand hammer blows. For cold chisels, hot chisels, or any cutting tool that has to stand hammer blows, steel of from 80 to 90 points carbon gives the best service. By "points" of carbon we mean hundreths of one per cent. In other words, steel containing one per cent of carbon contains 100 points and steel containing three-fourths of one per cent contains 75 points.

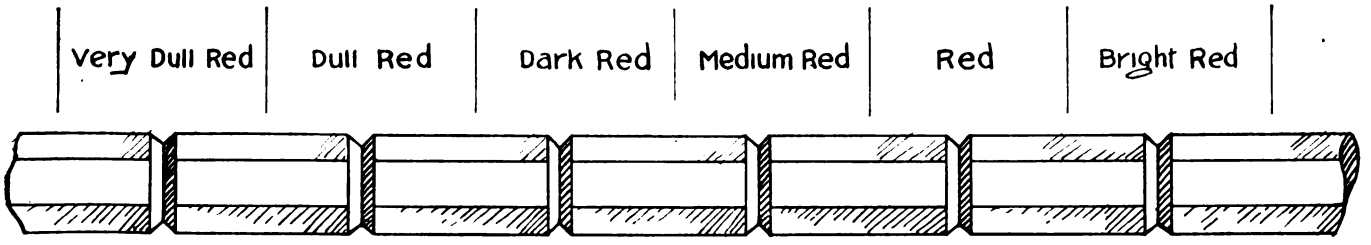
The higher the carbon, or the more carbon points contained in the steel, the harder it is, or can be made. Naturally, the harder anything is the more brittle it is; and is far more likely to break under a sharp blow. So, for a cold chisel, we must use a steel that can be made hard enough to hold a good cutting edge when used against hard substances, and still remain tough enough to stand without breaking. Experience has proven that steel of from 80 to 90 points carbon is of the right structure for this work. For hammers, sledges, flatters and fullers, and all anvil tools and blunt battering tools, steel of from 70 to 80 points carbon should be used.

There are methods by which an experienced and observant steel worker can tell the carbon contents of tool steel by testing it in his own shop. That is, he can tell the carbon percentage close enough for practical purposes; but it is hard to explain on paper and I doubt my ability to do so here. Anyway, the smith who knows the kind of steel he needs can get it from his hardware dealer by ordering it to contain the proper carbon content.

In the making of a good cold chisel I want to state a fact that most smiths overlook, or are not aware of the importance of proper forging. It is a fact—a cold fact—that if a cold chisel is not forged properly at the proper heat the best temperer in the world cannot make a good tool of it. The forging is just as important as the tempering, and is the first thing to be taken into consideration. That goes for all tools as well as chisels. Forging at a wrong heat, and in a wrong manner sets up strains in the steel that no amount of care in tempering can overcome.

We are all of us familiar with what we call water cracks in a chisel after tempering. Those fine checks in that part of the bit that has been held under water before allowing the temper to draw. You know how they look; little half-circular cracks down near the cutting edge, so fine you can hardly see 'em but they play havoc with the chisel before you've struck three blows on it. The corners fly off and leave the end of the chisel round instead of square. "Yes," you say; "we all know them, they're water cracks." Well, water cracks is just what they are **not**! They are **forge** cracks. Caused by improper heating or improper forging, or both. Strains have been set up in the steel during the forging operation that caused uneven contraction when the chisel was plunged into the water. Just a common physical law that anything subjected to a strain greater than its own strength is bound to break.

Now, for every cause there is an effect; and if we would change the effect—keep "water cracks" from our cold chisels, and other edge tools, we must remove the cause by properly forging them before hardening. The first operation in making a chisel is heating it properly. To do this use well-charred coal on the fire. Have the fire deep—that is, lots of fuel under the heat—and use very litle blast so that the steel will heat very slowly until it gets red. Then give it a little more blast until the steel gets to a good red, being sure that it is hot equally all through. Take from the fire and draw out quickly, not allowing the steel to spread any wider than you want the chisel to be when finished. Hammer the same on all sides as nearly as possible. After the steel gets down to a dark red stop hammering and reheat to a good red again, and this time don't strike on the edge at all. If the tool is a bit uneven on the edge when done forging, grind or file to a finish. When



THE MANNER OF NICKING A PIECE OF ¾" OCTAGONAL S TEEL AND HEAT CHART FOR FINDING THE PROPER TEMPERATURE FOR HARDENING

the chisel is about finished and the color is a fairly dark red strike several smart blows on each flat side with a good sized hand hammer, or better still, use a flatter and have the helper strike with a sledge. Now heat the forged end of the chisel all over to a good red. Heat slowly 'till hot all through, and lay on the floor until entirely cooled off. Finish the tool by filing or grinding before tempering.

To temper use clean water that is just warm enough to take the chill off. Heat about two inches of the tool very slowly to a medium red, keeping the tool high in the fire and turning it over often so that it will heat uniformly. When the desired medium red is reached plunge in water so that about ¾" of the red shows above water. Don't hold tool still, but move it up and down with a short, rapid motion. This keeps us away from a sharp dividing line between the rapidly contracting portion that is under water and the hot part above water. When there is just enough heat left in the steel to draw the temper to color, take from water and polish with a piece of emery cloth tacked to a piece of wood. Polish brightly so that color can be easily seen. Let draw to regular cold chisel blue. If these directions are followed closely in making a cold chisel, or any edge tool, and steel of proper carbon content used, a chisel that will stand up and do perfect service will be the result.

Just a word regarding the proper heat for hardening tool steel, and a simple method of determining the proper heat for steels of different carbon contents. The proper plunging heat for any steel is the heat at which it will take on the greatest degree of hardness when plunged in water, oil, or any quenching bath. This also is the heat at which the steel takes on the greatest degree of refinement. By refinement we mean closeness and smoothness of grain. Steel heated to the proper temperature and plunged in water will, when broken, show a fractured surface of whitish-gray color almost as smooth as glass, and with almost no grain visible to the naked eye. The fracture will be nearly smooth, with no ragged edges or sharp angles in the fracture.

If the smith is not familiar with his steel it is quite a simple matter for him to determine the proper refining temperature by the following test: Take a piece of, say, ¾" octagon tool steel and nick it around with a cold cutter about two inches from the end; then at two inches up the bar nick again all around, keeping this up until you have nicked the bar around in six places, two inches apart. For example, see cut at Fig 1. Now place the nicked end of the bar in the fire and heat so that at the first nick the steel will be a bright red, the second red, the third medium red, the fourth dark red, the fifth dull red, and the sixth so that the heat is barely visible. When this heat is attained plunge in water and hold there until steel is entirely cold. Take a hammer and break the steel at each of the nicks and compare the fractures. The broken end that shows the smoothest, evenest grain was heated to the proper temperature for that steel. Remember the heat contained in that smooth broken end and use it for hardening that grade of steel. With proper forging an hardening you can't go wrong.

The Son of the Sahara and His Blacksmith Shop

Under the hot sun of North Africa, a dark skinned man stands all day long. He has neither shop no shade tree. All he possesses, in the way of blacksmith shop or equipment, is his hammer, anvil, and bellows. And yet there he stands, under the broiling Sahara sun, plying his ancient trade.

The blacksmith of the Sahara combines his craft with that of the tinsmith and coppersmith. Also, he mends the harnesses of the donkeys and camels that bear their heavy packs over the shifting desert sands. And his little open-air "shop" is a busy spot and—in common with blacksmith shops, the world over—it is the place where men like to gather and discuss the neighborhood gossip and the world news.

Northern Africa, with its romance, beauty, and wandering Bedouins, has been something of a mystery to the outside world. But before long, its picturesque life will be revealed to the people of the United States. For the American Red Cross has made its entrance there. At the request of the Marabout of Temassine, (a wide-awake young official of Algiers), some representatives of the Red Cross went to Africa to investigate the causes and extent of blindness among the children of the desert, and to suggest measures of relief. They found that an eye disease, called "granular trachoma" had swept the country, claiming many victims, and afflicting them with partial or total blindness. Six thousand school children were examined in Algeria, and one-fourth of them were suffering with this disease. In the desert oasis, one native in ten is blind. The Red Cross photographer took many pictures, during the trip through Algeria and Tunisia, and before long these will be shown to the American people. "The Children of the Sahara" is an interesting motion picture film,

British Manufacturers Favor the Use of Trailers to Reduce Haulage Expense

By JOHN Y. DUNLOP

ALONG with the rapid increased use of the motor truck in the industrial world, the problem of reducing the operating expense by increasing the truck's capacity, has been seriously considered by the various haulage contractors. The increased cost of labor and fuel necessitated such action in order to keep the business on a paying basis without making a prohibitive charge for such service.

The problem has been solved to a certain extent by the use of the wide, iron wheel trailer. Some substantial gains in the profit of operation have been claimed through its use, as it is the contention of the users that the capacity of the truck can be nearly doubled with but a slight increase in the cost of operation. It is the prevalent opinion of road engineers that such equipment does less damage to the roads, than the rubber tired equipment with which we are familiar in this country.

The idea of attaching a motorless trailer to the rear of the truck in most cases does not impose a great task on the driver, as it is customary to use two hands on the average heavy lorry. The cost of additional help is therefore unnecessary. The only expense being that it requires a little longer time to load both vehicles. The idea has been developed in England to such an extent, that it is recognized as being generally successful. Loads of all kinds are handled under practically any and all kinds of road conditions.

The power necessary to move the ordinary motor truck on the average road, is only a very small portion of what the power plant is capable of developing. That can be easily understood from the fact that a truck in good working order is designed with sufficient power to enable it to be successfully operated on muddy roads and hilly gradients. The power required for their operation under such conditions is still in most cases well under their possibility of development.

The argument advanced for their use is. that if a motor truck can be successfully operated under such adverse conditions, the addition of a trailer on a fair road imposes very little added burden on the truck's mechanism. The extra expense for fuel is so slight, that the financial return is most encouraging.

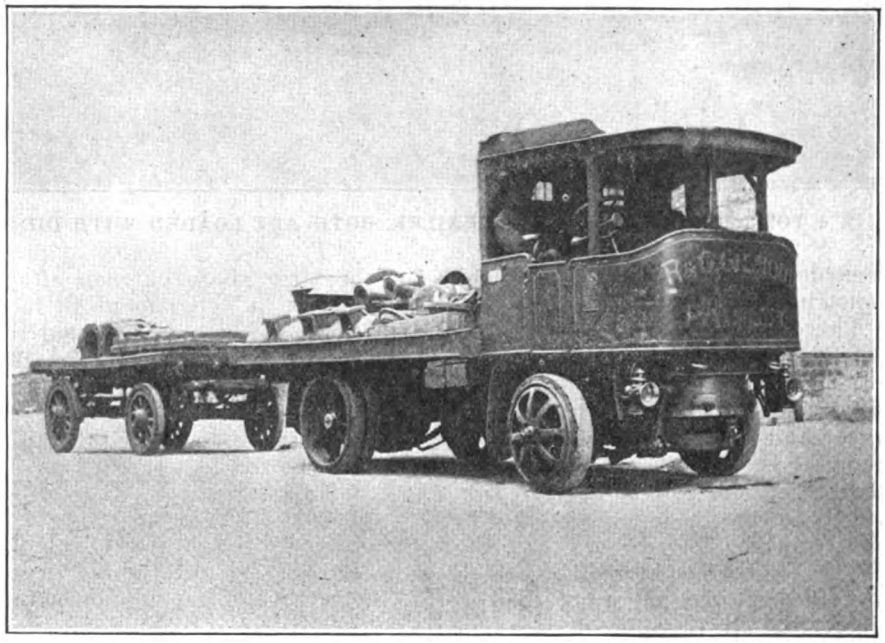
A large factor in the increased gain may be attributed to the fact that only one driver and loader are needed on the truck and trailer, with the result that running expense of the trailer is only about one fourth of the expense of the truck's operation. This means that if a motor lorry alone is being run on a 10% profit, the return from doing $20.00 worth of work a day is but $2.00, but with a trailer, which enables the load to be doubled, it is obvious that the return would be $40.00. Since the cost of the trailer is but one fourth more than the amount for which the truck could be operated alone, it is apparent that an additional profit of $15.50 a day is made through its use.

The trailer service is, however, mostly confined to roads which are fairly good and not too hilly. Another point that is favorable to the use of such equipment, is that being built with wide iron wheels, they do very little damage to the roads! much less in fact than the narrow rubber tired vehicles.

At one time, there were many protests against the use of heavy rubber tired trucks, because of the damage they caused to the country roads. Similar vehicles using iron wheels of reasonable width do much less damage because of the better distribution of the load on the road's surface and partly because they travel at a much lower rate of speed.

It is my opinion, that the reason for the damage caused to the roads may be accounted for by the type of tire which has been used heretofore. Until the last few years it was generally assumed that only a tire with a tread having a firm and well supported backing, so that there would be little or no deformation of the rubber by pressure on the tread, would be successful. The result has been that when they were new, or nearly so, they would have a very small area of contact with the road surface, and consequently, they easily sank into material of a soft surfaced road. Their action might be compared to very blunt circular wedges.

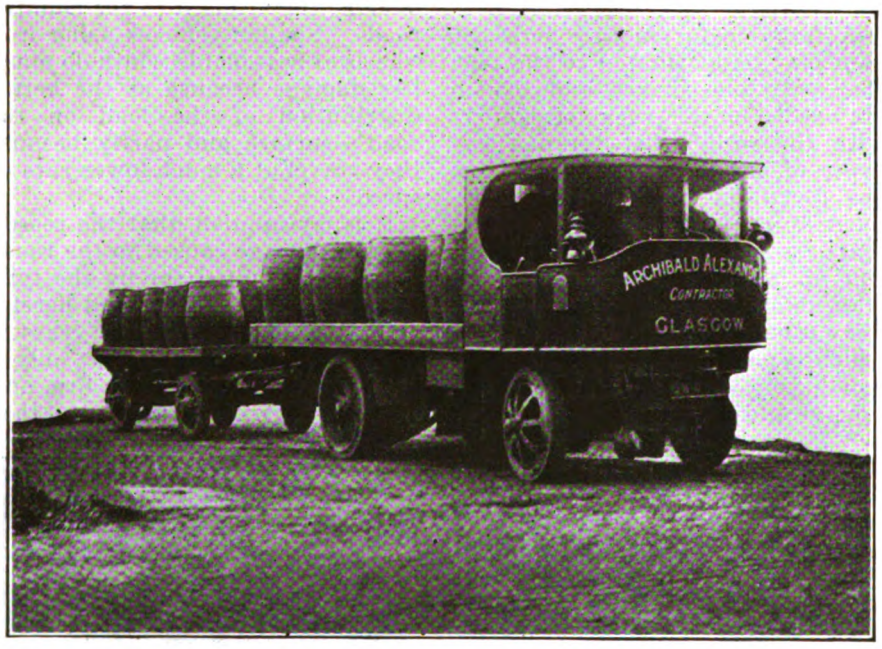
Thus, they tend to form furrows,



A SIMILAR TYPE USED IN HAULING HEAVY CASTINGS FOR THE ENGINEERING TRADES

as they roll along, and the ridges formed at the edges of these furrows do not get pressed down, as they do by a wide iron roller, but form loose material which is eventually ground up into a useless discrete mass, which at the first rain becomes mud.

With the trailer's iron tired wheels, which have an approximate flat tread, there is not squeezing wedge likely to cut into the road surface or displace its surface material. For that reason they are



A 6 TON STEAM LORRY WITH TRAILER, BOTH ARE LOADED WITH OIL

regarded most favorably by road constructors.

There is another advantage too, Besides avoiding any tendency to cut into the road, they effect a considerable saving in road maintenance, and permit an easier movement of the vehicle. The result is that what pleases our road surveyors means a money saving to our transport contractors.

The four wheeled trailer, which are shown in the half tone illustrations, are all capable of carrying three tons, and their weight is about one and a half tons, which make the extra load for the motor to draw about four and a half tons.

On a fair road, this load is about equal to a 80 pound per ton pull. It figures out that the motor is required to pull an additional 360 pounds to keep the trailer moving.

For steep roads the pull would be much greater and generally works out at an increase of 20 pounds per ton for every raise of one hundredth part in the gradient of the road. Allowance for hilly roads are rather a rough calculation as it is a question of using second gear and depends on actual road conditions. In England there is still room for considerable improvement in the design and construction of these trailers, as so far, they are mostly all of one pattern and all weigh about the same.

Still there is no doubt that the four wheel trailer, which in an emergency can be hauled behind the contractor's truck, provides for considerable increase in hauling capacity, and so far as haulage contractors in England are concerned, they enable them to make some very lucrative contracts, because of the saving which they effect.

Simple Accounting System for Small Repair Dealers

By WM. J. BRYAN

EVERY repair dealer, no matter how small his establishment may be, should have a proper accounting system for the conduct of his business. The small dealer is inclined to argue that while elaborate systems may be beneficial for the large shop that can afford to maintain a department to look after the necessary details, that the idea is not practical for the smaller shop because of the expense of maintaining the system is too great.

I agree that there is such a thing as too much system in an establishment. I came across an outstanding example of this in an establishment of considerable size while on a tour of investigation of business methods in the West a few years ago. This shop was certainly the last word in the matter of system. It could tell at all times the amount of stock on hand of every item it carried. It could ascertain at the end of each day's business just what the gross profit on the day's operations had been. Other business details, not obtainable in the average shop, were available by the management at all time. The system methods were most interesting, but they were also most costly. In fact, they were too costly, and the firm in question went into liquidation a few years afterwards and I am inclined to believe that this expense was, at least, partly responsible.

But the trouble with the average shop today is not too much system, but too little. This is particularly true of the medium-sized and small establishment. The result is that they have not sufficient details of their business to guide them in its proper conduct. A certain amount of information is absolutely essential for the proper guidance of any business. Money is too easily lost in business today to leave anything to hap-hazard methods. The business man of today must operate with assurance of profits.

I am going to try to outline a simple system of accounting for the smaller shop. In the average shop, where the dealer is his own bookkeeper, the bookkeeping systems as taught in most of our schools, are not in use to any great extent. The aim of the dealer is to have a system that will allow him to keep his business records efficiently without too much clerical work. Very few dealers conduct their bookkeeping in the same manner. They work out such records as are best suited to their own particular requirements and which give them readily such information as they most desire.

Customers' Accounts in some shops where there is little credit business done and the dealer is content to copy each each sale into a

ledger and make up his bill or statement from it. Where a credit business of any extent is done, an account register is advisable. By means of an account register each customer's account is kept totalled to date by carrying forward to each sales slip the total of the previous slip. It is unnecessary to make up an detailed bill for the customer at any time as he receives his account to date at each transaction. Some shops use the loose leaf system, which also eliminates the necessity of making out a detailed bill at the end of the period, as it is kept posted to date from the sales slips.

Invoice Book—The average shop has a simple invoice book in which a page (easily located by an index) is devoted to each firm from which stock or supplies are bought. The invoices are entered up as received. It is totalled up at the end of the period and checked off with the statement received from the firm from which the goods were purchased.

If there are any discounts allowable for payment in a specified time, a note is made of these in a special book for the purpose at the time the invoice is entered so that the date will not go by without payment and the securing of the discount.

Bills Payable—As each note, draft or cheque is signed, the "due" date is entered in a "Bills Payable Book" from which it can be charged to bank book at proper time.

Bank Book—This is kept so that the dealer will know his standing at the bank at all time, and also as a check on the bank's records.

One dealer known to the writer has a combined Bills Payable and Bank Book. A double page is devoted to each month. On one side a record is made of each note, draft or cheque due in that month, at the time it is signed. The due date is entered and as it comes due it is charged up to the bank account on the opposite page. Deposits are also entered on this page and it is kept balanced to date so as to show the dealer the exact state of his finances, while on the other page he can see what other amounts are coming due during the month.

Cash Book—Many dealers who look after the handling of their own moneys do not keep a cash book, although it is well. It should always be kept when an employee looks after the cash and banking. It shows the amounts taken in, the amounts paid out and deposits made in the bank. The balance indicates the amount that should be on hand.

The above accounts are ones that the dealer, of necessity, generally has to keep, in order to have any check of value on his business. He should also keep track of his expenses and a record of the amount of money taken in each day. A record should also be made of any money taken out of or added to the business, so that it can be used in making out the annual financial statement. In figuring his expenses the dealer generally figures a certain drawing allowance for his own salary. If this is not all taken out each week or month, he should have a Personal Account which should be credited with the balance as it should not be allowed to swell the net profits as it will give a wrong gauge of them.

Every man in business should make out a financial statement at least once a year showing the exact standing of his business. Made out each year a comparison can be made and the dealer can tell exactly how much money he has made, or has not made, during the year. In addition to this, individual transactions should be checked up so that a profit will be assured on each operation or piece of work done. It is a good plan to follow the method of the tinsmith who charges for all material used on a job, invoicing same at price to show a profit on it, and adding to this a certain charge per hour for the time of the workman. In this way the dealer is assured that each job bears its full percentage of expense and is being done at a profit. It is better to be sure than sorry.

PRACTICES TO AVOID

1. Threatening or using the public print in such a manner as to attempt to intimidate a competitor.

2. Selling or offering to sell goods at less than cost or at a lower margin of profit than makes safe business conduct possible.

3. False, deceptive, over-enthusiastic advertising, or that which misleads by what it suggests, says outright or leaves unsaid.

4. Substituting the goods of one manufacturer for those of another and representing them as such.

5. Deliberately enticing away employes of competitors by means of more favorable working conditions or higher wages.

6. Attacking the methods or goods of competitors in the presence of customers or prospects.

7. Refusing to give a fair hearing to complaints and requests for adjustments.

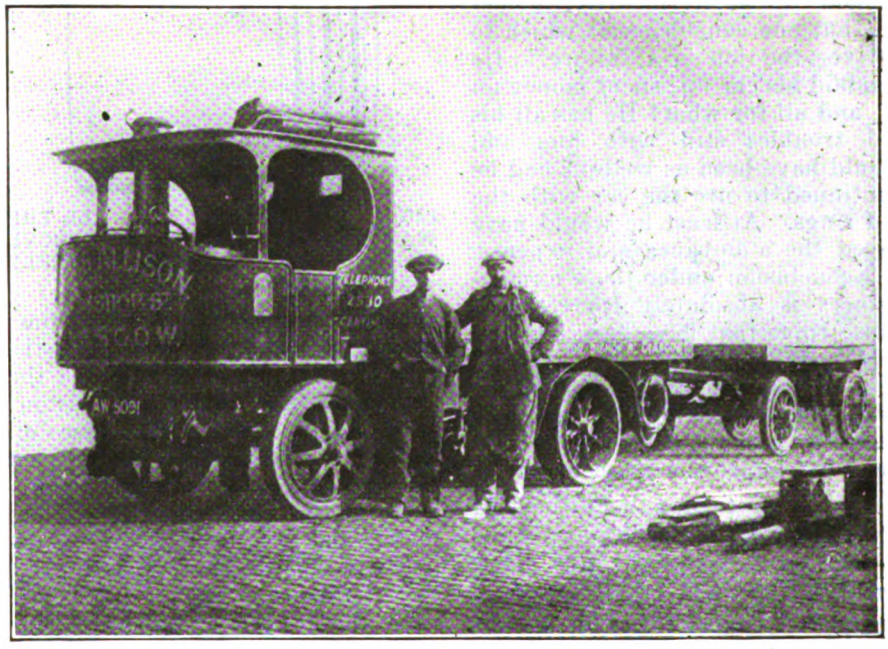
8. Overcharging for goods or service, just because there is a chance to do so.

9. Offering customers a cheaper article than that which they ask for.

10. Falling into the habit of trying to sell customers what you like, rather than what they want.

11. Wasting time doing unnecessary visiting or attending to small tasks which might better be delegated to some one else.

12. Despising the other man and his methods when perhaps you would not do as well in his place.



TYPE OF MOTOR LORRY AND TRAILER USED IN THE FLOUR TRADE

PISTON RINGS

By N. WARD GUTHRIE

Some Practical Suggestions on the Use of New and Old Rings

IT is a source of keen disappointment to many car owners, after having installed a new set of piston rings, to find that the conditions which prompted their installation still exists; and more annoying yet, is that not in a few instances the conditions seem to be actually worse. The owner's complaint to the repair-man is glibly passed off with the explanation that the rings will have to be given an opportunity of seating—that is the car has not been run far enough so that the rings will have worn themselves into a good running relation. True enough; but after the car has been run several weeks, and there is no perceptible improvement in running conditions, Mr. Car-owner grows rather suspicious as to the reliability of that explanation. Ater all the theories about the oil being too light or too heavy and the quality of fuel that is being used, further explanations seem difficult to advance. The owner has but one conclusion at which to arrive—the job is a failure. He has laid his car up; spent money on it; and all for what? He has all his old troubles still with him and would have been as well off had he continued to use the car with the old rings. At least he would have saved the annoyance and expense. His conclusion under those circumstances is absolutely correct; because rings that have been improperly installed, or where they have been installed on worn pistons, or used in cylinders which are out of round or perhaps scored, effect little or no improvement whatsoever.

There are certain conditions of the cylinder walls and pistons which are responsible for many troubles commonly attributed to the piston rings. These are conditions which require something more than new rings. Good results can not be expected where rings are merely placed on a piston with an utter disregard for other contributing factors. Simply because they are new rings, it does not necessarily follow that they will fit properly, or that they will offer any improvement over the ones already in use. The man who regards the new piston ring as a cure for all evils, regardless of other conditions, is bound to come to grief sooner or later; for piston rings must be carefully fitted, not merely placed on the piston, and further, the mechanic must be observant of other conditions to make the job a complete success.

We are all only too familiar with the conditions which prompt or rather suggest the use of new rings; loss of compression due to the

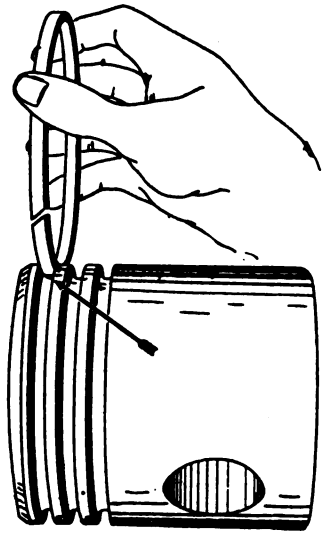


FIG. 1. ROLLING THE RING ALL THE WAY AROUND IN THE RING GROOVE TO SEE THAT IT BEDS PROPERLY

charge working past the piston; loss of power resulting from the failure of the rings to confine the expanding gas above the piston; pollution of the crank case oil through the admission of gas past the pistons; excessive oil consumption due to its working up past the piston and resulting in carbon deposits with all their attending results. The new piston ring is not like the country fair medicine fakir's remedies, a cure for everything. It will not prevent, entirely, the formation of carbon, to be sure, neither will it minimize the consumption of oil, so that the supply will never have to be replenished. Those are impressions we may have gained from the advertisements of some few patented products, but nevertheless the new rings will effect a great improvement and a more efficient operation of the motor.

There are a wide variety of rings to select from. Those regularly furnished by the manufacturer and any number of differently designed patented rings. There are the ordinary concentric and excentric rings with the split gap, and stepped gap also. So one might leave the selection to the individual and merely regard the installation. We might go on indefinitely discussing the concentric versus the excentric ring, or the machine hammered ring against the one on which this operation had been omitted. When we had concluded it would have envolved merely a matter of personal opinions.

Before deciding on the new set of rings, it would be a good policy to thoroughly examine the *old* rings, thus being certain that *new* rings are really essential. The first step is to inspect the cylinder for such defects as scores, high spots, cylinder out of round and tapers. It is obvious that these conditions have a decided bearing on the success of the new ring. In a previous article on fitting pistons, some suggestions were given in regard to detecting these conditions. They could be used to good advantage here.

Next, the rings should be removed from the piston, thoroughly cleaned and then inspected. If there are black spots on the outside surface where it should come in contact with the cylinder wall, it indicates that the charge is blowing by, and the ring is therefore unserviceable. Such a condition is caused either by the cylinder being out of round; the ring not conforming to the cylinder wall; or that the ring has lost its wall tension, in other words, meaning that the ring has insufficient spring to press against the cylinder wall and remain there during the force of the explosion; but instead collapses and allows the burning gas to rush by. This is an important detail and should not be overlooked either when inspecting old rings with a view to their continued use, or in selecting new rings. The wall tension of the ring is

usually carefully considered by the manufacturer because of the important part which it plays. However, in old rings the metal occasionally loses its resiliency. The result is that when the ring is either drawn apart or pressed together, it remains in that position. There being very little tendency on its part to return to its former shape. The old rings, therefore, should be tested to see that they have sufficient life and resiliency to ensure

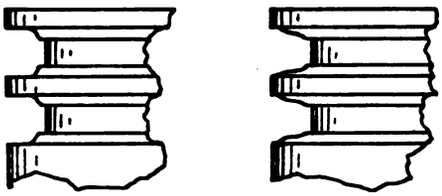


FIG. 2 AND 3. SECTION OF A PISTON SHOWING THE EFFECT OF WORN RING GROOVES

their conforming to the cylinder wall during the force of the explosion, and that they will not collapse and allow the gas to escape into the crank case.

Next, the ring is placed in the cylinder, and with the aid of the piston, it is shoved into the cylinder squarely, that is so that it will not be tipped. The gap between the ends of the ring is then measured and if found not to be excessive, the ring is still serviceable. A thickness gauge should be used for this purpose. A blade that will fit the gap is selected. By looking at the thickness marked on the blade, it is an easy matter to determine the distance that the two ends are apart. Care must be exercised not to select a blade that will have to be forced into the opening, otherwise one end of the ring is simply moved up the cylinder and the other end moves down. It is apparent that the reading would be incorrect. A greater distance than really exists would be shown. In a cylinder of 4" or thereabout in diameter a space of .015" may be allowed on old rings; the distance being increased on larger cylinders and diminished on smaller ones, the allowance being made because there is less expansion in the smaller cylinders.

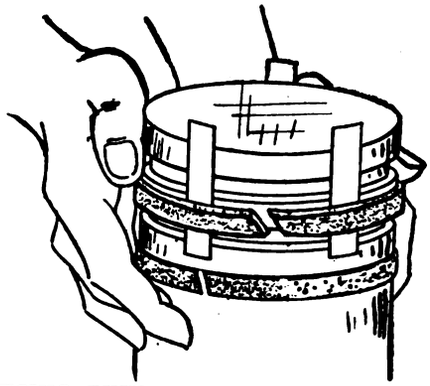
The next step is to remove all the carbon from the ring grooves on the piston. The rings should then be placed in the ring groove and rolled all the way around the piston, as shown in figure 1. This is to be certain that the cleaning has not left any carbon which will prevent the ring from bedding properly in the groove. The piston itself is then inspected to see that the ring grooves have not become worn. Figures 2 and 3 show, in an exaggerated manner, the appearance of such a condition. It is apparent that when a ring is applied to a piston in this condition, that the charge will have a decided tendency to blow around the ring, thereby causing a loss in compression and power. Pistons in this condition should either be placed on a lathe, and have the ring grooves turned out square and then fitted with a wider ring, or else new pistons should be used.

There is a decided inclination on the part of a great number of mechanics to install new rings on each and every occasion without regard as to whether they are actually needed. Their philosophy being, "Well, we've got the pistons out, we might as well put on new rings." They are perhaps in a class with the inveterate bearing scraper, who can not resist the temptation to wield his trusty scraper, whittling out a little babbit, irrespective of whether conditions warrant it or not. He likes to see the shiny chips. It behooves many of us to be certain that these parts are really needed, and if they are then to see that they are properly installed.

The installation of new rings is governed by about the same rules that are applicable to the old ones, except of course that the limits should be much closer, otherwise, it will have been of but little avail to use the new part. First, the new ring is fitted into the cylinder, in order to determine the distance of the gap. The same method is employed as was used on the old rings. This is done to see that the ring has ample clearance at the joint or gap. This is very essential, because when the piston becomes hot as the motor is run, the rings and piston expand. If this is not allowed for at the gap, the ring will squeeze out against the cylinder wall and is very apt to sieze, or at least score either the rings or cylinder, or even both. In some cases where new rings have been fitted too snugly to an old cylinder, the heat and friction will deposit and fuse some of the metal from the rings onto the cylinder wall. There it forms little high spots which cut the piston every time it passes. Where such conditions are encountered, it will be found virtually impossible to entirely remove these spots, as they are so hard that they will resist nearly every kind of treatment except the grinding wheel.

The clearance between the ends of new rings, when used in cylinder around 4" in diameter should be about .005". The distance is increased in large cylinders and reduced in smaller ones. When installing leak proof or patented rings, it is important to follow the instruction of the manufacturer in this respect, as there are instances where a gap of .020" or more is advised. Where there is not the requisite clearance between the ends of the ring, they should be dressed off. This can be done to advantage by placing the tang of a thin mill file in the vise, and then sliding the ends of the ring up and down on it, pressing them together as this is done. In this way the ends can be dressed down so that they will meet evenly when pressed together.

When the proper gap is provided, the ring is again placed in the cylinder to see that it conforms properly to the cylinder wall. An electric light placed in the cylinder ahead of the ring permits a visual inspection; but a safer plan is to use the thickness gauge, after the ring has been squared up with the end of the piston. The .0015" blade is tried all around between the ring and the cylinder wall to detect any place where the ring is not in contact



USING THIN STRIPS OF METAL TO SLIDE THE RING INTO PLACE

with cylinder. A piston ring of around 4" should conform to the cylinder within .002". If the distance is greater than that, it would be safer to use a better fitting ring, as it is highly questionable whether a ring which was out to that extent would ever wear in satisfactorily.

The ring should then be tested to see that it beds itself properly in the ring groove on the piston. It should fit the groove so that it can be rolled all the way around the pis-

ton without binding, and at the same time without being loose. In cases where new rings are being used with old pistons, it is a good practice, if the rings appears to be loose, to insert the .0015" blade of the thickness gauge between the ring and the ring groove to be certain that the clearance is not greatly in excess of that amount, otherwise the oil is likely not to form the proper seal around the ring and consequently allow the charge to blow past. However, the reverse of the last mentioned condition is the one usually met in ordinary practice. That is the ring fits the groove too snugly. In this event it is necessary to dress the ring down slightly. Never attempt to file the ring groove wider. Such a practice is ruinous and can only be done successfully in a lathe after the piston has beeen properly centered. Ordinarily there is less than a thousandth of an inch to be removed from the ring in order to make it fit properly. This can be done by placing a sheet of medium emery cloth on a surface plate, or in the absence of which, a flat board will work fairly well, and then rubbing the ring around on the cloth, using a circular motion, until the desired amount of material is removed. The operation should be checked up from time to time to see that it is not carried too far, otherwise it will fit too loosely.

When the ring has been dressed down the required amount, it is again rolled around in the ring groove to be certain that it beds properly. In event that it doesn't, the ring groove should be inspected to see if any foreign matter is holding it up. In many instances it is a piece of carbon that has been overlooked in the cleaning operation. If this fails to correct the difficulty, and it is apparent that the groove is too shallow for the thickness of the ring, do not attempt to file any material from the back of the ring. When the ring was cast, and later machined, the skin of the casting was purposely left on the back of the ring. It adds to the ring's tension and resiliency. To file it off simply means to lessen or to entirely destroy this quality, and when the ring is installed, it will be very apt to collapse under every explosion. Then too, there are a class of rings, the backs of which have been peined or machine hammered. This is for the purpose of increasing their wall tension and to give a better and more equalized distribution. Filing on the back of these rings would likewise be ruinous. Where rings will not bed properly in the piston, it is necessary to either increase the depth of the groove, by placing the piston in a lathe and turning the groove out deeper or else using rings which are not so thick. In any event all filing should be avoided.

There are a great many suggestions in regard to the installation of the sealed gap or patented ring. Where this type of ring is used the instruction of the manufacturer should be rigidly followed. Each one has its peculiarities on which no one is better qualified to comment than the maker.

Some rings are made tapered slightly; for example those furnished by the Ford Motor Co., are made in that manner. To be sure the taper is so slight it can not be detected with the eye, but nevertheless it exists. Unless the instructions of the manufacturer are followed, in regard to its peculiarity, the primary idea of the designer is defeated and faulty performance is the inevitable consequence. In the case of this ring, it should be installed with the larger diameter down, presumably so that the ring will sort of slide over the oil on the upward stroke, and scrape it off on the downward stroke. A punch mark on the side of the ring indicates which is the upper side.

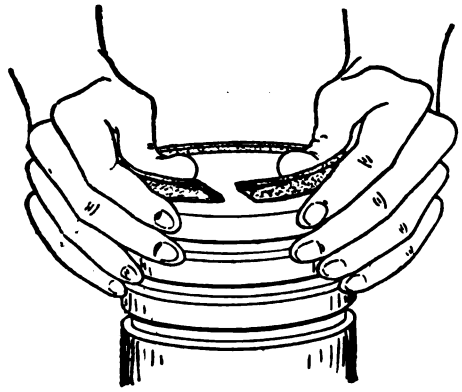


FIG. SPRINGING THE RING INTO PLACE

Many mechanics before installing the rings on the piston use a mill file to slightly chamfer the outside upper corner of the rings. The theory being that this will produce a similar effect to the tapered ring, namely, in being inclined to slide over the oil. However, the results are speculative; but since there is no apparent damage done there seems no reason for condemning the practice.

Most mechanics prefer to put the ring onto the piston by merely pressing the back of the ring against the piston and then springing it into the groove. The operation is illustrated in figure 4. Many broken as well as sprung rings can be attributed to this method, which is perhaps a little quicker than the one shown in figure 5. Thin strips of metal are used as sort of skids and the ring is slid down to its proper groove without having to work it first from one to another.

THE VALUE OF TACT

For the proprietor of a small blacksmith shop to succeed he must possess a large amount of tact. Skill is but one of the necessary qualities making for success in this, as in every other branch of industry. This single talent must be combined with several others if the efficiency of the thousands of blacksmith shops scattered all over the country is to be raised to a reasonably high standard. A highly skilled mechanic becomes proficient, but this proficiency is not necessarily the efficiency which is to-day so eagerly sought by our captains of industry, in big business.

The small shop owner has to be many men. He is accountant, buyer, salesman and mechanic. Upon his tact and diplomacy in handling the public, as well as his mechanical ability in handling their work, depends in no small degree his ultimate success.

Ordinary tire tape may be used to patch inner tubes by running it twice around the tube and lapping the ends so as to cover the leak. Adhesive plaster may be used in the same way.

The common assertion that scratched surfaces make stronger glued joints than smooth surfaces seems hard to prove. Comparative tests made on several occasions by the U. S. A. Forest Products Laboratory all indicate that the strengths of these two types of joints are practically the same. The test specimens used by the laboratory were pairs of hard maple blocks, some with smooth and some with tooth-planed contact surfaces. These blocks were glued with a high grade hide glue, allowed to stand for a week, and then sheared apart in an Olsen universal testing machine. Four joints of each type were compared in a single test.

METALLURGY OF BALL-BEARING STEEL

By Mark Meredith.

IN order to select a suitable material for ball bearings it is of primary importance to investigate the mechanical stresses set up during the operation of the bearing. The knowledge of these stresses will form a basis, for a selection of a material to withstand them. In addition to the stresses there are other considerations affecting the material. Some operating conditions of the bearing may require special properties of the material, such as freedom from corrosion, non-magnetic properties, etc. Material of suitable strength may not stand up under heat treatment. The steel should be able to resist "fatigue" caused by high rotating speeds.

Materials with a high elastic limit means great hardness the most important property of a suitable ball bearing steel is hardness. It must not be too brittle but a certain amount of toughness is necessary to enable the bearing to withstand shocks. Steel obtains its hardness partly through a high carbon content and partly through hardening. Since alloy steel of suitable composition permits of uniform hardening throughout to a sufficient depth, ball bearings are made of hardened alloy steel, generally containing chromium with a high carbon content. This steel is glass hard after hardening and is therefore subject to a moderate drawing process which removes stresses set up during quenching and increases the toughness without materialy decreasing the hardness of the steel.

Regarding chemical composition of the material, it is important to point out that it ought to be as free as possible from impurities, and for this reason the contents of Sulphur and phosphorus should be kept as low as possible. It should also be borne in mind that the composition of the steel must be varied in accordance with the dimensions of the final product.

From the metallurgical viewpoint, the material should be as free as possible from local structural weaknesses, such as segregations and slag inclusions of different kinds, and it should be correctly treated during the process of rolling, forging, annealing, hardening, etc. If this is not the case, the structure of the steel will be ruined, and the strength of the finished product will suffer.

Case hardened carbon steel has been frequently used in the manufacture of ball bearings for economical reasons. Theoretically this would be permissible because the greatest stresses occur at the surface, and the other parts of the material could, therefore be softer. In practice, however, case-hardened material is inferior to a high carbon-alloy, steel, which is hardened throughout. This is due to the fact that there is always the danger of insufficient depth of the carbonized surface layer, so that the stresses set up during the operation of the bearings will produce cracks at the junction between the hard and soft material. Furthermore, in order to obtain satisfactory results, case-hardening requires much more complicated heat treating methods than those used in general practice. It is important, however, to state that proper case hardening employed in connection with a soft, high-grade alloy steel may give as good results as a special high carbon alloy steel hardened throughout. Nevertheless, it is doubtful whether case-hardening under such conditions would represent any economical advantages.

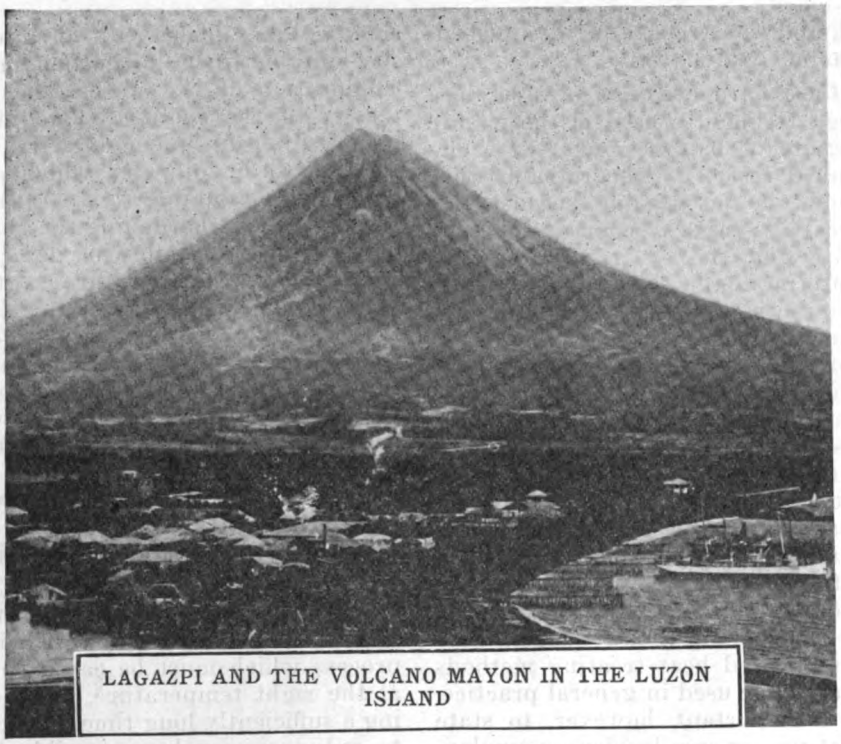
The quality of the finished product is not only dependent upon the purity of the raw material, but just as much upon the skill and care with which each one of the different manufacturing processes are carried out. The forged or rolled blank of steel must be annealed before being machined. The annealing is a delicate process, and care must be taken to protect the steel against oxidation and decarbonization. Further-more, the correct annealing temperature must be reached and maintained during a sufficient length of time and, finally, the cooling process must be slow. Faulty annealing may produce a soft surface, due to decarbonization which cannot be hardened. It may cause the steel to be brittle and not sufficiently soft for the subsequent machining operations.

During the hardening of the rings and balls a uniform and correct temperature must be maintained in the steel during a proper length of time without causing material scale formation or surface decarbonization. The quenching must take place immediately after removal from the furnace, and in such a manner that uniform cooling takes place with an intensity suitable to the dimensions and composition of the steel. The intensity of the cooling is modified using different quenching liquids such as water, oil, etc., which are kept at a suitable temperature. Lack of care in hardening the rings may produce the following defects: If quenching temperature is too high, the material will be brittle; if too low the steel will be too soft. In case a surface scale has been formed that does not come off completely during quenching, soft spots will be produced where the scale adheres. Decarbonization in the furnace produces a soft surface. Uneven cooling results in abnormal stresses and deformation of the hardening body.

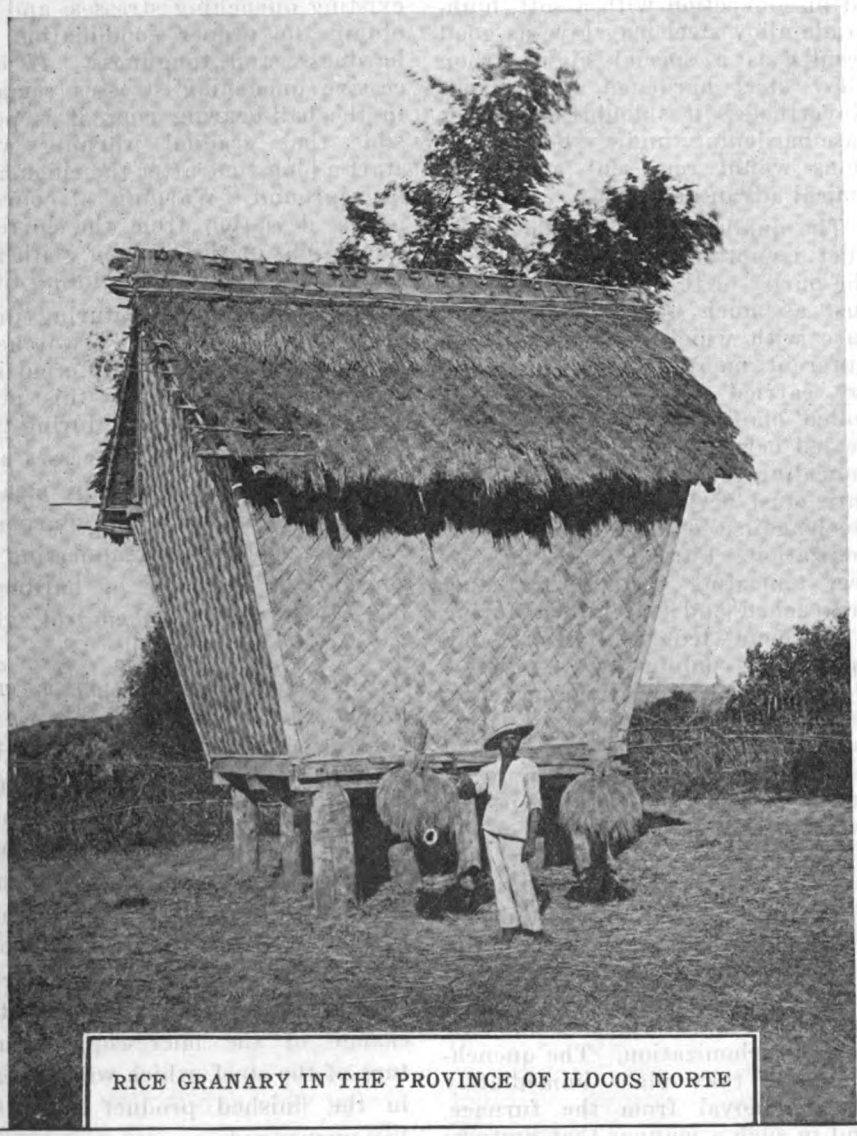
After hardening it is necessary to subject the parts to a drawing process which must be carried out at the right temperature, and during a sufficiently long time, in order to reduce as much as possible the existing quenching stresses, and to obtain the proper combination of hardness, and toughness. If excessive quenching stresses remain in the ball-bearing ring, it is possible that gradual warping will start a long time after the rings has been ground. Warping, of course, means deviation from the correct dimensions of the bearing, with resultant decrease of its running life.

The various manufacturing processes must be carefully watched, and a large number of different instruments are used for this purpose. The temperatures during the various heat treating processes are measured and controlled by means of pyrometers for this purpose. After quenching and annealing a considerable number of hardness tests are used to control the material.

Microscopic investigation is employed as an excellent means to control the original quality of the steel before it is subjected to any of the manufacturing operations, as well as all the mechanical and heat treating processes during all the subsequent stages of manufacture. Every deviation from the correct conditions during these processes results in a characteristic change of the microscopic structure of the steel, which will appear in the finished product more or less unchanged.



LAGAZPI AND THE VOLCANO MAYON IN THE LUZON ISLAND



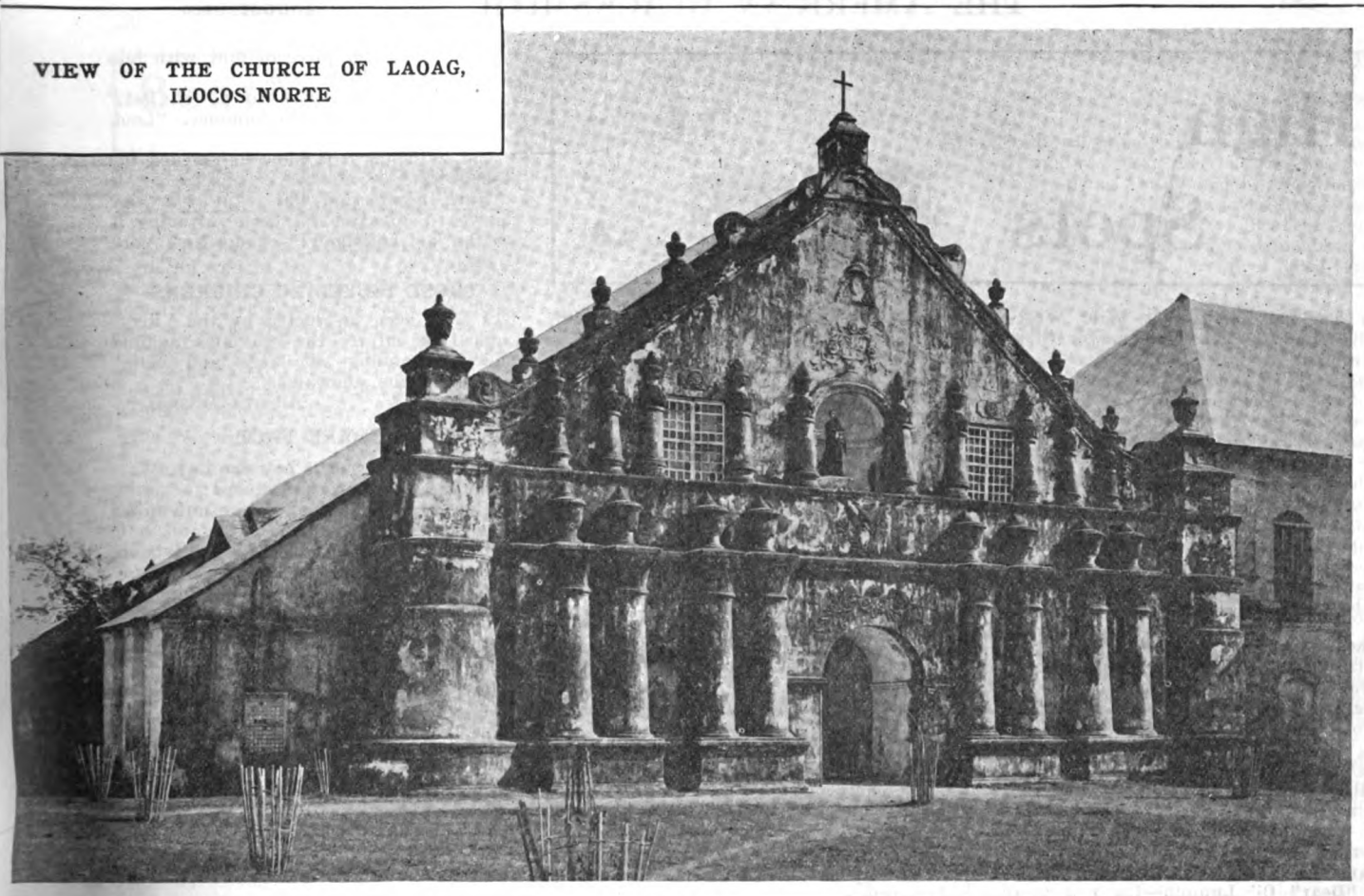
RICE GRANARY IN THE PROVINCE OF ILOCOS NORTE

INSPECTION CAR IN A SUGAR CANE PLANATION

TYPICAL VIEWS IN THE PHILLIPPINE ISLANDS

While our Antipodean has been an American subject for only a comparatively few years, he has in that time developed a lively interest in American methods, and is a great deal more progressive than many of us imagine. Great strides have been made in the general work of sanitation. The marshes, in which the deadly fever germs used to breed are disappearing rapidly, so that foreigners can visit the interior of the country with much less danger of contracting the disease. The general progress has contributed largely to making it a most favorable territory for the development of agriculture and a very promising future seems assured for the land of Lagazpi.

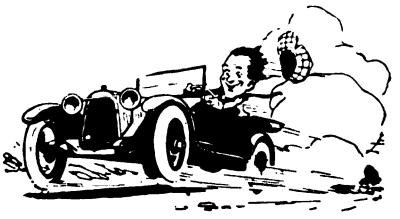
VIEW OF THE CHURCH OF LAOAG, ILOCOS NORTE



PHILIPPINE GIRLS SHREDDING RICE

TYPICAL HUT AT NIPA, USED AS A RESIDENCE BY THE SMALL FARMERS

High Spots



As England Views Our Wild West—"Well," said the Far West mayor to the the English tourist, "I dunno' how you manage these affairs in your country, but over here when some of our boys got tied up in that thar bankrupt telephone company I was tellin' yer about they became mighty crusty."

"Oh!"

"Yes, they didn't like the way the receiver was handlin' the business nohow."

"Indeed!" commented the earnest listener. "Then may I ask what they did?"

"Sartinly; I was goin' to tel yer. They just hung up the receiver."—London Tid-Bits.

When a man flatters himself that he is getting something for nothing there is generally the devil to pay in the end.

Theatrical Manager—"As a playwright do you thing Scribbler will live?" Dramatic Critic—"He may, if he runs fast enough."

Milly—"I don't agree with you that women are becoming more changeable." Billy—"But the Divorce Courts prove it. Just think how easy it is to change one husband for another."

In "Dear" Ol' Lunnun—Du you mean to say you think this room is fit to live in?" "Oh, no! But I thought you only wanted to pay four guineas a week?"—London Opinion.

Interesting Bed—Little Roy had returned from a week's visit to his aunt, and was trying to describe the folding bed he had been sleeping in. "It lays down at night, mama, and stands on its hind legs in the daytime."—Boston Transcript.

Breaking It Gently—At an amateur performance an artist gave imitations of several popular actors, one of whom happened to be present.

Afterward the ambitious amateur sought an introduction to the "star," and asked hopefully:

"Did you see my imitation of you?"

"I did," replied the great man, promptly.

"Then sir," persisted the aspiring youth, "may I ask you to give me your opinion of my art as shown in that impersonaion?"

"Well, my boy," the great man said, "one of us is rotten!"—London Tid-Bits.

THE DAY'S NEWS

Mrs. Jenkins was reading the daily paper. Presently she exclaimed:

"What strange things these society people do, Jeremiah!"

"What's up now?" asked Jeremiah, who was half asleep.

"Well it says here about the launching of a ship: 'With graceful ease the huge vessel slid into the water, just after the Duchess of Dumpshire had cracked a bottle of champagne on her nose.' I must have hurt her! Why should she mutilate her face like that, Jeremiah?"

—New Pork Globe.

A QUICK DECISION

"Selecting the jury has become one of the most important features of the modern trial," remarked a well-known judge recently. "and you'd be surprised how difficult it is to get twelve really intelligent and unbiased men together at one time.

"I recall once when a whole week was spent in selecting a jury in a murder case. Finally one old fellow seemed to fill the bill and would complete the quota. He was not opposed to capital punishment, and was considered a valuable find.

TRAFFIC CODE FOR PEDESTRIANS

Proposed by Eddie C. Wilman, Chief Clerk, City Engineering Department, Rochester, N. Y.

Rule 1—Pedestrians crossing boulevards at night shall wear a white light in front and a red light in the rear.

Rule 2—Before turning to the right or the left the pedestrian shall give three short blasts on a horn at least three inches in diameter.

Rule 3—When an inexperienced driver is made nervous by a pedestrian he shall indicate the same and the pedestrian shall hide behind a tree until the automobile has passed.

Rule 4—Pedestrians shall not carry in their pockets any substances which when broken will be apt to cut automobile tires.

Rule 5—In dodging automobiles pedestrians shall not run more than seven miles an hour.

Rule 6—Pedestrians must register at the begining of each year and pay a license fee of $5.00.

Rule 7—Pedestrians will not be allowed to emit cigarett smoke on any boulevard in an offensive and unnecessary manner.

Rule 8—Each pedestrian before receiving his license to walk upon a boulevard must demonstrate before an examining board his skill in dodging, leaping, crawling, and extricating himself from machinery.

Rule 9—Pedestrians will be held responsible for all damage done to automobiles or their occupants in collision.

National Safety News.

So the prosecuting attorney said solemnly, 'Juror, look upon the prisoner—prisoner, look upon the juror.'

"The old man adjusted his spectacles and peered at the prisoner for a full half minute. Then turning to the court, he said: 'Judge, durned if I don't believe he's guilty."—New York Globe.

A CONNOISSEUR

Second Story Worker—"Hullo, Bill. I see you got a new overcoat. What did it cost you?"

Burglar—"Six months. I never wears cheap clothes!"

After being out of work for some time Pat was put on breaking stones by the roadside.

A friend came along and found him belaboring one large piece of flint with lots of energy and little skill.

"That's not the way to do it, Pat," said the friend taking the hammer. "Look here!"

And with one deft blow he cracked the stone.

"Sure, now," said Pat. "ut was aisy for ye to do after I'd been softening it for the last half hour!"—From New York Globe.

THOSE BICYCLING CHICKENS

"I have been instructed by the Village Council to enforce the ordinance against chickens running at large and riding bicycles on the sidewalks."

Alberta Advocate.

A BARE FACT

Two ladies gay met a boy one day,
His legs were briar scratched;
His clothes were blue, but a nut-brown hue
Marked the place where his pants were patched.
They bubbled with joy at the blue-clad boy
With his spot of nut-brown hue,
"Why didn't you patch with color to match?"
They chuckled, "Why not in blue?"
"Come, don't be coy, my blue-brown boy,
Speak out!" and they laughed with glee;
And he blushed rose-red, while he bashfully said:
"That ain't no patch; that's me!"

SUGGESTIONS FROM A HOLYOKE LUNCH ROOM

Don't make fun of our coffee. You may be old and weak some day.

Use one helping of sugar and stir like hell. We don't mind the noise.

These spoons are not like the doctor's medicine—to be taken after each meal.

A small boy, who was sitting next to a very haughty woman in a crowded car, kept sniffling in a most annoying way, until the woman could stand it no longer.

"Boy, have you got a handkerchief?" she demanded.

The small boy looked at her for a few seconds and then, in a dignified tone, came the answer:

"Yes, I 'ave, but I don't lend it to strangers."

FROWNS OF FORTUNE

It was in the Argonne. A regiment of negro pioneers from Dixie who had been inducted into the service had just received a batch of mail. But neither Jefferson Madison Monroe nor his particular side kick, Washington Jones, were manifesting any great elation. In fact, they both looked decidedly in the dumps.

"Wash," mourned Jefferson, "I'se the hard luckin'est nigger what was ever. I done just got a letter from mah gal, and she's gone and went and married another.

"Oh, man, man!" wailed Wash. "You don't know what hard luck am. Me, I just got a letter from the draf' board what says I'm exempt."—Home Sector.

Experience is an alarm clock that calls our bluff.

You never can tell. All of life's hard knocks don't come from the anvil chorus.

It may be possible to make bricks without straw, but ice cream soda tastes better through one.

Muggins—"What do you think of women in politics?" Buggins—"Oh, they are harmless. A woman couldn't even throw mud straight enough to hit the people she aims at."

Benton's Recipes

To prevent the Accumulation of Foreign Substances on Top of a Hardening Bath—Dust or small globules of oil, which sometimes give trouble by collecting at the top of hardening solutions, can be disposed of by placing a piece of ordinary newspaper on top of the solution the dirt and oil adhere to the paper and are thus readily removed, thereby avoiding the labor of skimming the bath.

White Lead and Tallow of Even Consistency at all Temperatures—In order to keep white lead and tallow soft in winter and summer alike, so that it can be applied with a brush to finished parts of machinery before shipping them, and for use in fitting keys, etc., prepare a mixture composed of five pounds of white lead and fifteen pounds of tallow. Heat this in a suitable receptacle, and stir until the ingredients are thoroughly mixed. Then remove the mixture to a cool place, and add two quarts of linseed oil, continuing to stir the composition until it becomes cold, as otherwise the white lead will settle to the bottom. This mixture will always remain of the same consistency at all temperatures.

Zinc Paint for Oil Wells—Persons having occasion to paint oil wells or bearings, or any surface coming in contact with either hot or cold oil, will find a zinc consisting of 25 pounds oxide of zinc, 3 gallons gloss oil, and 1 quart linseed oil, cut with turpentine, and bleached with ultramarine blue, to be one of the best coverings ever made. The surface to be covered should be absolutely free of all greasy or oily substances; if proper care is taken, the paint will not crack and will retain its pure white appearance indefinitely. The paint can be blown into water jackets of bearings, filling the sand holes, and as it dries rapidly, will be found excellent for the purpose.

To Prevent Glue Cracking — A useful fact to know in regard to glue when using it on furniture or other work that will be exposed to a very dry autmosphere, is that a small addition of chloride of lime will tend to prevent the glue drying out and cracking. The chloride of lime is strongly hygroscopic and constantly attracts enough moisture from the atmosphere to keep it moist. Use about one-fourth ounce of chloride to one quart of glue.

Preservative Oil—To make a preservative oil use high test grain alcohol and best grade of sperm oil, equal parts. Keep in a tightly-corked bottle, and shake well before using as the alchol and oil separate after standing. Any moisture on a tool or gun at the time of application is quickly absorbed by the alcohol which in a short time evaporates, leaving a good coat of sperm oil to protect the surfaces from rust.

Glue for Leather Belts—Take common glue and isinglass, equal parts; place them in a glue pot, cover with water, let soak 10 hours, bring to a boiling heat, add pure tannin to make to consistency of the white of an egg. Apply warm, have surfaces clean and dry; clamp joint firmly.

Soldering Solution for Steel That Will Not Rust the Work—A soldering solution for steel that will not rust or blacken the work is made of 6 ounces alcohol, 2 ounces glycerine and 1 ounce oxide of zinc.

Preparation for Producing Extreme Hardness in Steel—The steel to be hardened should be immersed in a mixture of 4 parts of water, 2 parts of salt, and 1 part of flour. To get the steel thoroughly coated it should be slightly heated before dipping in th composition. After dipping, it is heated to a cherry red and plunged in soft water. This will make the steel harder than is simply heated and dipped in water.

To Fasten Paper Labels to Iron or Steel—Rub the surface over with an onion cut in half. Then apply the label with glue or paste.

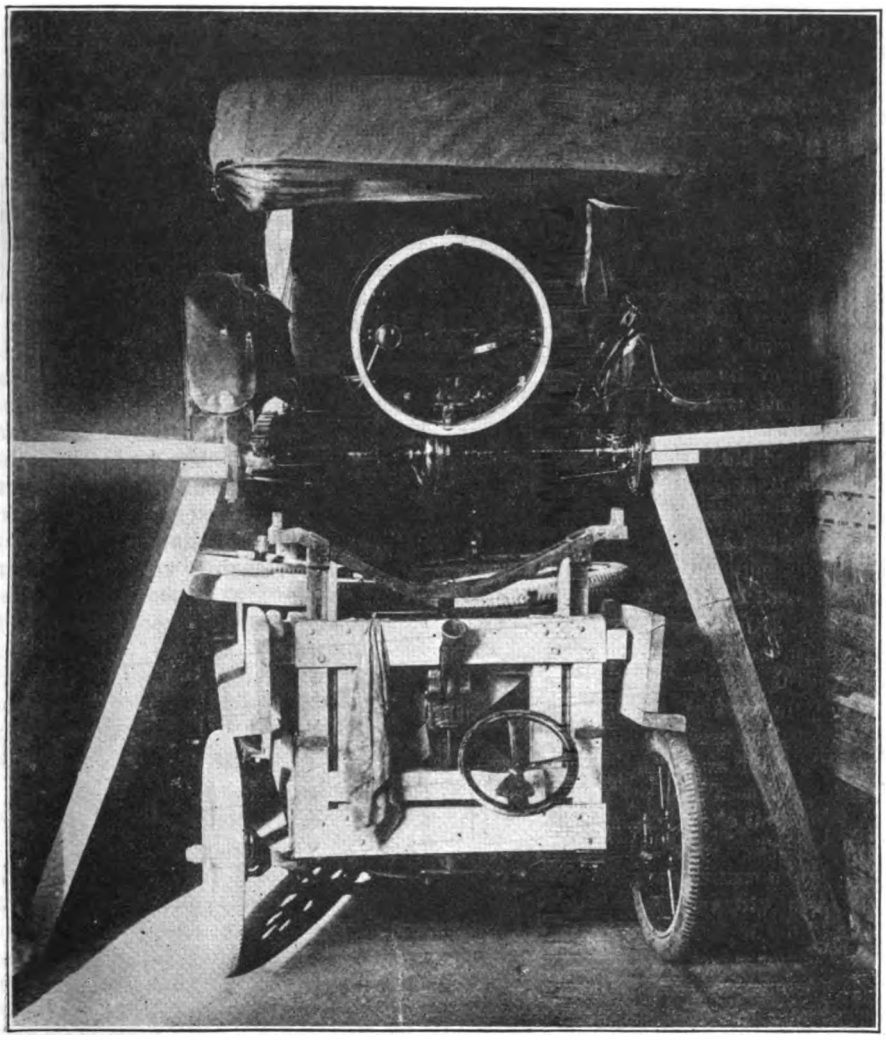
Lacquering Effect on Polished Steel—Mutton suet burnt on a polished surface produces a brilliant black which is very lasting.

To Prevent Exposed Iron Rusting—To prevent iron, which is exposed to moisture, from rusting, paint over with a coat of Portland liquid cement. This is very satisfactory for posts which are set in the ground.

Preventing Serious Results from Injuries from Rusted Objects — Everyone knows how a small wound caused by rusty pieces of metal oftentimes develops blood poison, or lockjaw. The following old-fashioned but infallible (first aid to the injured" may therefore be of value to remember. Ordinary brown sugar is heated on the surface sufficiently hot to produce a smoke, and the wound is held in this smoke for several minutes. No serious results will follow after this treatment, and all soreness will be taken out of the wound even though the application takes place some time after the accident. The smoke given off by burning woolen rags is equally effective,and, as they are more often available, particularly to a man "off on a job," to keep this simple remedy in mind may be well worth while.

Permanent Iron Cement for Steam Pipes—To make a permanent cement used for stopping leaks in steam pipes where calking or plugging is impossible, mix black oxide of manganese and raw linseed oil, using enough oil with the manganese to bring it to a thick paste; apply to the pipe or joint at leak. It is best to remove pressure from the pipe and keep it sufficiently warm to absorb the oil from the manganese. In twenty-four hours the cement will be as hard as the iron pipe.

PACKING 'EM IN TO SAVE SPACE



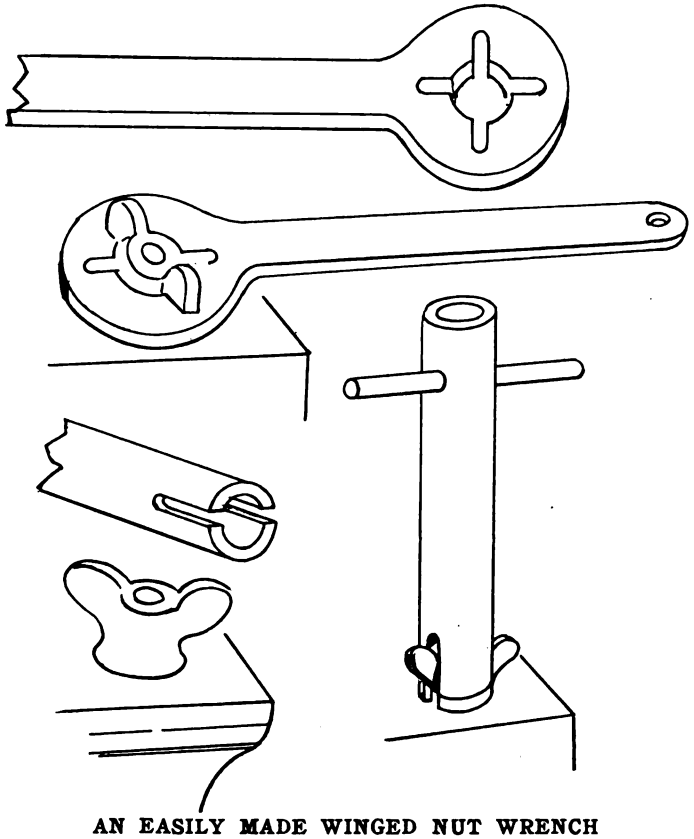
IT IS A VERY SIMPLE MATTER FOR THE MEN AT EACH END OF THE TRUCK TO LOWER THE AUTOMOBILE ONTO THE UPRIGHTS, WHERE IT IS MADE FAST WITH BRACES EXTENDING FROM THE WALLS OF THE FREIGHT CAR

Some Handy Tools For The Shop

CHAS. H. WILLEY

WINGED NUT WRENCHES

The two types of wrenches shown in the self explanatory sketches herewith will be found a pretty useful addition to the tool kit of any mechanic who has to adjust brake bands and other parts of the truck and auto. They are made easily from flat stock and short lengths of pipe to suit the different sizes of nuts. The most stubborn wing nuts come off easily with these tools.



AN EASILY MADE WINGED NUT WRENCH

HANDY BELT TRIMMER

Quite often some of the shop belts get curled over on one edge due to poor alignment of the pulleys and the improper placing of the belt shipper, etc. Such belts after awhile have to be discarded and if one makes a trimming or splitting tool as shown in the sketch, the belt can be cut down to a narrower width and used on other machines.

The device is simple to make. The frame A is a piece of 1/8-in. sheet iron bent at opposite right angles and having a couple of slots cut in it to take the small angle iron to which is bolted an old wood chisel that has been re-sharpened. The device is secured to the edge of the bench. The width desired is set and then the belt drawn through.

METAL SAWING KINKS

When cutting thin sheet metal and thin tubing with a hand hack saw, unless one has been through the mill it is ten chances to one that they will break the saw or rip off all the teeth. Those who have much of this sort of sawing to do hold the work between two pieces of board, as shown in Fig. 1. This steadies the work and prevents the saw from digging in and breaking.

Short pipe is plugged with wood but for work where it is too much bother to put in the wood, take the hack saw and dull the cutting teeth. This will prevent breakage and yet permit very good sawing.

KEY EXTRACTING TOOL

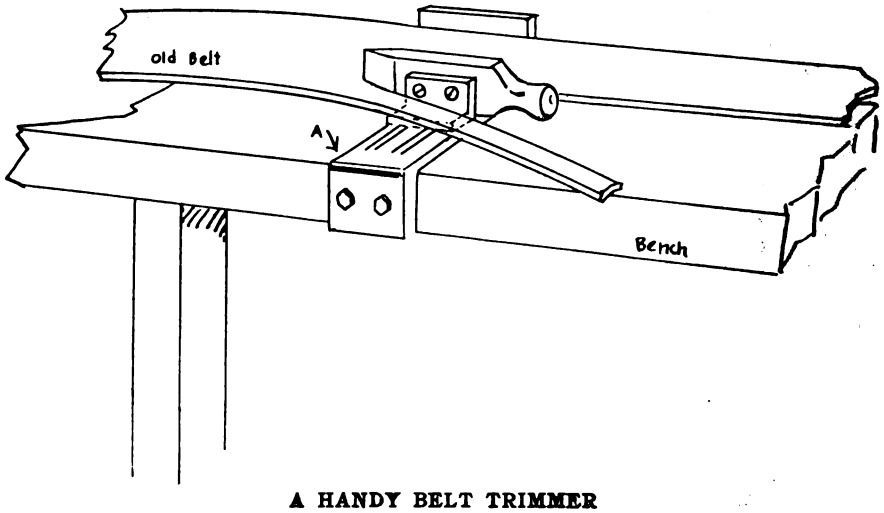
Where one has any amount of work involving the pulling of flywheel keys it is worth while making some sort of an extractor that makes the work easier. Such a home made tool that I found pretty good is shown in the drawing. It is made from a regular steel bolt forged up on one end and machined to go over the key and head and secured by a screw. A strong back and two distance pieces complete the device.

ODD PIPE VISE

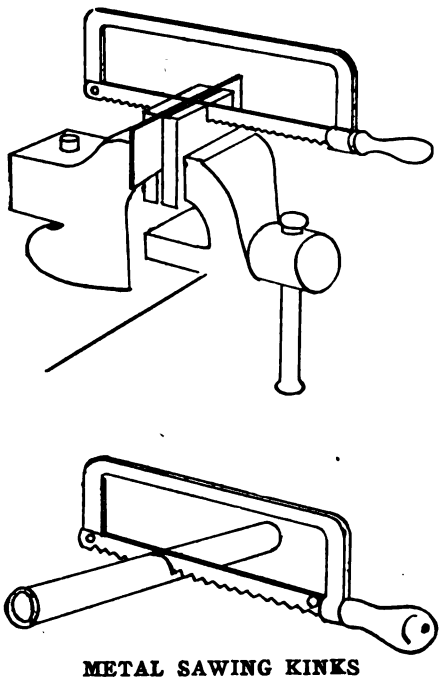
Recently I noticed a rather odd sort of home-made pipe vise while on a visit to a farm. The farm mechanic wanting a pipe vise and not having any means to make a suitable screw type of vise hit upon the idea of making one operated by a wedge and lever. The scheme is sketched herewith but it tells the story of the way to make it better than printed description.

LUBRICATION OF BALL BEARINGS

Although ball-bearings are well-known and are being used in many industries, there still remains a good deal to be done in the way of instructing users as to their proper use and care. Unsuitable lubricant will damage ball bearings, and this is very likely to happen because of the lack of data on this important subject. There is not as much information available on the lubrication of ball bearings as there is for plain sleeve bearings. The behavior of lubricant under various loads and speeds has been the subject of considerable experiment but at the present time there is no accepted method of determining the lubricating value of oil or



A HANDY BELT TRIMMER



METAL SAWING KINKS

grease as applied to ball bearings. The efficient lubrication of plain bearings, however, presents few difficulties and there is plenty of data available on this phase of the subject, but not so for ball bearings. The formation of a wedge shaped film of oil was discovered by Beauchamp Tower in 1885, and the lubrication of plain sleeve bearings has since been based on the maintenance of an oil film on the bearing surfaces.

In the case of ball bearings, conditions are different. In the first place an oil film does not exist under normal operative conditions, and, secondarily the lubricant must be of certain quality to eliminate any possibility of erosive action on the highly polished balls and raceways. Ball bearings should not be used without lubricant because it is necessary to protect the balls and raceways and to minimize the slight friction between the balls and ball retainer. As a friction reducer, however, lubricant is not as necessary for ball bearings as for plain bearings.

Three important points must be taken into consideration when dealing with ball bearings. (1) The co-efficient of friction is practically constant throughout wide ranges of loads and speeds; (2) metal-to-metal contact, as an oil film being only possible at very high speeds when slippage may take place; (3) co-efficient of friction is lower in an unlubricated than in a lubricated bearing, that is, at light loads and moderate speeds. It will be seen that as plain bearings and ball bearings possess such widely different characteristics, a true comparison is impossible. It is on this account, that the rules governing the lubrication of plain bearings do not hold good for ball bearings.

Mark Meredith.

KNOWING HOW AND WHY

A blacksmith of wide experience who visited us recently gave a telling argument which he finds never fails when customers kick about the prices of work. He tells them something like this.

"Over there is the dentist's office. For five minutes' work you pay him a dollar and think it a reasonable charge. There's the lawyer going past in his car. For ten minutes' talk he makes you separate yourself from a five-dollar bill—and you raise no kick.

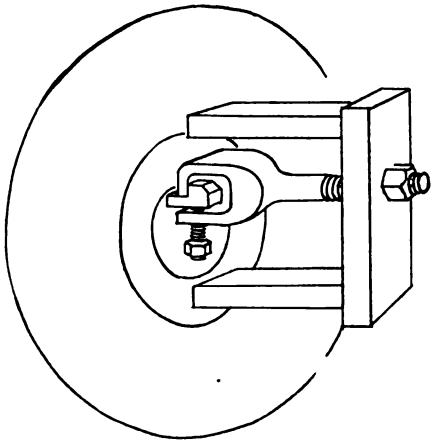
"These worthy professional men spent a few years learning their business. They are justified in charging for their knowledge. I have been at the anvil for over thirty years, and I am still learning. But I maintain that I have just as much right to charge a good price for my skill and experience as has the doctor, lawyer or dentist. It's a matter of knowledge. If you consider the dentist can shoe your horse better than I can, why take up my time arguing over what I know is a fair and just price for a new shoe. Take your horses right to the dentist."

We believe in the policy of this blacksmith. Most men are reasonable—under their skin. Logic appeals to their sense of fairplay. Don't fly off the handle. Quietly tell them your price—and what your price means. Don't waste time over it. If they are chronic kickers let them talk to the wall—go ahead with another job. Do you argue with them as to why a bushel of potatoes costs what it does to-day? No, you pay up—or go without the "spuds."

REMOVING NEVERSLIP CALKS

Probably a few brother craftsmen would be pleased to know how to remove Neverslip calks, if they are not worn level with the shoe. The job can be done in quick time, without much trouble and without having to heat the shoe.

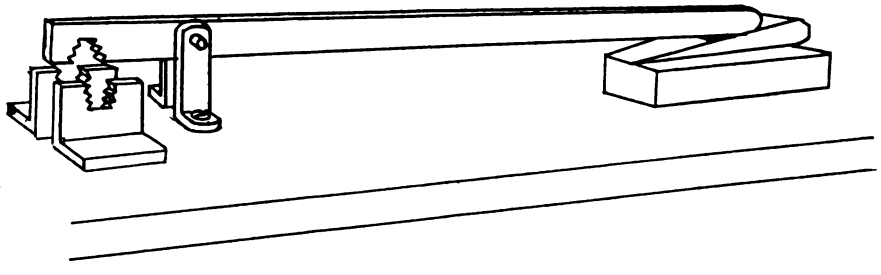
Have some coal oil handy so that you can drop some on each calk, or dip the entire shoe in the coal oil. Give each calk a few blows on each square with a sharp hammer and you will find that they can be got out very quickly. Grip each calk in a good vice. I find that this method saves me a lot of time and tapping.



KEY PULLING MADE EASIER

CARE OF AUTOMOBILE STEERING CONNECTIONS

The leather boots necessary to protect the steering joints of an automobile from mud and water should be given careful attention. Old grease should be removed from the joints when necessary, and the boot cleaned. The joints should be greased thoroughly, and a strip of linen, 3 in. wide, used as an inner covering to retain the grease. The boot is placed over this cloth covering, thus keeping it clean for lacing. The inner covering may be discarded when the joint is again greased.



AN IMPROVISED PIPE VISE

Sid Tries Reading For Profit

By D. G. BAIRD

Illustrations by Art Helfant

I'VE always been some enthusiastic about the joys and pleasures of perusin' the printed page and I've found rest and relief from many a weary hour in such sport, but I always keep a eye open for makin' my pleasures a little more pleasurable by mixin' in a goodly proportion of profit here and there even in such a highly cultural exercise as burnin' the midnight Mazda.

"Let them as so desires," says I to yours truly, "absorb all that bunk about wild injuns and wilder cowboys and still wilder women what don't live nowhere outside o' the stories; as for me and my house, we'll find all the romance and adventure we're lookin' for in the periodicals what enlighten us on the thrillin' subject of serving the public in the latest and most approved manner and collectin' the usual stipend therefore."

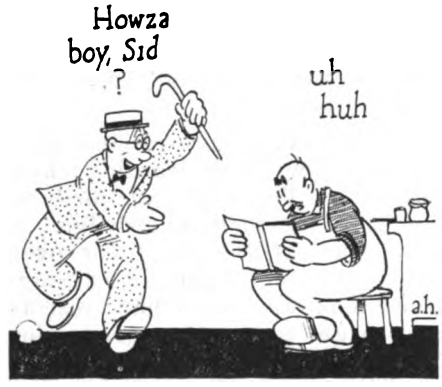
All 'uv which is a strictly personal preference and woulda never been mentioned if Sid Lee hadn't took it upon hisself to try to infect me with the fiction fever and wean me away from the aforementioned pleasant pursuit'uv trade-journalism.

Sid had the fiction fever bad hisself, and when I happen to drop in one day somewhat unexpected and catch him right in the act, he seems to think he'd be doin' me a personal favor by introducin' me to some of the pipe dreams he has when he's in his deliriums'uv romance and adventure.

As I said, I catch him right in the act and he's so busy readin' one o' his thrillers he hardly knows when I come in; just glances up and nods absent-minded-like and goes right on with his story without answerin' my solicitous inquiries about the state'uv his health and well-bein' and prosperity and other interestin' matters.

"Howza boy, Sid?" says I, f'rinstance, real enthusiastic, and he just gruns "uh huh" like he's talkin' in his sleep. But I'm in no wise discouraged, so I come right back: "Whadda you think'uh the presidential campaign, Sid?" But he seems to think the same as he did about his health, 'cause he just says "uh huh" again and don't miss a word'uv his readin'.

Well, I begin to get somewhat peeved after about ten minutes'uv such conversation, so I says real dignified: "Guess I could get a coupla gallons o' gas by puttin' up the necessary amount'uv capital, couldn't I?" and after about a minute, Sid says "um-m-m...just a minute... I'm nearly through." And then directly he grunts real disgusted "Shucks! To Be Continued."



"If you continue it much longer," says I beginnin' to get my dander up at such remarks from a friend, "I'll continue on down the pike and see if I can't find a fillin' station tha's willin' to dispose of flivver fuel for cash money."

"Eh? Oh, I was talkin' about the story," says Sid. Right at the most thrillin' part, where you're wonderin' whether the villain're gonna dash the hero to death over the prescipice, the story breaks off and's to be continued next week. Let's see, it'll be four days before the next issue's on the stands! That's what I hate about—"

"I hate it just as bad as you, I'm sure," I put in beginnin' to lose patience with such ravin'.

But Sid don't catch the idea in my remark and goes right on: "It sure is some tale though, don't you think so? I always keep up with the 'Wild and Wooly' magazine every week. Best stories published, I think. Still, there's some mighty good stuff in the "Sex and Senseless" too. D'you read 'Driven Apart' that was running last month?"

"Well, no," says I, "I didn't, but I read a mighty good article in the Garage Magazine about how to make some handy tools to use around the shop—"

"Listen to this," Sid interrupts like he didn't hear what I was sayin', "ain't this some thrilling situation to leave off at? 'At last,' snarled Berdyne, 'I have you in my power Reginald Preston, and—'"

"Pardon the interruption, Sid," says I, "but may I inquire whether you learn how to run a garage in the most modern way by readin' that kinda literature?"

"O' course not. I don't expect to learn nothin' about garages from the 'Wild and Wooly'. But whadda I care about that? I guess I learned how to run a shop some while ago. What I want to read these days is something to get my mind off'n the old joint—not something that'll keep me thinking about it all the more."

"I see. Then I suppose conductin' your business is work, while readin' fiction is play—that the idea? And o' course you already know all there is to be learned about running a garage, makin' handy tools, doin' neat jobs o' repairin', handlin' difficult pieces o' work, sellin' accessories, and the like.

"F'rinstance," I continue as I pick up a trade journal and open it at random, "I suppose you could weld a large crank case without any difficulty, could you not?"

"Oh, I suppose so. But I don't undertake anything like that. I'm not prepared for it, you see. As I was sayin' about this here story, I want you to listen to these lines: 'At last,' snarled Berdyne, 'I have you in my power—'"

Again I must ask you to pardon the interruption, friend Sidney, but I wish to remark that from all outward appearances them wild and wooly tales seem to have you in their power."

"Aw, you make me tired!" Sid says in a grieved tone. "Can't a man enjoy a little literature without bein' ridiculed for havin' a little better taste in such matters than some others?"

"Oh, sure! Only there's much

difference of opinion as to just what may be called or denominated literature. Now—"

"And I suppose you're some authority on the—"

"Excuse me, Mr. Proprietor, but there's a customer approaching and such a event is so unusual I must call your attention to the matter... Oh, I was wrong. He just headed in this way so's to turn around and go back down the road. I thought sure some stranger was about to come in for the purpose of askin' you to do a little repair work for him or sell him an accessory or something."

"And I guess you mean to hint that I don't get no customers, huh?" says Sid beginnin' to get a little touchy. "I'll have you understand—"

But just here a gent in a limousine halts out in front and honks his whistle so loud Sid jumps up and runs out before he realizes that he's makin' such unusual exertion, and the gazabo in the gas wagon hollers out and asks him if he keeps pumps for sale.

Sid does and in a few minutes he's back in the office after havin' made the sale. I see my opportunity to do a real service for a friend, and usin' the pump sale for a text I set in to educate Sid to the trade journal habit.

"Now you see, you poor fish," says I, "there's a sale you come pretty near missin' just because folks don't know whether you've got goods for sale or whether you're just runnin' a real estate office.

Now if you'd keep up with the progress 'uv the world and the garage and accessory business by readin' real literature—the kind what tells you how other men have succeeded in corrallin' the frolicksome dollar—instead'uv idlin' away your worthless time gulpin' down a lot'uv blood and thunder im—"

"Aw, how'd you get that way!" Sid wants to know, showin' he don't appreciate my efforts in his behalf. "How'd readin' about weldin' a crank case learn me anything about sellin' accessories? Just answer me that. And's for my readin'—"

"But, you fiction fiend, you don't think that's all there is in the trade magazines, do you? W'y the way you talk you've never looked inside'uv a real publication. Look at this—"

"I guess I've looked enough to find out that about all there is to 'em is a lot of advertisin' with a little bunk scattered along in between. I'm not—"

"What if there is advertisin' in em? You gotta have goods, haven't you? And where you gonna get 'em if you don't see 'em advertised? And besides, have you got any idea what the magazine without any advertisin' matter would cost you? Huh? I guess you didn't know that the subscription price of a up to date magazine is a small matter to the publisher, did you? It helps, o' course, but it's the advertisers what really pay for the publication'uv the journal, see?

"And as for the 'bunk' as you call the readin' matter, seems to me like you wanted to borrow a little money last fall, didn't you? And if I remember correctly you had to get an accountant and pay him a big price to figure up your business before the man behind the railin' would let you have the dough. Am I right? Yeh, you know it to your sorrow. Now just looka here right in this magazine that's been lyin' unread on your desk. Here's a little article what tells you how to keep track'uv your own business without hardly any trouble a-tall and how much to figure for expenses and what percentage to figure for profit and all—and you didn't even know it.

"Then here's a department on how to do things easier around the shop—looks like a lot o' little experiences handed in by the fellows round about what've picked 'em up from their own experiences. Oughta help you out a lot in your work. and here's one on Makin' the Garage Revenue Greater, but o' course you're not interested in a little thing like that. Here's the very thing you've been needin': Window Display As a Advertisin' Medium. W'y man if you'd spend ten minutes a day readin' and studyin' this here trade journal—"

"D'you mean to say that there one magazine tells all about them subjects you been reelin' off? Let's see that'un about how to keep books on your business."

I hand over the copy what contains the information and for the next half hour all I can get outa Sid is, "Who'da thought it?" and Whadda you know about that?"

and "Say, there's a good idea—I'll clip that out and paste it in a scrap book," and other such remarks what don't mean nothin' by themselves.

I see there's no chance for conversation while he's so busy with his new-discovered source of knowledge and wealth, so I pick up his copy of 'Wild and Wooly' and proceed to entertain myself for a spell.

Pretty soon I'm readin' away on a thriller what makes me mad clear thru one minute and happy as a fool the next and wanta cry about three seconds later, and all the time I'm holdin' my breath to see just how it's all gonna end. But after a time the hero succeeds in thwartin' the foul designs o' the villain and I'm so worked up over the case I just gotta say somethin' to Sid about it. I hold in as long as I can, then I jump up and grab Sid by the arm and shake him and yell out: "Say how'n the world does this tale about 'The Tenderfoot Hero Holds An Ace' turn out?"

And would you believe it? Sid just grunts "uh huh." But I'm all excited and I rush on real enthusiastic: "Just listen to this, Sid, ain't this some scene though? 'Hang the law,' gritted Cactus Pete, 'I've swore to possess that girl and I'll—'"

And Sid looks up real disgusted like and snaps, "Aw, shut up I'm busy."

Motor Knocks, How to Locate and Repair

By J. N. BAGLEY

ONE of the most annoying things with which a motorist contends is a continual knock about the motor, or some other part of the car. A knock generally indicates a worn part, or a part which has not had sufficient amount of lubrication. Most every one driving a car has begun to look upon the knock as a warning of danger. Many of us can remember the old two cylinder motor with the long stroke, and how they would knock a little while before a connecting rod gave way. When this did happen our hearts would turn over a couple of times in quick succession, and we would place our hands on our pocket books, as Farmer Jones used to do at the Rag Time Carnival. Usually when the connecting rod comes down, it ruins the piston, rod, crank case, and in many instances springs the crankshaft so badly it is necessary to replace it with a new one. Those of you, who have never experienced the connecting rod knock, or have had the rod come down and go thru the case, do not realize how much danger is indicated by that sound. To the old experienced driver, its meaning is understood as well as the death rattle is understood by the physican.

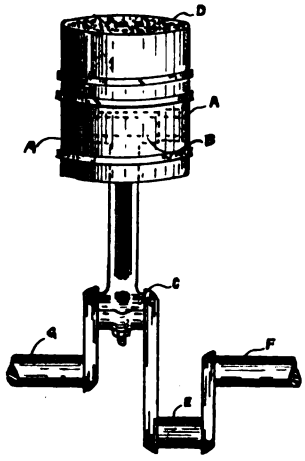


FIG. 1. THE PISTON ASSEMBLY

Locating the Knock by Sound—Almost every knock that develops in a motor, regardless of the place, can be located by sound, after one makes a little study of it. The only two knocks which have much resemblance is a slightly loose wrist pin, and a carbon knock, which is caused by a carbon deposit on the piston and in the cylinder head. This sound is a sharp rattle with a bit of an echo to it, which sounds much like tapping a piece of steel about 4 inches long, laying on a table. This knock is not dangerous, but may be considered injurious to the motor for if it is carbon, it tends to affect power, because it becomes incandescent and pre-igitions occurs. If it is a wrist pin, it will soon wear the bearing out of true and the continuous tapping many times results in a broken piston, at any rate, while either may not be considered dangerous, they should be corrected.

The connecting rod knock has a distinct sound all its own, as there is no other knock which resembles it. This is rather a heavy knock and comes at regular intervals, whether the motor is running fast or slow. When the motor is pulling, it sounds the same, only somewhat louder. The connecting rod knock comes at the end of the working stroke, as the shaft whirls over to carry it back to highest point in the cylinder, and it also occurs at the upper end of both compressions and exhaust stroke, thus a knock comes at both top and bottom turn of the shaft. This knock should not be allowed to continue, as it is extremely dangerous. A loose crank bearing will soon be thrashed out, owing to the jerk at both turns. As soon as the connecting rod is freed of its babbit bushing, the space is so large that a hard jerk or knock at each turn occurs, and it is a matter of a very short time until the bolts are jerked loose or broken and the result is a great deal of damage. If a connecting rod is allowed to run after the bearing is melted out, it will have a tendency to ruin the crank pin, as the shaft bearing surface is polished as smoothly as accurate machinery will permit. It only takes a very short time to destroy this smooth surface. Once this surface is broken it takes much time to prepare it, so that it will stand the constant wear, without cutting the bearing.

Main Bearing Knock—The main bearing knock is a deep heavy knock, compared to the connecting rod knock, and unless very loose will only develop when the motor is "drifiting" at high speed. We mean, by drifiting, to speed the car approximately 30 miles an hour and suddenly shut off the power and let the momentum of the car run the motor. This will expose any looseness in the connecting rod as well. A main bearing knock is not considered as dangerous as the connecting rod knock, but nevertheless, it is injurious to the motor, and should be repaired. The danger lies in the possibility of a loose main bearing, whipping out the bearing and damaging the shaft.

Fly Wheel Knock—The "Fly Wheel Knock" as it is sometimes called, comes from a loose fly wheel and while it is not particularly dangerous, it is injurious to the shaft as well as to the interior of the hub bore. A fly wheel knock is a deep heavy pound, which resembles a main bearing knock, but comes at each revolution of the crankshaft. This is due to the wheel not being keyed tightly, or if on a taper, is due to the nut holding it to the taper, having worked loose. It should not be allowed to run in this condition, for the interior of the hub is cast. It will take but a short time to wear it until it never can be kept tight.

Bevel Pinion Knock—"Now who ever heard of a bevel pinion knock?" was the remark of a customer one day after I had taken a little ride with him to diagnose his car trouble. This comes from a small chip being picked up and lodged between the teeth of the small drive pinion or the bevel drive gear. At each revolution of the large gear, the small gear strikes it, thus a bearing must spring enough to permit the gears to pass over the obstruction causing a knock at each revolution. The frequency of the knock, depending

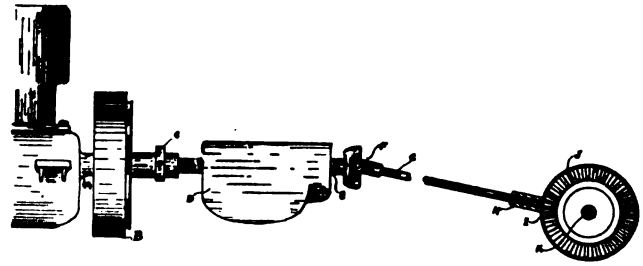


FIG. 2 SHOWING OTHER PARTS WHERE NOISES DEVELOP

on whether the chip is lodged in the pinion, or in the ring gear. If it be the latter, the sound occurs at each revolution of the rear wheel, whereas in the former instance, it will be noticed at each revolution of the propellor shafts. This knock can be felt all over the car and should be corrected as soon as possible, as it may break the pinion or the bearing.

Miscellaneous Knocks — Other knocks of less consequence are

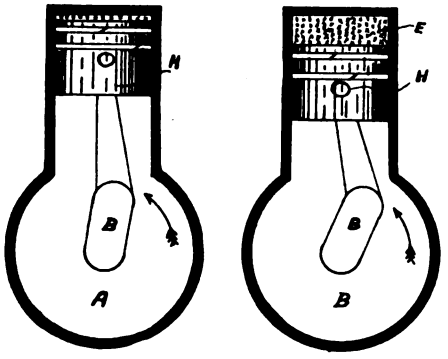


FIGURE 3.

found in the universal joints, etc. Such knocks are easily found and should not be allowed to continue. A bolt head on the hub may strike the brake band at each revolution and cause a knock, and a hundred such little things would happen, all these are readily taken care of with very little trouble. We will now go over the repair of such knocks as we have mentioned, and make clearer the things which are of most importance:

In Fig. 1 we have a drawing of a piston, with a wrist pin, etc., connecting rod and a section of a crank shaft. At D, is the point where the carbon accumulates. This is due to a surplus of oil, or to oil of inferior quality. The carbon should be removed and the oil examined as well as the oil pump supplying it. If no pump is used and the method of supplying oil is the splash system, possibly the level of the oil is too high. The wrist pin bushings, which are usuallly bronze are located at point "A," frequently become worn, because of in insufficient lubrication, and should be replaced with new ones should this be the case. In the event the bearings are located in the upper portion of the rod, instead of the piston, they can be replaced all the easier. Where only a slight amount of play is perceptible. it may be corrected by pressing the bushing out, tinning it on the outer surface and then pressing it back into the rod. This will shrink the bushing sufficiently to correct mild cases.

The bottom of the rod at "C," is the most particular bearing about the car and should be adjusted with great care. The bearing should be fitted so that when the bolts holding it together are drawn perfectly tight, the weight of the piston will slowly drag it down. The oil channels in this bearing should be large, and lead to an opening in the upper part of the bearing, so that the oil may reach the bearing at all times. In fitting the bearing it should be scraped with a bearing scraper until all parts bear on the shaft evenly. The crank shaft bearing shown at "G." and "F." should be fitted with the same care as the bearing C. If they are too tight they should be shimmed with thin sheets of brass until a smooth running fit is obtained. In the bottom bearing, should be cut a long straight oil channel within about ½ inch of each end of the box. In the top the oil channel should be about the same, with a sort of a spiral twist to it. This top channel should open directly into the hole or reservoir which supplies it with oil.

It is well to examine the part thoroughly to insure it getting proper lubrication. Where a pressure feed system is used, with an oil duct running from the crank end of the connecting rod to the wrist pin, examine the oil duct for obstructions.

In Fig. 2 we have the drawing which shows the general connection of the power unit, the transmission, the universal joint and drive pinions, the bearing "A", being known as the rear main bearing. The next place where a knock is liable to develop is at the fly wheel, which should be adjusted as often as it shows any little looseness. Such a condition may be detected by placing a jack under the wheel "B." The collar "C" which releases the clutch, will cause a little knock or rattle, if it is not properly lubricated. It should not be allowed to run in a worn condition as that tends to affect the gears and gear shifting. A worn transmission bearing at "E" will cause a knock because of the tendency of the universal joint "F" to move in directions, other than those necessary. This bearing should be replaced for proper operation with a new one, as soon as looseness can be felt by lifting up the universal, with the hand at point "F." A loose universal joint (F,) will not knock, but will sort of rattle. If badly worn it may necessitate replacement with a new one while in many cases a thorough lubrication will effect a big improvement in its operation.

The bevel pinion knock is usually caused by an obstruction lodged in the ring gear, as indicated by point "J", every revolution of the gear bringing the obstruction "J," under the pinion "I," the bearing "H." and "K" together with the spring of the large gear must take the strain. The resulting sound is often misleading, as the sound travels up the drive shaft and seems to come from the motor or the transmission. By jacking the wheel up, and turning, this obstruction can be felt at each revolution. If there is an opening in the housing, the gear can be washed clean with kerosene and the obstruction probed out with a sharp instrument. The case should be drained of all the old grease and filled with new. If this is done once every month,or at regular intervals, the danger of picking up some little chip of steel will be lessened to a great extent.

Figure "A" in Cut No. 3, shows the piston position, when the spark

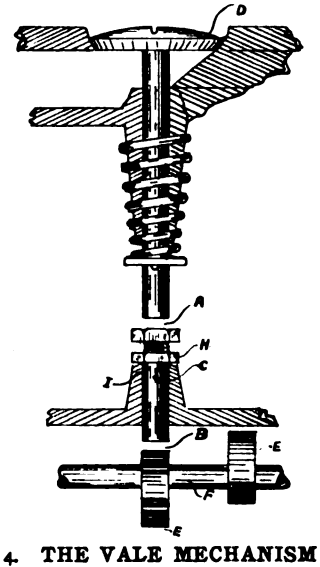


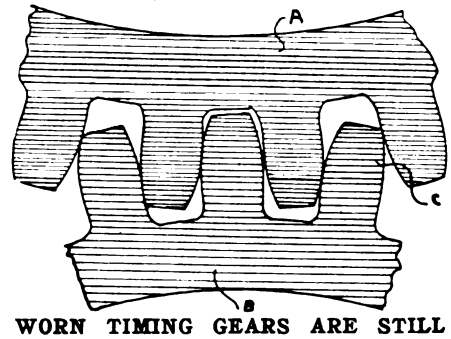
FIG. 4. THE VALE MECHANISM CONTRIBUTES ITS SHARE OF STRANGE NOISES

is partially advanced, as under moderate running conditions. It will be observed that the spark occurs before the piston has reached head end dead center. This condition is necessary because the gas does not explode instantly as many people believe. On the other hand it might be described as a rapid burning process, consuming sufficient time to allow the piston to travel a noticeable distance be-

tween the time the spark occurs and the utmost expansion of gas is attained. It is clear that if the spark occured directly on dead center, particularly, when the engine is running at high or even moderate speed, that a considerable portion of the explosive force would be lost, due to the piston having in the meantime traveled part way down the cylinder. To obviate this loss the spark is set sufficiently ahead to compensate for that loss of time.

Figure "B" of the same cut shows what occurs when pre-ignition, due to carbon deposits, takes place. The charge of gas while undergoing compression is ignited by the incandescent carbon deposits laying on the piston head. The explosion in this case being so early that the piston does not have an opportunity of reaching the top before combustion is complete. The piston, therefore, tries to go in the opposite direction but is prevented from doing so by the momentum of the fly wheel. It is apparent, that such power impulses are working directly against the fly wheel, and therefore instead of adding to the power therein stored, they detract from it. But that is not all, such a condition besides applying a reverse torque has a decidedly bad effect on the mechanism of the motor, and if allowed to continue is bound to produce a bad effect on those parts resisting the unnecessary strain, as these parts were not designed to run continuously under such conditions. The efficacy of carbon removers, are as a whole, questionable, since the perfect solvent of carbon is an acid, and the result of acid on metal is quite clearly understood. There are carbon removers on the market, which have no deleterious effect on the engine, and it is questionable whether the same might not be said in regard to their effect on the carbon itself.

Valve and Push, Rod Knocks Fig. 4 shows a diagram of the valve and push-rod mechanism which frequently causes a little knock, that is annoying. "D." representing the valve, "A." the push rod which passes thru the guide, "I." The push rod bears on the cam "B" when the valve is seated. If the adjusting nut "H" is not properly adjusted and leaves too great a space between the valve "D" and the push-rod "A," every time the cam comes over and strikes the lower end of the push rod, it is suddenly slapped against the valve and causes what is known as the valve tap. This can be easily corrected by adjusting the nut "H" until the space between the valve "D" and the push-rod "A" is such that a very thin calling card can be slipped between it, when the cam is at its lowest position. The usual valve clearance being from .003 to .10 according to the design of the motor. This will remedy the trouble, unless the bottom of



WORN TIMING GEARS ARE STILL ANOTHER CONTRIBUTING FACTOR

the push rod is held from the cam by the adjusting device nut resting on the push rod guide "I", thus preventing the push rod from bearing on the cam at all times. In this case the top of the guide should be dressed off so that when the push rod is at its lowest point there will be no space between the push rod and the cam. Loose or improperly adjusted valves make more of a rattle than a knock, but while this may not seem to be doing any particular damage, it affects power and sometimes causes the motor to overheat. In severe cases, where the clearance between the valve stem and push rod becomes excessive, the timing is affected. The valve opening only a portion of the requisite distance, and late as well, the burning charge is not allowed to escape properly, and a knock and overheating results. Such cases are rare, but possible, and should accordingly be avoided. "A" shows two straight spur timing gears. These gears often become worn until there is an excessive clearance between the teeth. Every time a cam raises a valve, a slap in a gear occurs. While the resulting sound might not be classed as a knock, it is quite annoying, especially to one who is used to a quietly running motor. These worn gears will, to an extent, affect the valve timing and thus the power of the motor will be lessened, depending on the extent of the wear. Generally the gear operating the magneto is connected in the train and the slack makes the spark a little late, which tends to overheat the motor and lessen the power. A magneto coupling can make a sort of a rattle or knock, when loose, and this should be replaced, as should the gears, when worn.

Lubrication of Gears to Prevent Knocking—The gears should be well lubricated, and it is best to add to the grease, a little graphite as this tends to prevent them wearing rough for the teeth of the gears are hardened, and when the glaze is rough and broken, it is a matter of a very short time until the gear will be worthless. The gear case should be washed out and filled with fresh clean grease occasionally as the fine wearing and cuttings have a tendency to act much the same as an emery dust grinding paste does in grinding valves. In cars where the timing gears are lubricated by the oiling system, the use of graphite is disadvised, since it is apt to clog some of the oil ducts. The clearance between the teeth of new gears is .002" and old gears having a clearance not in excess of .006" will work, sufficiently quiet for ordinary practice.

YESTERDAY AND TODAY

You are lucky to be blacksmithing today instead of thirty or fifty years ago. Did you ever sit back nights and compare the craft of today with what it was in the days when your granddad worked at the anvil? Look back and see what the blacksmith in the old days had to work with—the tools—the stock—the machines. He made his shoes, drew out his own nails, drilled his holes by hand, worked a long and hard day for mighty little money. For a change, consider the advantages you have today—the labor-saving devices—the time-saving tools—the temper-saving material. And yet you've got to know more than granddad to be a real live, up-to-date worker and, working right, to make more money. Just sit back and think it over.

TO MAKE WOOD ACID PROOF

Some storage batteries are carried in wooden battery boxes on cars and annoy the owners by leaking or slopping of the acid. To make the wood acid proof take six parts of wood tar and 12 parts resin, and melt them together in an iron kettle, after which stir in eight parts of finely powdered brick dust. The surface to be covered must be thoroughly cleaned and dried before painting with the warm preparation.

Accessories Help Increase The Profits

ROBERT FALCONER

THERE is, in a small village, a blacksmith shop that, when the blacksmith business began to fall off due to the advent of the automobile, began to repair automobiles. When making repairs it was necessary to secure new parts. Often accessories were needed, such as a horn, a new speedometer or something else. Also a great number of the cars upon which he worked needed new tires.

This man decided that it would be profitable to secure this business for himself rather than buying in small quantities from the nearest dealer. At first he put in a few tires. These sold so well that he added other lines until to-day he is carrying a good stock of accessories and the profits on these go a long ways towards taking care of the overhead.

Any blacksmith who does very much automobile repairing will find it necessary to carry in stock a certain number and kinds of spare parts and a certain stock of accessories, if he is to make the greatest success of his repair work. If he is working day after day on the same makes of cars it will never do to depend upon the dealers in town for parts and accessories. He should carry his own stock.

It is only another step to display these in such a way that they will attract attention of people who come into the establishment. This display alone will result in the sale of the stock.

A large and a complete stock such as would be carried by an accessory store may not be needed. It probably will not be advisable to buy such a stock. In the accessory business it is more necessary to buy with care than it is in any other business. If one keeps adding new lines as he finds a demand for them he will not be spending his money for something that he cannot sell and he will not be missing opportunities to make additional profits. All that is necessary is careful buying and effective displaying.

Men who have been in business for any length of time have learned a good deal about buying. These same men, however, may not have given as much attention to the displaying of the goods. If goods well bought are half sold then goods well displayed are usually all sold.

It will pay to partition off one corner of the shop, and make a display room in that corner. It will pay, provided there is any great amount of travel upon the street or road where the shop is located, to go still further and build a show window facing the road. This show window will be sure to attract the attention of passing motorists. The better the appearance the window makes, the more business will be attracted both for the repair shop and the accessory store.

Of course it will be necessary to keep this window clean and to change the displays made in it at least once a week. A display that remains in a window for more than a week becomes dusty and unattractive and tends to hurt sales rather than to create them. It is for this reason, if for no other that they should be changed.

In the store itself, it will be well to install one or more show cases and to display the smaller accessories in these cases. A show case keeps the stock in better condition and somehow it seems worth more when displayed in a show case than it does when piled upon boxes and barrels.

The accessory store department need not be large. One man who now is doing a large accessory business started four years ago with a little room about fifteen feet by eight feet and nearly all show window at that which he built on the street side of a little garage he was operating at the time. There was not room for a room inside the garage, so he had this little addition built on the old building and extending out to the sidewalk line. From this small beginning he has developed his business into one that now occupies the whole of a three story building and does nothing but an accessory and tire business. example of success illustrates the possibilities of the accessory business and the advisability of adding a line of well chosen accessories.

This garage man added accessories because he was running behind in the garage business and he needed something that would help him make things break even. The accessories proved so profitable and the business grew so rapidly that it was not long before he required all of the space available in the garage for storage of stock and storage and care of his service cars.

Just as the blacksmith is losing a great opportunity if he does not immediately turn his attention to the repair of automobiles, so when he does turn his attention in this direction he is missing an opportunity if he does not add a line of accessories and push these with all his energy. Every year there is an increase in the number of automobiles in use. The number already in use is in excess of an average of one for every five families. There are some sections of the country where there is a car for every family. This means a tremendous demand both for repairs and new things to put on the car.

There is probably no line of retail business where there have been so many cases of quick and spectacular success as there have been in the accessory business. We find one man who after having made an attempt to conduct a mail order business found himself without funds or credit and with only a few hundred dollars worth of automobile accessories on his hands. Because he had been more successful in selling these than in selling anything else he had tried to sell through the mail, he opened an accessory store. Within a couple of years he was doing a large business. In a short time he developed such a large wholesale business that he closed out his retail business and confined all of his attention to the wholesale business. To-day he has a very large and a very profitable business.

A man who had never been engaged in the retail business and who knew nothing about automobile accessories, outside of the fact that he was not able to find a store that rendered the sort of service he thought an automobile accessory store should render, decided to open a store of his own. His first store was small and more or less of an experiment. He used care in buying only those things that he knew would give his customers satisfactory value for the money spent. Soon he had outgrown the little store and opened another one. In ten years time he had opened a chain of stores and was still growing and prospering.

This is the story of accessory dealer after accessory dealer. These men come from all lines of business. They have made a success because they have entered a line of

business where the demand is constantly increasing and they have done their utmost to give satisfactory values to their customers.

In no one of these three cases mentioned has it been cut prices that have resulted in success. In two of the cases, prices have not been cut at all. In each case, however, care has been exercised to give the purchaser good values. In other words to sell him those articles that will not fail to give satisfactory service.

If these men have been able to make a success of the accessory business, there is no reason why the blacksmith cannot also make a success of accessories. There surely is no reason why he cannot add materially to his profits by adding a little store to the front of his building, either by building an addition or partitioning off a corner.

If, in this little store, a good selection of accessories is displayed, the room is kept clean and accessories are shown in the window, sales are sure to result. If in addition some sales effort is exerted through newspaper advertising, letters to former and present, as well as to people who should be customers, the sales will materially increase. The profit on these accessories, however, is not the only thing to consider. The stock of accessories will tend to attract repair work and the repair work will tend to sell the accessories. The two work together to help build up profits and most men who are in business to-day are in it to a very considerable degree for the money they can make out of it. If for a time they may forget about the profits in the excitement of running the business they are frequently reminded of the necessity of watching them for it requires them to buy that new hat for the wife and the new shoes for the children.

Provided the blacksmith grasps his opportunity there is no reason why the passing of the horse should work any hardship. We now have more than six million automobiles and that number is increasing every year. These cars require a vast amount of just the kind of work that the blacksmith is able to do and often to do far better than other men who have set up in the repair business. Any man who can demonstrate his ability to do first class repairing soon finds no difficulty in filling his shop. If to this he adds the profits that can be made from accessories, he will find no cause from a financial point of view to regret the passing away of the horse age.

SPECIFIC GARAGE SERVICE ADVERTISING

By Ernest A. Dench

That much abused word—Service—has been twisted and distorted to such an extent that the word has lost much of its former effectiveness. It will no longer do to insert vague statements of the service your garage is prepared to offer. Motorists want to know precisely what the service consists of. All garages, for that matter, offer service of some kind, and automobilists know it.

The service that pays is the kind which sends motorists flocking to your garage—not only for gas and repairs—but also accessories. Your service may be superior to that of the garage further down the street. If it is, why not advertise the fact without knocking your competitor.

The Albany Garage Co., Albany, N. Y., had the right idea when it specified the service motorists are entitled to—

"FREE!!

A sound Business Maxim is that you "can't get something for nothing". At the Albany Garage, however, there are three exceptions that prove the rule.

They are—Free Touring and Road Information Bureau in Charge of an experienced manager.

Whenever you plan a short trip or a month's tour, it will add to your comfort to start with authoritative information.

Free Air at the curb. Clean, free air, free from oil and gases that ruin tubes.

Free Storage Battery Inspection.

Run in once a month or oftener—proper inspection extends the life and usefulness of a battery.

We want the motoring public to acquire a habit of accepting these courtesies—with the same freedom that the general public consults a drug-store directory.—They're yours to use."

The service specified above is the kind, if rendered with cheerful willingness, that attracts permanent patrons.

There is a borderline between service that is free and service that is paid for. This borderline should be plainly indicated so that there will be no misunderstanding. The Mulford Hass Co., Brooklyn, N. Y., made a special appeal to Ford owners.

"NO MORE TROUBLES

Don't sacrifice a minute's time to worry, or work, on your Ford car. Whatever's the matter with it, we will fix it—in record time—at minimum cost—and hand it back to you, not patched—but as good as new! You've been looking for us ever since you bought your Ford. Call us on the phone for particulars. And come in to see the niftiest new models in specially equipped pleasure cars, trucks, tractors and commercial vehicles turned out this year.

With the large number of second-hand cars changing owners this year, the garageman will get the most of the business in his community if he advertises and practises service in the right way.

SUCCESS SECRETS

ONST there was a man who was chock Full of good ideas. He could hatch more Schemes in a month than an old hen could hatch chickens. An' the best of it was that each and every Scheme was a Beaner—no doubt about it, they had money-making possibilities. But he always required other people to help Work out his planS. An' he chose **inexperienced** but **admiring** friends and applicants, putting these in important positions.

Once he had started a business enterprise along, an' had engaged people to operate it, he would proceed to attend Strictly to his own part of the business and expect the other Folks to attend to theirs. Some way or other, there were always GAPS through which the profits fell, an' so he would apply his self closer an' closer to his part of the work to try and Improve matters.

Well, Scheme after Scheme failed just because he expected 2 much of inexperienced help. He was looking for men who were smarter than himself—that is, People who attend to their own jobs and co-relate to that of others about them.

Our friend, the Hatcher, MISSED his calling. He should have been a designer of something or other, letting other folks work out his plans. When he came to work them out himself, he wasn't there, and so the brightest of his ideas came to naught.

He would have had a FAIR chance of Success had he taken inexperienced help and watched an' trained an' guided them, but he never did that, an' so he arrived in the end at the Bottom of the ladder in place of the TOP!

AMERICAN BLACKSMITH AUTO & TRACTOR SHOP

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MORE ON THE GASOLINE SITUATION

R. L. Welch, General Secretary and Counsel of the American Petroleum Institute, of which most of the leading petroleum producers and manufacturers of this country are members, made public the following memorandum on the gasoline situation addressed to 5,000 members of the Society of Automotive Engineers:

"The automobile industry and the public have been asking for years what kind of gasoline or motor fuel we were going to have in the future and whether it would be necessary to abandon gasoline and to use kerosene or some similar product of petroleum. Furthermore, every one has been asking whether we would have enough gasoline.

"The time has arrived when so far as ordinary human foresight can go, we can answer the first question by stating that the motor fuel of the future will probably be substantially the same product known as motor gasoline today. But it seems equally clear that there will not be enough of it to go around unless the automotive engineers cooperate to conserve gasoline. There is no doubt but that such conservation could be accomplished by proper design.

"A careful study of statistics will show that the amount of crude oil available during the period of very low-priced gasoline was so great as to excuse for the time being any great expenditure of effort on the part of the automotive engineer to conserve fuel. That time is past.

"The time has now come when, from the oil man's standpoint, it would seem as though the problem of the automotive engineer is to build engines that instead of making from seven to twelve miles a gallon of gasoline will make twenty or thirty miles on the same amount. The problem is not to build engines to burn refined oil, or some product of petroleum other than the present motor fuels. At the present time there is not enough petroleum to meet all requirements.

"With the speed limits of automobiles at about 25 miles an hour, and with the crowded condition of our city streets and roads today, making it unsafe to drive very much faster, why is it not necessary, advisable, and practicable to cut down very materially the consumption of gasoline by all types of automobiles, by the more efficient use of fuel?

"Should not the horsepower of the heavy cars be cut down, and could not the cheaper and lighter cars be so equipped as to get all the speed desirable from a very much smaller amount of gasoline than is now used?

"No reasonably well-informed man likes to make predictions about the oil business. At the same time, the logic of the situation is such that automotive engineers should plan to use and conserve the present-day motor fuels. The only fuels possibly available aside from the present-day motor fuels are kerosene and perhaps a distillate similar to the fuel which is used in Diesel engines, that is, something approximating gas oil.

"Gas oil and kerosene are tending to become as scarce as gasoline. At the present time many gas companies in the United States are in distress for gas oil. It has more than doubled in price in a comparatively short time.

"The demand for kerosene has been so great that the tank wagon market price of kerosene throughout the country is approximating two-thirds of the tank wagon market price of gasoline. A short time ago it was about one-half.

"This increasing demand for these heavier distillates will apparently continue and must be met. We must never forget that the kerosene lamp is a long way from being supplanted, and that the demand for gas oil will continue to be very great.

"The price of kerosene and gas oil is rising more rapidly than the price of gasoline. With the great demand for these two products, it is difficult to see where the kerosene is going to come from to enlarge the motor fuel supply. If the kerosene or gas oil is available, it seems obvious that by efficient refining methods it will be cracked into gasoline approximating in its boiling points the ordinary grades of motor fuel in use throughout the country If you design your engines to use these two heavier fuels it looks as though the oil industry were going to beat you to it by cracking both of them and making gasoline out of them.

"It will be possible to furnish fuel provided we have the co-operation of everybody who has a proper relationship to the problem. It is doubtful whether it will be solved unless we have that co-operation. If the government of the United States will co-operate with the oil industry, the same courage and the same business ability which have characterized the automotive industry and the oil business will get the oil.

"In 1911, the oil industry had to supply gasoline for only 700,000 automobiles. In other words, the supply was 314 barrels of crude oil to each automobile. Bringing it down to last year, there were only 50 barrels of crude oil produced in the United States to each automobile in use. There is the story—from 314 barrels per car in 1911 to 50 barrels per car in 1919.

"If you produce the cars which it is predicted you will produce, and if production of crude oil does not increase any more rapidly than it has in the past, there will be available per car only 40 barrels of crude oil this year, 1920. In 1922, if your calculation that there will be nearly 12,000,000,000 cars registered is correct, there will be provided only 35 barrels of crude oil per car in this country, if production does not increase more rapidly than it has in the past.

"In 1919 we consumed 375,000,000 barrels of crude oil. Since the first of August, 1919, and down to the first of March, 1920, we have been consuming at the rate of 436,000,000 barrels per annum, and we have been producing at the rate of 402,000,000 barrels per annum. This shows an excess of consumption over production of 34,000,000 barrels.

"The remedy for the present fuel shortage lies in the following:

"First, the government of the United States must co-operate with the oil business and with the automotive industry at home and abroad if the gasoline problem is to be solved.

"Second, the greatest possible efficiency must be gotten by the automotive industry and by the consumer from motor fuel or the problem will not be solved.

Third, the oil industry must be more efficient and must get more gasoline from each barrel of crude.

"With reference to the second remedy, the efficiency of the products of the automotive industry, there is need to curb the present demand of the American public to have motor cars with motors developing 70 to 80 horse-power which are operated generally at 20 miles an hour.

"The recent change in gasoline prices occurred by reason of the change in the relationship of production to consumption.

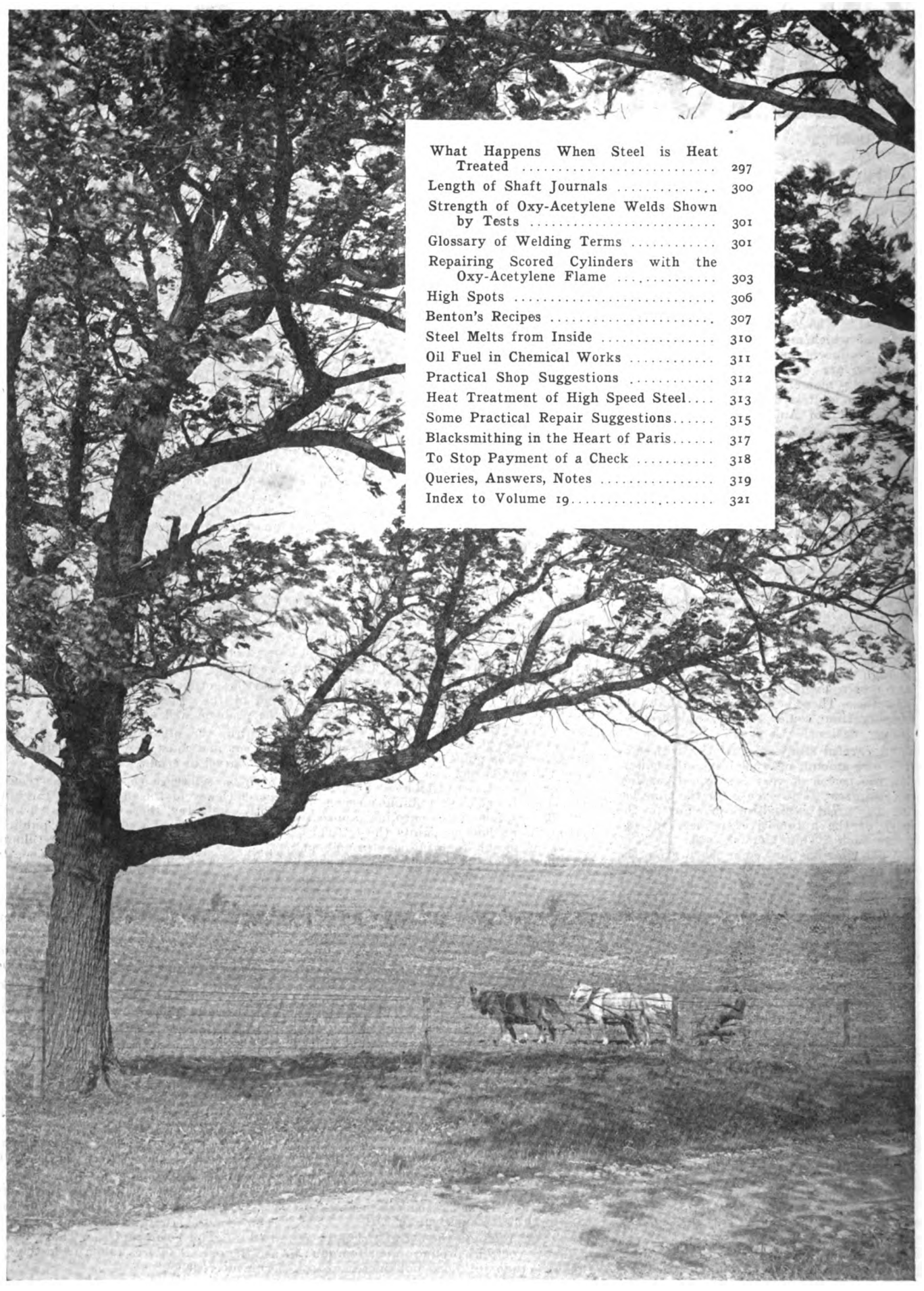
"There never was a time in the history of the oil business when there was so much competition as there is today, and there is more competition in the oil business, I believe, than there is in the automotive business.

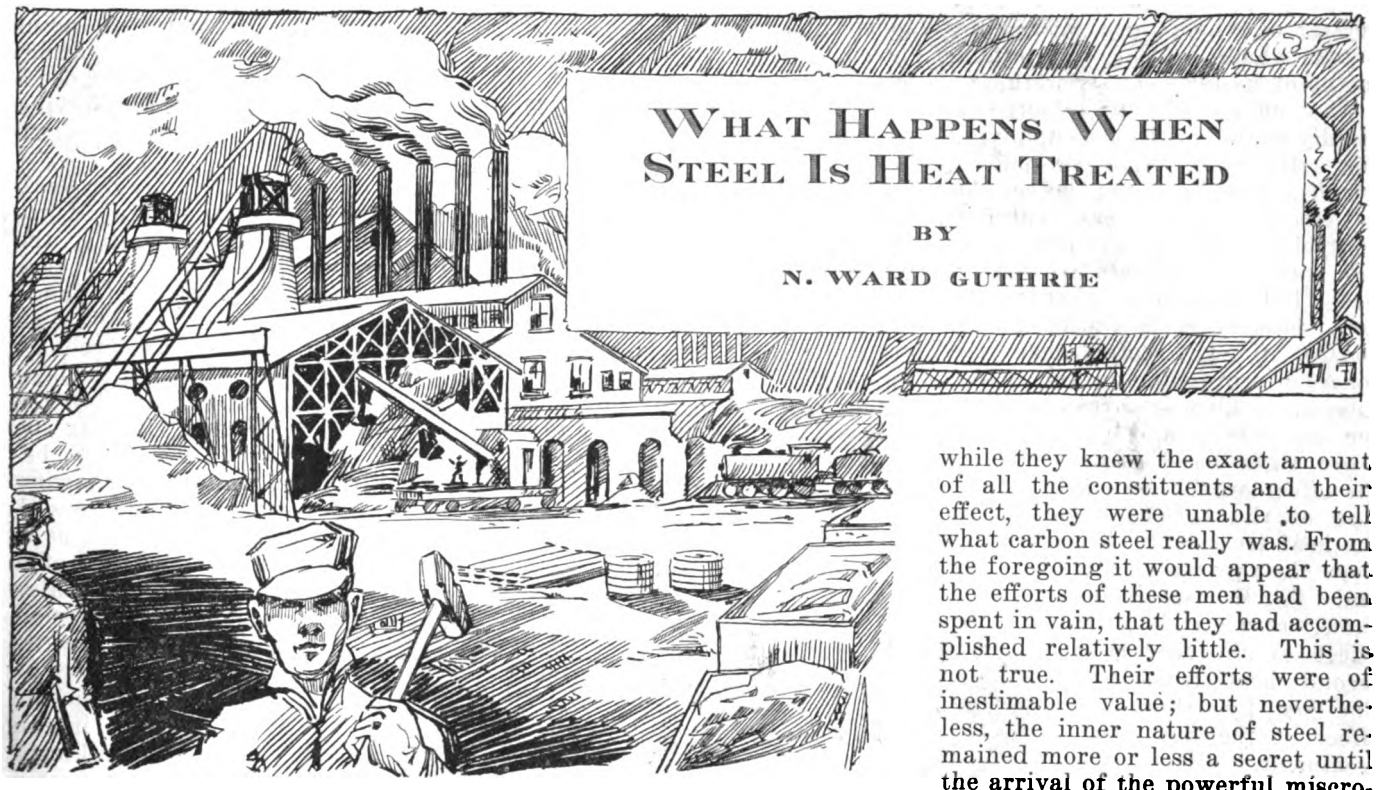
"Just to give you a few figures: In 1911 the Standard group refined eighty per cent. of the petroleum refined in the United States.

"In 1915, the Standard group refined sixty per cent. of the petroleum produced in the United States.

"In 1919 the Standard group refined only forty-nine per cent. of the crude oil refined in the United States.

"In 1919, for the first time in the history of the oil business, the independents refined more crude oil than all the affiliated Standard companies. These figures are the official figures taken from the government reports.





What Happens When Steel Is Heat Treated

BY

N. WARD GUTHRIE

MANY of us have but a vague conception of what steel really is, in fact, there are but few people, comparatively, who, even though they are intimately associated with steel in the course of their daily work, have a clear idea of its inner nature, or the effect that heating, annealing and tempering has on it. To tell what steel really is, and to attempt an explanation of its inner nature and the effect of various heat treatment, doing so in terms that will be readily understood by the man who has not spent a goodly portion of his life studying metallury, is indeed most difficult. From that angle, it appears to be sort of an intangible subject, around which a great deal can be said without bringing out clearly the vital points.

"Steel" said one man, "Why that's just iron with a certain portion of carbon in it." That is a pretty general definition, yet it is about as far as the most of us would care to go in our analysis. It is this same general vague idea of steel that makes it doubly hard to explain intelligently just what it really is. Cast iron, we might say, without fear of contradiction, is iron with carbon in it; but it's a long way from being steel. Perhaps the man responsible for the definition, may have attempted to use it in place of steel at some time, if he did, he should be able to vouch for it being a mighty poor substitute. Since cast iron and steel are both "iron with steel in it", and there is such a decided difference in the two metals, then it must be the manner in which the carbon is contained that causes such a marked contrast. That is percisely the governing condition.

For years back, scientist who have conducted investigations into the chemical nature of steel, were aware that carbon was the controlling element. They realized fully, that where the carbon existed in various proportions, the quality of the steel varied accordingly. They went even farther. They found that where the carbon existed in proportions of 1.00 per cent, the steel could be hardened sufficiently to be used for tools, and where the carbon content was only .50 per cent, the material was incapable of being hardened sufficiently to do severe work. Thus they established a line of delineation between the two varieties. Their work was of infinite value in classifying the various qualities of steel, and in discovering just what constituents were best suited for the many different needs. But, just how this carbon existed, and just what the effect of tempering, annealing and heat treatment really were remained more or less a matter of personal opinion. In other words, while they knew the exact amount of all the constituents and their effect, they were unable to tell what carbon steel really was. From the foregoing it would appear that the efforts of these men had been spent in vain, that they had accomplished relatively little. This is not true. Their efforts were of inestimable value; but nevertheless, the inner nature of steel remained more or less a secret until the arrival of the powerful miscroscope with its photographic attachments. Perhaps they were of the opinion that the carbon existed in the form of true chemical combination with the iron. If they did, their opinions must have suffered quite a surprise at what the microscope disclosed, because carbon steel is not homogenous. It is not like silver, gold or many other metals, that is, the carbon does not exist in chemical combination.

The microscope has shown, conclusively, that particularly unhardened steel exists in the form of two substances closely intermingled in the form of thin films or crystals of pure iron and the other of iron carbide, either of which in itself is a homogenous substance. The metallurgist refer to this iron carbide as cementite. It is the growth and size of these crystals, as well as the amount of carbon present, that determined the hardness and toughness of the tempered piece of steel. Just how this occurs, we will see later on.

When a piece of steel is subjected to heat treatment for the purpose of either annealing, hardening or tempering, it should be borne in mind that the percentage of carbon, or that of the other constituents do not change, but remain exactly the same. The change which does occur are changes in the physical structure of steel itself.

In other words it is either an increase or decrease in the size of the crystal of which the steel is composed which is the determining factor of its physical strength.

The effect of this change is vividly shown in the accompanying cut. Here we have six micrographs, showing the effect of various steps in the heat treatment of steel used in high grade automobile springs. The cuts are magnified 1150 diameters; that is the area shown here is approximately 765,000 times greater than the space it represents on the actual specimen. They are arranged from the upper left hand corner to the lower right hand corner to show the effect on the crystalline structure of the various steps during the heat treatment. The first two show the raw material. The third and fourth specimens show, respectively, the effect of the first and second heat treatment. The last two show the effect of the final heat treatment. Even the casual observer will have but little difficulty in detecting the change in the granular or crystalline structure which has occurred. Chemically the steel remains the same. In that respect, it is identically the same steel, yet its physical properties have been entirely changed, its strength and toughness has been increased, merely through the change in its granular structure.

THE EFFECT OF HEAT TREATMENT ON THE STRUCTURE OF STEEL

Now, let us see why this happens. A piece of unhardened steel, or a piece which has not been subjected to heat treatment, is composed of innumerable grains or crystals, consisting of closely intermingled particles of cementite and pure iron. Cementite is a carbide of iron, or, in other words a form of carbon. It is the hardest constituent of steel, and may exist in fine granules, thin plates or in comparatively large quantities. This structure of alternate layers of cementite and pure iron, or even as a conglomerate mixture, in unhardened steel, is technically known as pearlite.

Cementite is weak and brittle, but extremely hard, while pure iron is relatively soft in comparison. If we polish a piece of steel of this structure, it is apparent that there will be a tendency to wear away the soft iron before the harder cementite is effected. In this way a series of minute high spots and depressions are produced, which, if treated with various chemical, become clearly visible under the microscope. Thus, we have another branch of metallurgy which works in conjunction with the chemical analysis. The chemical analysis reveals the various proportions of the constituents, while the miscroscope shows an equally important phase, namely, the structure of the crystals which are so important to the strength of the steel.

The heat treatment of steel envolves several unusual things in connection with the size and growth of the grains. When a piece of steel is placed in the fire and heated slowly, for a time the size of the grains remain unchanged, then when a temperature of slightly below 1300 degrees Fahrenheit is reached, the grains begin to grow larger in size, and this growth probably continues long after the critical point of the steel has been reached, and it is nearing the melting point. As the grains grow larger, they grow fewer in number, as they seem to absorb material one from the other. This growth also brings about weakness in the steel, as the larger grains will not adhere as closely to one another as the smaller one will. Besides the growth in the size of the crystals, another phenomenon occurs. The change in a piece of carbon steel, when subjected to heat treatment, occurs at certain well defined points. For example, take a piece of steel containing .85 per cent carbon. When heated, its temperature will rise steadily until a temperature of 1335 degrees F. is reached. At this point the temperature will remain unchanged for a time, even though the heat is increased, after which the temperature of the steel will again rise. The temperature of 1335 degrees F. is known as the point of decalescence. It denotes the point at which time, during the heating, the nature of the steel undergoes a change. The change is a desolving of the carbon in the cementite into the iron.

In practice, the decalescence point lies above the recalescence point, because upon heating, the temperature rises above its true critical value before the change has time to begin. The same phenomenon can be observed by carrying a mass of water through the freezing point. If the water is kept perfectly quiet, it may be cooled as low as 28 degrees F. before it freezes, while upon thawing it will always rise to 32 degrees F. before it begins to melt, and, as is well known, the temperature of a mixture of ice and water remains at the freezing point as long as there is either a particle of ice or a drop of water in the mixture, that is, it can neither rise nor fall until change from ice to water is complete. Thus it would appear that there are two changes in the steel as it is heated, one within the other, so as to speak. First, when it has reached a certain temperature the size of the grains begin to grow, and secondly, when the point of decalescence is reached the iron starts to absorb the carbon contained in the cementite.

Now, as the piece of steel is allowed to cool, one would be inclined to believe that the reverse phenomenon in regard to the size of the grains would occur. That is, that the grains would grow smaller as the piece of steel cooled, however, this does not occur. Consequently, after we have heated the steel past its critical stage, we have caused a decided and permanent change in its structure, unless some corrective measures are used. The grains have grown large and are of the size produced by the maximum heat reached. They have not changed in size as the piece slowly cooled, and since large grains mean a weakness of the steel, tensionally, the inner nature has been entirely changed.

But let us follow the inner workings of that piece of steel as it slowly cools. The temperature will drop steadily until a temperature of 1,250 degrees F. is reached, then

it will remain unchanged for a time, or it may even rise slightly, and then the heat will gradually decrease again. This is called the point of recalescence. Any observant person, who has done any amount of forging, will have noticed a peculiar brightening of color as a piece of steel was cooling, that phenomenon occurs at the point of recalesence. It denotes the point at which, during the cooling that the steel undergoes another change, for the carbon is again crystallizing out of the iron. These points can always be recognized by the pause in the rise or fall of the temperature that occurs when these points are reached. At the point of decalesence 1,355 degrees F. the individual particles of the eutectoid are as hard and of as fine structure as they can be made, while the steel as a whole is soft. A similar condition is that of a wet ball of sand or mud, which is as a whole soft and plastic, yet many of the individual particles are extremely hard.

The point of recalesence of all carbon steel is the same, namely, 1,250 degrees F. The range of temperature between this point and the point at which the necessary change in structure occur to give the best hardening and annealing results, is called the transformation range. The upper transformation range varies with the composition of the steel, while the lower transformation range remains virtually the same. The transformation range of steel containing .85 per cent carbon is between 1250 and 1355 degrees F.; but for steels containing less than that amount of carbon, the upper limit of the range is not the same. As the amount of carbon present decreases, the upper limit of the transformation range increases. For example, in steel which contains only .10 per cent carbon the upper transformation range limit runs as high as 1,600 degrees F.

Now, we have learned that the larger the grain of a piece of steel is the weaker it is going to be, and we have also brought out the point that this growth in the size of the grains occurs at around a cherry red. Since nearly all the forging operations are conducted at a higher temperature than this it can be readily seen that the part will be materially weakened unless some corrective measures are used. Fortunately, however, we are able to produce nearly any grain size we wish, and since small grains are so closely associated with strength, it is highly important to do so.

By permitting the steel to cool below the critical temperature of 1250 degrees F. and then reheating it, we will be able to get a grain size corresponding in size to the temperature at which the heating is stopped. This is an important principle, because the closer we remain to the critical with the reheating, the smaller the grains will be. It is important to remember that the grain size corresponds to the maximum temperature reached. Thus by selecting the proper time to quench the piece, we are able to retain the particular structure which existed at that temperature. The grains are also broken up to a certain extent by mechanical means. The blows of the smiths hammer or any similar operation has the beneficial tendency of breaking up the grains or particles, but unfortunately the effect does not extend to any great depth, but on the contrary is more or less localized near the surface. It is apparent that thorough forging while producing some good results on light work, is of but little consequence on the heavier jobs.

In cooling or quenching a piece of steel, if it is carried to the extreme will produce brittleness. In that condition it is about as useless as though it were too soft, let us see what causes it. Extremely rapid cooling or quenching of the steel from above the critical temperature forcibly retains the structure corresponding to the higher temperature and thus requires the continuous exertion of molecular force, which makes itself perceptible to us as brittleness. We can imagine the internal state of that steel, if we think of a ring of children running around as fast as they can. Just as soon as the weakest one in the ring is forced to let go the whole ring flies apart, and all pull between them is released. Thus it is with a brittle piece of steel. Every particle is pulling with all its might against each of its neighbors, and then a sudden load, such as a sharp blow from a hammer, is applied the particles in that neighborhood give way and let loose of their companions, which immediately fly apart, thus equalizing all stress and incidentally completely disrupting the steel. This is what is known as internal stress in a piece of steel. It is caused by either too rapid cooling or sometimes by uneven heating, or heating which is applied so rapidly that the outside becomes hotter than the inner portions.

In order to relieve these internal stresses harmlessly, it is only necessary to reheat the steel to a moderate degree and let it cool slowly. This is called "tempering" or "annealing." The same purpose may be accomplished by slow cooling from the critical temperature, but in practice, while slow cooling is cheaper, reheating is more susceptible to accurate control and hence produces more uniform and high grade results.

In summing up the heat treatment principles there are a few facts that stand out prominently:

To change the structure of steel from a form corresponding to ordinary temperature to that of higher temperature, it is necessary to heat it to its "critical temperature" or higher. No temperature below this will produce a change.

Steel that has been heated above the critical temperature will retain a structure corresponding to that temperature, if chilled immediately.

Steel that has been heated above the critical temperature can be given any structure between that point and ordinary temperature by combining the proper amount of rapid chilling and slow cooling.

Steel that has been heated above the critical temperature and quenched can be released to a greater or lesser degree into its lower temperature forms by a certain and definite amount of moderate heating and slow cooling.

Unhardened steel contains its carbon in the form of cementite, which is iron carbide.

Heating above 1,250 degrees F., which is a medium cherry red, causes the grains to grow in size.

Large grains mean weak steel, that is, weakened tensionally.

After the steel has cooled, the size of the grains correspond to the size of those produced by the maximum heat.

It might be well before bringing our discourse to a close to mention just a few of the more common causes for failure when hardening steel. Perhaps one of the most common troubles is caused from uneven heating of the piece in forging, annealing or hardening. The result is that violent strains are set up, which either cause the piece to crack, or in the case of heavy pieces, to burst. The different parts of the piece being heated unevenly, must when cooling be

effected by a difference in contaction. Being rigid to a certain extent, they are unable to yield to one another. The effect of uneven heating is most pronounced in the case of pieces having delicate or intricate parts.

Another very common cause for trouble arises from heating the steel too hot for the necessary operation. High heats open the pores of the steel, making the grain extremely coarse and weak. Steel which has been overheated to the extent that it is burnt has been hopelessly ruined. There is just one way of restoring it, that is the blast furnace. The pores of the steel have been opened by the excessive heat, and have combined to a certain extent with the oxygen in the air. The result is oxidation. It may be possible in the case of small tools where only the edges, perhaps, have been effected, to grind off the injured portion; but where the whole piece has been effected there is just one place for it, namely, the scrap heap. Then too, high heats have a tendency to cause the steel to crack when it is hardened, this is particularly true in the cases of cylinderical objects.

Too rapid heating is another contributing cause or trouble, while the heating should be as rapid as is consistent with good practice, nevertheless it should not be applied so rapidly that there is danger of overheating the edges and corners before the body of the object has had an opportunity of heating properly. This will also cause violent strains to be set up, because there is a tendency of the inner portions to be cooler than those on the out side. On the other hand the heating should not be conducted too slowly, as allowing the piece to "soak" in the fire is liable to produce soft spots.

Here are just a few don'ts that may avoid lots of trouble.

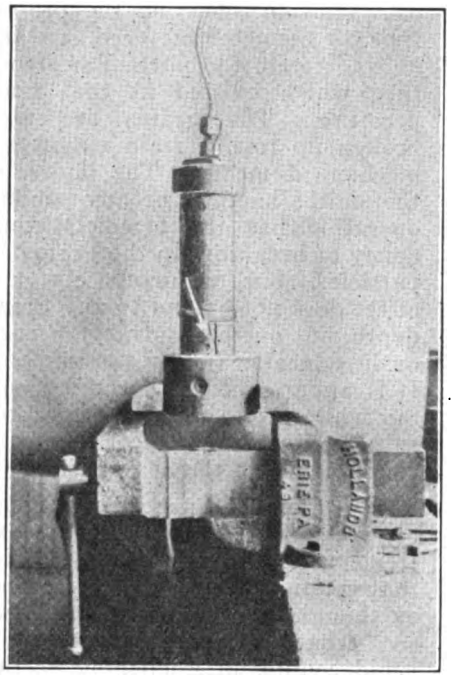
A piece of steel which is going to be hardened, should not be straightened without bringing it to a red heat.

Never attempt hardening a tool of irregular shape unless it has been annealed after having been blocked out to shape.

One should never take for granted that because a piece of steel has been heated and then plunged in water that it will be hard. Try it with a sharp file before preparing it for the final temper drawing. A lot of valuable time and annoyance can be saved in this way.

When hardening a piece of steel of unknown quality, it is a good practice to experiment with a small sample, observing at what temperature the best results are produced. It is as a rule cheaper to experiment with small pieces than to ruin an expensive tool.

Remember, that heating is the process of softening the steel; while cooling is the hardening process, and that the slower the process of cooling is carried on the softer the piece of steel will be. It is never advisable when annealing



THE OXY-ACETYLENE WELD ON THIS PIECE OF 3" PIPE HELD PERFECTLY UNDER A PRESSURE THAT SPLIT THE PIPE. THE SPLIT STOPPED AT THE WELD

a piece of steel, to place it in cold or damp lime or ashes.

Do not forget that ten pieces of steel are cracked as the result of uneven heating to every one that cracks as the result of a defect in the steel itself.

Simply because there is no scale on the harden piece of work, do not feel assured that the piece was not overheated. Every degree of heat above the temperature absolutely necessary to produce the desired results unfits the steel from doing the maximum amount of work which otherwise would have been possible.

The hardening should always be done on an ascending heat. The piece should never be heated a little too hot and allowed to cool to the proper heat. The grains of the steel always remain in the condition imparted by the maximum heat. It is necessary to refine the piece, allow the piece to cool and then reheat it to the proper temperature.

LENGTH OF SHAFT JOURNALS

There is a great difference in opinion among men and as great a variation in practice, concerning the length of journal-bearings for shafts. The diameter and speed of the shaft, besides the kind of bearing metal and the weight, govern the length of the journals of shafts. The softer the bearing metal, the longer the journal should be in order to distribute the pressure over a greater area of metal. For example, white-metal bearings should be longer than bronze bearings.

The ordinary method of proportioning the length of journals is to make the length proportional to the diameter, and to make the ratio of length to diameter increase with the speed. The following table is a good one for ascertaining the lengths of journals according to the diameter of the shaft. D equals the diameter of the journals.

Kind of load	Bronze and gun-metal	Brass	Anti-Friction-white metal	Cast iron
Ordinary loads.	Dx1.5	Dx2	Dx3	Dx4.5
Light loads ..	Dx1.25	Dx1.5	Dx2.5	Dx4.25
Very light loads	Dx1	Dx1.25	Dx2	Dx4.
Heavy loads ..	Dx1.75		Dx8.5	
Very heavy loads	Dx2		Dx4	

For shafts of fans, blowers, and emery wheels, the length of the journals should be 5 1/5 to 7 times the diameter.

Many perfectly good, willing, faithful and naturally industrious employes are spoiled by poor employers who do not take the pains or interest to organize their own work, and to make it and the people about them efficient.

It took a second to put his finger into the machine, and an hour to get it out (what was left of it), says the National Safety Council.

Be true to the very best that there is in you and you will profit in friends, in character, in progress, and in money.

Be friendly. All the world appreciates a friend—the man or woman who does not is an ingrate and is to be pitied from the depths of an honest man's heart. There is not a normal individual under the blue canopy but does not appreciate true friendliness.

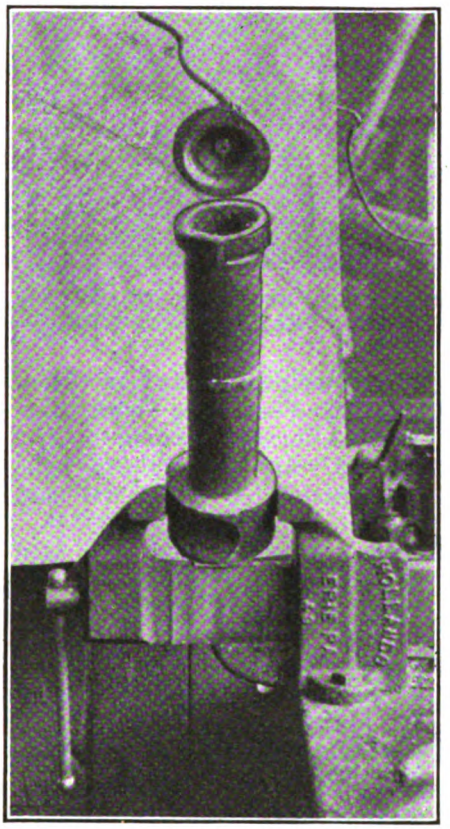
Strength of Oxy-Acetylene Welds Shown by Tests

THE big gas show at Buffalo brought together men in all branches of the industry from every part of the country. In the course of informal discussion on oxy-acetylene welding of oil pipe lines a big Kansan questioned the strength of the welded line to hold up under the service pressures in his field. Of course there are abundant instances where welded lines are in service in oil districts, carrying pressures of 800 to 900 pounds; but the skeptic was not entirely satisfied. What he wanted was a breaking pressure test to determine just where the welded pipe would give way under breaking strains. In his opinion the break would occur in the weld.

The discussion was staged, as it happened, in a stronhold of oxy-acetylene welding. One of the factories and machine shops of the Linde Air Products Company is located in Buffalo, and it is in their big Buffalo laboratory that the development department engineers of the company conduct their experiments and tests in working out application problems for users of oxygen and acetylene in welding and cutting. This circumstance led to a series of tests to finally settle the matter in the minds of those concerned.

The engineers first welded together two short sections of standard 3″ iron pipe, threaded the ends and screwed on two standard cast iron caps. When the cold water pressure test was applied to the breaking point, it was found that the top of one of the caps had blown out, leaving the pipe and the weld intact. The undamaged cap and the remaining portion of the broken cap were then removed and two extra heavy iron caps were screwed on. At a pressure of 6,200 pounds (sq. in.) one of these caps let go, still without injury to the weld or the pipe. Again the uninjured cap and remnant of the broken one were taken off and extra heavy steel caps screwed on. This time the caps held, but the pipe split and ripped under the added pressure upon passing its elastic limit, tearing up to and being effectually stopped by the weld, which refused to give. The pipe was distinctly bowed out at the rupture.

The next test was made with 4″ pipe. Two lengths were welded together as in the 3″ pipe, the ends threaded and two extra heavy standard caps screwed on. In this test one of the cap heads blew out at 4,400 pounds, which gave a total end pressure on the cap of approxi-



AN EXTRA HEAVY CAST IRON CAP WAS BLOWN OFF OF THIS PIECE OF 3″ PIPE AT A PRESSURE OF 6,200 LBS. THE WELD HELD SECURELY THRU THE TEST

mately 33 tons, proving that the broken cap was not in any respect defective. The weld was not impaired at all. After this test it was suggested that an entirely new weld with other pipe lengths of the same diameter be tried. Accordingly, two more lengths of 4″ pipe were welded, threaded and sealed, this time with extra heavy steel caps made to withstand a working pressure of 3,000 pounds of air. The pressure was applied and the pipe gave way in the threads at 4,200 pounds. In all of the tests the welds held securely.

The gentleman from Kansas decided that if there is anything stronger than a good oxy-acetylene weld it is not needed in the oil fields of the Southwest. He examined a large number of welded pipe specimens that had been subjected to hydrostatic breaking tests, finding that in no instance had the pipe given way at a weld. He also inspected the shop welding and testing equipment with unusual interest, from the familiar Oxweld blowpipes to the big pumps that supply pressure for tests up to 10,000 pounds per square inch.

Oxy-acetylene welding of oil pipe lines, gas and water mains and laterals is increasing daily in all parts of the country, and it is more and more being specified in preference to riveted and threaded construction.

GLOSSARY OF WELDING TERMS.

Acetone—A liquid that is used in an acetylene cylinder to hold the gas in solution, minimizing the danger of an explosion on account of compressing the gas.

Acetylene—Flammable gas used in oxy-acetylene welding and cutting.

Adaptor—A brass fitting or connection used in connecting the regulator to the acetylene cylinder.

Alignment—To be straight or in line, or the placing of parts in a position of proper relation, one to the other.

Alloy—A metal which is made by mixing several different metals.

Annealing—Reheating with a view to relieving internal stress or reducing the hardness.

Asbestos—A fibrous material not effected by fire; used to confine heat while welding.

Babbitted—Lined with babbitt.

Bearing—The support of a revolving shaft or pin.

Bevel—To cut at an angle.

Blowhole—Cavity, hole or depression in metal.

Blowpipe—The device used for burning oxy-acetylene gases during the process of welding.

Brazing—To join parts, or seal holes or cracks with brass.

Burning Bar—The welding rod used in lead burning.

Butt Joint—The type of joint formed by butting the two edges together and welding in that position.

Carbonization—Combining with carbon, thereby making the steel harder.

Contraction—A shrinking or decrease in size as the result of cooling.

Countersunk Rivet—A rivet with the head depressed in the plate so that the head is flush with the surface.

Cutting Jet—The central jet of oxygen coming from the cutting torch .

Lap Joint—Joint formed by lapping the ends of two pieces of metal, one over the other. .

Lead Burning—Welding or joining lead.

Monel Metal—An alloy of copper and nickel.

Nozzle—A tip for a cutting blowpipe.

Overhead Welding—Welding with the blowpipe operated overhead.

Oxidation—Combining with oxygen. A form of burning.

Oxide—A scale formed through the combination of the metal and oxygen.

Oxygen—A non-flammable gas used in oxy-acetylene welding and cutting. It is a supporter of combustion.

Paddle—A piece of steel flattened at one end. It is used when welding aluminum.

Preheating—Heating before actually welding. .

Scale—Coating of oxide that frequently forms on melted metal. It flakes off when cold.

Slag—Melted scale or refuse caused either from cutting or overheating.

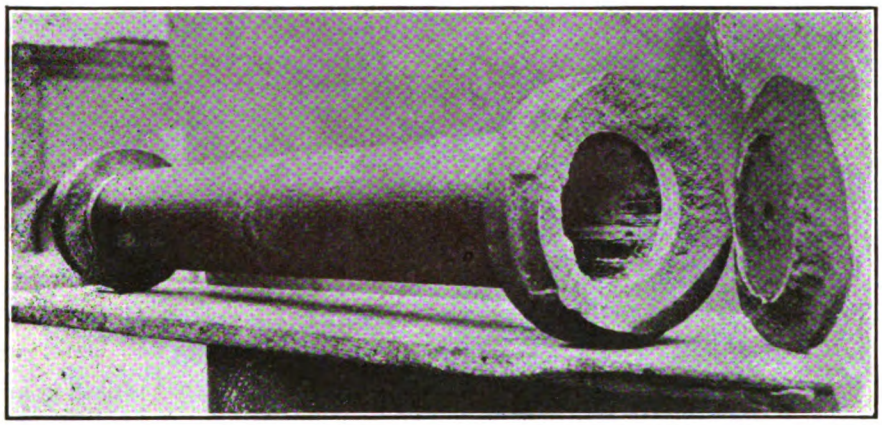
Tip—Copper or brass nozzle for welding blowpipe.

V—An angle or groove between two beveled edges prepared for welding.

V Block—A block of either iron or steel cut in the shape of a V or X. It is used in holding various objects during welding.

Vertical Welding—Welding which is applied in an upright position.

Weld Rod—Rod used for supplying the metal to the weld.



AN OXY-ACETYLENE WELDED PIPE. THE EXTRA HEAVY STANDARD CAP GAVE AWAY AT 4,400 LBS., WHILE THE WELD WAS NOT EFFECTED

Cylinder—Tank containing compressed gases.

Cylinder Cap—The metal cover protecting the cylinder valve.

Ductility—The property of a metal which permits it to be drawn or bent in various shapes without a tendency to break or snap.

Expansion—An increase in size as the result of heating.

Fillet Weld—A weld made in a corner formed by two surfaces meeting at an angle.

Filling Material—Rod or wire for supplying metal to the weld.

Flammable—Easily ignited. Formerly the word inflammable was used, but since its prefix "in" appeared to imply "against" the word was understood by many as meaning incapable of being lighted. Being confusing, some of the safety authorities have advocated using "flammable" for material which can be easily lighted and "non-flammable" for those which resist fire.

Flux—Powder used for cleaning molten metal during the process of welding.

Gauge—An instrument used for measuring the pressure of the gases.

Grain—The arrangement of the crystals which form the metal.

Header—Pipe or cylinder which permits of more than one outlet.

Horizontal Welding—Welding in a horizontal or level position.

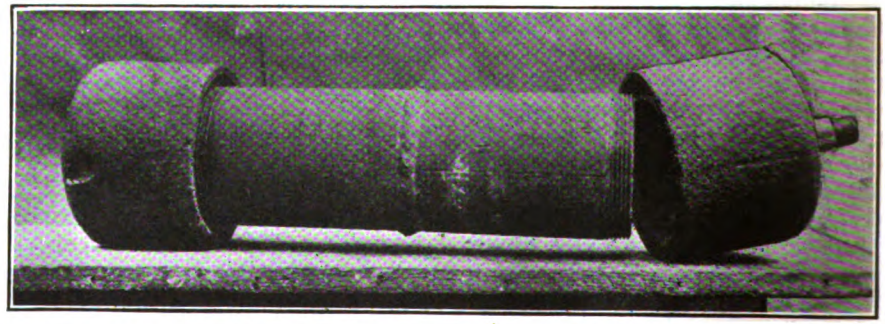
Reaction—A change resulting from a chemical or mechanical action.

Regulator—A device for reducing the pressure of the gases coming from the cylinders.

Reinforcement—An addition of metal to strengthen some particular section.

Asbestos paper that has been used for protecting preheated castings and welded parts is a most excellent packing for annealing steel dies. It crumbles readily and forms a superior fireproof heat insulator, which cleans off easily and which may be used indefinitely.

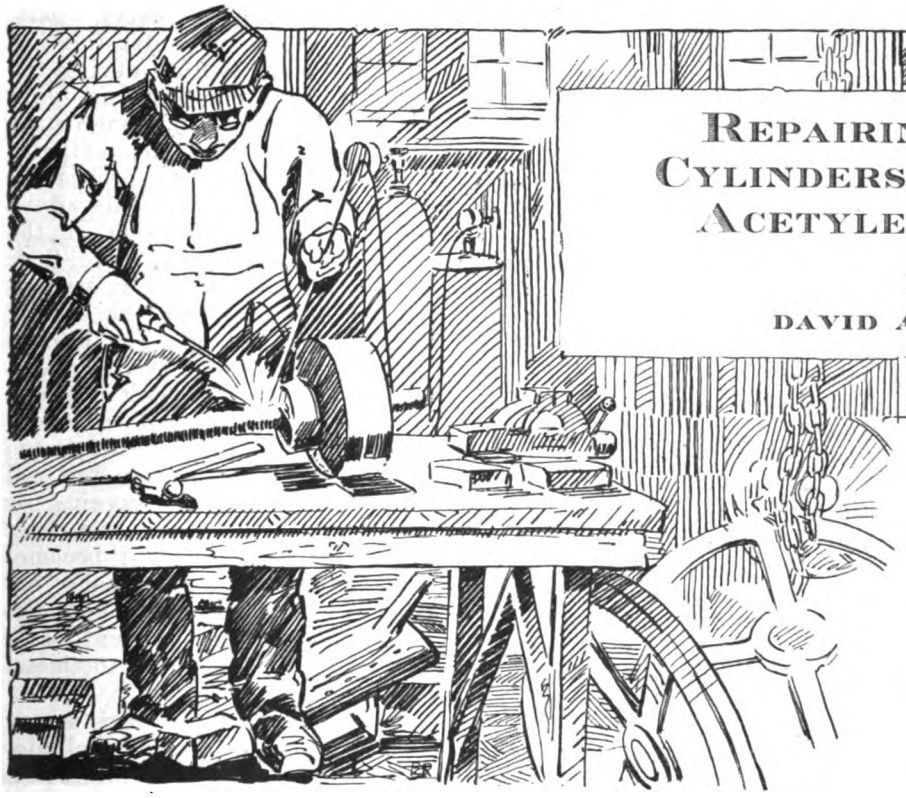
The welder should learn to weld quickly, using the largest tip consistent with the job. It is much the same as using a hammer. If a machinist has small work to do he chooses a light hammer for any hammering required, but if the job is heavy, and he knows his business, he will use a heavy hammer. Less distortion will be produced in welding with as large a tip as the job will stand than would result if a small tip were employed. Less gas and less time also will be required, and the job will be sounder throughout.



A PIECE OF 4" PIPE WELDED WITH THE OXY-ACETYLENE FLAME. PIPE GAVE AWAY IN THE TREADS AT A PRESSURE OF 4,200 POUNDS. THE WELD HELD PERFECTLY

IOWA LEADS IN MOTOR VEHICLES

Iowa still leads the United States in the number of motor cars owned there in proportion to the population. About one machine to every seven persons is the ration there.



Repairing Scored Cylinders With Oxy-Acetylene Flame.

BY

DAVID A. BAXTER

THE welding of scored engine cylinders is at best a distasteful difficult job, but when the cylinder is one with a long small bore the troubles are increased many fold. So many things influence the success or failure of the work that it is a rather uncertain undertaking, unless the welder has had some experience in handling the welding torch. He will find it more than a mere matter of filling a groove with melted metal, not to mention the lack of working room.

However, the blacksmith who operates an oxy-acetylene welding apparatus in connection with his smithing business, and, who makes any pretense at all of doing general repair work should have some knowledge of repairing scored cylinders; at least in so far as the process has been developed. He should have a fair understanding of the fundamentals of the methods now being employed, and a working theory of the oxy-acetylene method in particular. Then with some practice on discarded cylinders, he will soon be able to do most of the custom work.

I shall say but little here concerning the other methods, of which there are two worthy of note, since one is a patented process and the other a sort of semi-brazing process that is more or less a make shift. In fact neither one is to be compared with the oxy-acetylene method when it is properly executed. By the welding method the filler metal becomes a part of the cylinder bore while with either of the other methods the filler is merely adhered to the surface of the score. Which means that there must be a chance of it working loose.

The patented process is termed silver soldering and consists of cleaning the score thoroughly and tinning it with the assistance of a mixture of acids; then melting the score full of the patented solder, which is afterward scraped smooth with a special tool, and polished smooth with grinding compound. It is a rather complicated process, which may not be successful in the end unless everything is just right because there seems to be some danger of melting out the solder if the engine is ever allowed to run too hot, a thing which cannot happen to a welded score, because the weld becomes part of the cylinder and is of the same metal.

The brazing process consists of filling the groove with Tobin bronze in the usual manner of brazing. The groove is thoroughly cleaned and prepared then the bronze is melted into it with the welding flame. Since it is difficult to make bronze adhere to cast iron, it is liable to work loose through the heat and vibration of the engine. However, this process may be handy sometime as a makeshift hurry-up repair. Although, as I say, it is not recommended to replace the oxy-acetylene method.

Probably the worst drawback to the welding method is the lack of room in the cylinder bore in which to manipulate the welding torch and filler rod. These close quarters also work another evil. The heated air in the cylinder makes it difficult to keep some make torches burning. The first difficulty is overcome to some extent by the employment of special welding tips, or straight head welding torches. But even these are unwieldy in small bore cylinders. It is difficult to prevent overmelting the metal of the bore and at the same time to get it fluid enough to fuse with the filler metal. To accomplish this it is necessary to hold the torch so the flame will strike the score at an angle, for if it is directed straight into the groove it will result in breaking down the adjoining sections and causing a slight collapse along one or both sides of the weld. Thus causing hollow spots in the bore when the cylinder is re-ground.

In larger cylinders, the operator has more opportunity to manipulate the flame correctly, about the same as he would in an open weld; he can move it forward or back, up and down or sidewise, at almost any angle. But in the back end of a small bore cylinder, if he needs to draw the flame back quickly, he is liable to strike the wall of the casting and lose control of the torch, with the result that he gets rattled and damages the weld. This lack of welding room is annoying, but it is no impossible obstacle, if the welder is patient and deft. He must handle the torch accurately but rapidly. The metal must be melted in skillfully with out loitering over any one spot. The welder must work steadily onward without being forced to go back over any part of the weld. Even the application of the flux in the usual

way is a risky proposition. In fact it might be said that most of the things done in the conventional welding process will not work out satisfactorily in welding scored cylinders.

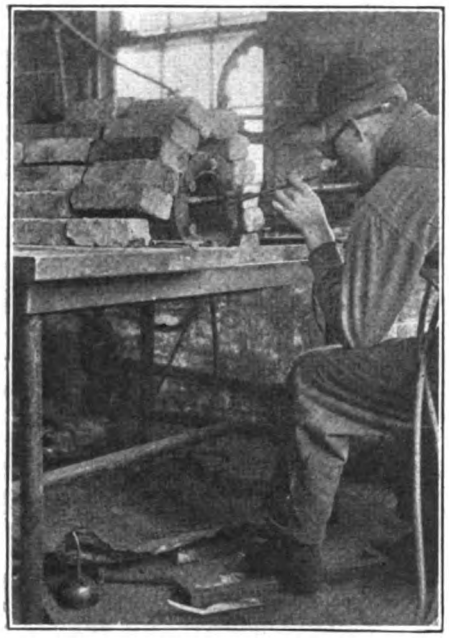


Fig. 1. FILLING THE SCORE. THE CYLINDER IS PLACED IN A CRUDE PREHEATING OVEN CONSTRUCTED OF BRICKS TO RETAIN THE HEAT

Take for instance the filler rod, it is difficult to handle a common straight rod in the customary way since it either is in the way of the torch or back where it cannot be properly fused. Then, too, a straight rod must be held at an angle almost parallel to the groove. This angle covers most of the score and tends to induce poor fusion.

A short tipped torch must be used to follow the filler; or a torch without any angle in the head must be used ahead of the filler. In either case the welding is started at the back and worked toward the open end of the cylinder.

It is easier to construct a special filler rod by welding a short piece of filler rod at right angles to the end of a long rod. This forms a rod that can be worked side by side with the flame without obscuring any part of the weld; at the same time permitting quite a range of shifting. It is conveniently employed with a right angle tip or with a straight head torch; or it may be used with a wide angle torch.

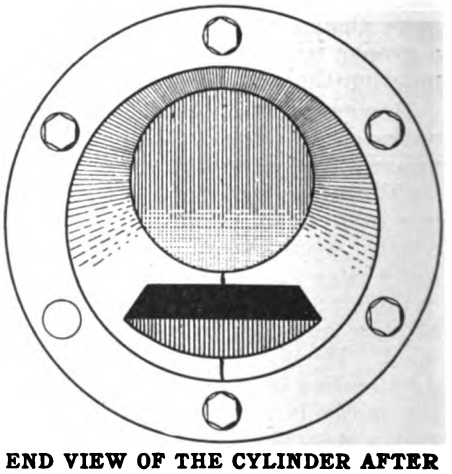
If a straight rod is employed, it should be smaller than is used on open work of the same proportion. It is desirable to confine the line of welding to as narrow a margin as possible, which is best accomplished with a small rod since a large one furnishes more filler then can be assimilated by a narrow groove. If a special rod is made the short or filling part should be small for the same reasons applying to the straight rod. Both of which should be a soft grade of gray cast iron.

Whether the operator decides to weld with a straight torch or a short tip angle torch, or whether he prefers a wide angle torch, he must be very particular about regulating the welding flame. Probably more so than in any other class of welding. He should regulate the flame strictly neutral at the start and then endeavor to maintain this condition throughout the entire operation. At the least sign of fluctuation, he should test the condition of the flame to make sure that neither element of it is exceeding the other. Both the oxygen and the acetylene should be equal. When welding where the heat is closely confined like it is in the interior of a preheated auto cylinder, the flame elements are liable to be adversely affected. This action is often so gradual that it is unnoticed by the operator, until after the damage has been done, unless he is watching this condition particularly close.

Like the filler rod, the flame should be comparatively small, as a narrow weld cannot be executed with a large flame. Not only is the power of a large flame too great to readily control the melted metal, but the area of the melting and the amount of new metal is too large to confine within such narrow limits as a score. It not only makes more work in regrinding the cylinder but it increases the danger of warping the bore. The size of the welding flame is governed to a large extent by the size of the cylinder to be welded. This is also true of the filler rod. That is, these things should be selected according to the size of the cylinder. But then as the diameter of the bore increases the welding problems decrease, so that it is not so essential to impress these things upon the welder.

The matter of preheating is another item that should receive more attention that is usually given most welding jobs. Especially is this true where the cylinders are cast en bloc. The complex construction of the casting with its adjoining thick and thin sections of metal, its angles, corners and curves makes it quite a problem to heat regardless of its size. These castings should be heated slowly and evenly throughout every part. There should be no contrasting hot and cold parts, neither during the welding nor previous to applying to torch flame. Even though it be necessary to turn the cylinder several times in the preheating fire. In fact, it is probably advisable to preheat the side of the cylinder opposite the score first. That is, to have this side nearest the fire first and turn the casting just before welding. The heat is then more apt to be evenly distributed. A careful watch is sometimes needed to prevent some portion of the job from getting too hot. After it passes the dull red stage the danger of sagging or warping increases; as the heat nears the white stage it becomes critical. In fact, it is probably too late to prevent warping and certainly too late to prevent some damage to the quality of the metal in that particular spot.

No doubt the most satisfactory way to preheat the scored cylinder is with natural gas as a fuel. It is more nearly under control at all times than wood, charcoal or coke fires, and is rivaled only by oil burners. The gas flame may be utilized to heat the whole casting, or to heat only a part of it. It may be concentrated in one spot, or spread out over the whole job. It is readily confined and needs no attention other than the turning of a valve.

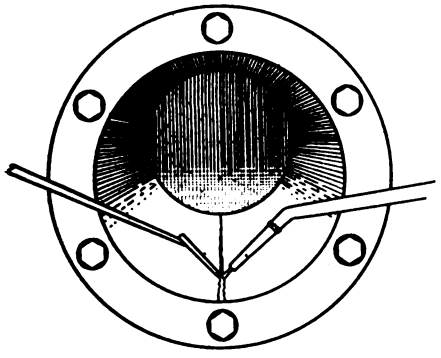


END VIEW OF THE CYLINDER AFTER THE WELDING WAS COMPLETED. THE BABITT BLOCK USED TO SMOOTH THE WELD IS SHOWN IN POSITION

like the one shown in the pictures. The casting is placed over the gas burners in such way that the flames will rise on both sides of it, entirely surrounding the cylinder in a circle of heat. Then the gas is lighted and allowed to burn slowly at first and for several minutes

in an ordinary single cylinder job to permit the expansion to start evenly. As the heat spreads through the cylinder, the gas pressure is increased until the entire casting is heated.

The preheating is confined and thereby hastened by enclosing the casting in some sort of oven-like device. It may be pieces of sheet iron and asbestos paper; or the job may be walled in with loosely laid fire brick. The latter is probably the best since the bricks absorb the heat and hold it around the cylinder. The enclosure also protects the casting from sudden cold draughts of air; also forces it to cool slowly and evenly after the welding is finished. These are very important factors in welding scored

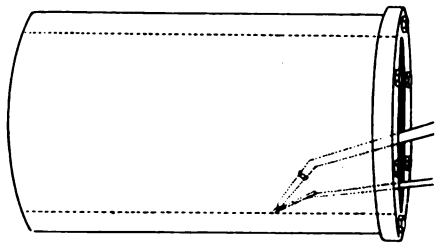


ENDVIEW, SHOWING HOW THE FILLER METAL WAS APPLIED

cylinders; the casting must be heated slowly and evenly; then it must be allowed to cool just as evenly and slowly. If such is not the case, the casting is liable to crack in its weakest part due to the stress of unequal expansion or the pull of unequal contraction.

The job is allowed to heat until the whole of it is red hot before applying the welding flame. The greatest contraction will naturally be inside the bore in the neighborhood of the weld, so that the whole outside should be expanded in order that it may follow the contraction of the weld inward as the job cools; this is the reason in brief for preheating the whole cylinder. A covering of asbestos paper placed over the brick enclosure will further insure that the casting does not start to contract before the operator is ready. This covering should hang down over the open end of the furnace until the job is ready to weld.

Before preheating the cylinder, it is essential that the bore particularly the scored portion, should be clean and entirely free from rust, carbon or grease. The cleaning is done with gasoline, and afterwards polished with emery cloth along the score. Unlike most jobs, it is usually unnecessary to groove the line of welding, since the score forms suffi-



SIDE VIEW, SHOWING THE POSITION OF THE TORCH AND FILLER

cient groove, unless the cylinder is large and the score narrow, in which case the groove may be widened with a square file. Afterwards brushing the dust out of the groove.

When the job is red hot, the end curtain of asbestos is removed to permit as much light to enter the bore as possible. Then the torch is lighted and regulated. Together with the filler rod, it is inserted into the bore. The rod is held in readiness while the flame swings in short arcs over the inner end of the score. When this spot starts to melt the end of the filler rod is brought in contact with the outer flame close to the white cone where it can start heating in order to be ready for the melting weld. When the spot is melted, the red hot end of the filler rod is immersed in it and a small portion deposited in the melting groove, over which the flame is played to melt it smoothly. At the same time, the flame is gradually worked toward another portion of the groove where the filling process is repeated. Then bit by bit the entire groove is filled and melted level. The flame and rod working side by side, alternately changing. Only enough filler is deposited to furnish a slight surplus above the level of the bore, to prevent low spots when re-boring the cylinder.

During the melting and filling the welder is careful not to play the flame over the weld longer than is necessary to complete the fusion. That is, he endeavors to get the melted metals only hot and fluid enough to flow together, or for the filler to soak into and mix with the cylinder metal. By starting at the inside end of the score he brings up the heat of the outer end last, which may have been lost during the welding. This also helps him to keep the unmelted parts of the groove in sight at all times so he may know just how it is acting; he may know whether or not it is responding properly. By bringing up the heat of the outer end of the cylinder last the expansion is kept up for the final covering to let the casting cool.

After the weld is finished, the entire arrangement is covered with extra sheets of asbestos and allowed to remain intact until the casting is cold. No air is allowed to reach the casting after the gas is shut off so it is forced to cool slowly. And as a result to contract slowly. The heat is evened up during the cooling process by being conducted from one part to the other as the temperature of each part subsides. As fast as one part cools the heat of a heavier part is conducted to it to balance the heat. The radiation of the whole mass is necessarily slow; the space inside the furnace maintains a regular temperature due to the radiated heat of the casting being unable to escape freely. In this way the casting is caused to contract or shrink within itself gradually and evenly. The contracting casting follows the shrinkage of the weld inward so

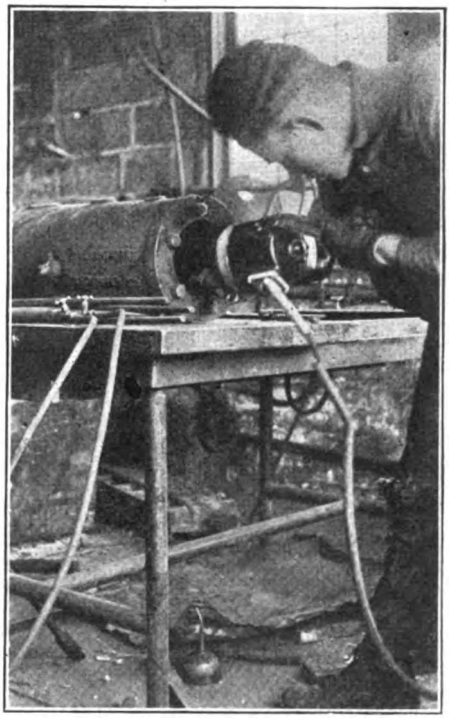


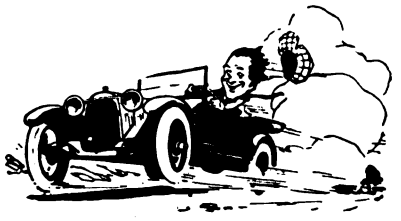
Fig. 2. REMOVING THE SURPLUS FILLER WITH AN ELECTRIC GRINDER

there is no danger of cracks in the weld. The heated interior of the cylinder naturally retards the contraction of the weld, so it cannot shrink and pull away from the adjoining metal of the bore.

When the cylinder is cold enough

(Continued on page 310)

High Spots



Questions and Answers

"My car used to make 18 miles to the gallon—but now it makes only 8. What's the cause?"

Answer—You probably drive it more.

"What makes the tubes stick to casings?"

Answer—Glue.

"How can I double the mileage on casings?"

Answer—Don't use them.

"How can I get more speed out of my motor?"

Answer—Try a little "high-life" on numbers 1 and 4 cylinders.

"What is a vacuum oiler?"

Answer—An empty oil can.

"—locate a loose pushrod—"

Answer—Take an X-ray picture of motor.

It sure looks as if the camel is destined to become Canada's national bird.

Talking over the 'phone has put many a man into the hands of the receiver.

Cheer up—A few kicks don't mean you're the football of fate.

ANOTHER WAR SECRET REVEALED

Red Cross Canteener: "And while you were in Ireland did you kiss the Blarney Stone?"

The Returned Hero: "No, but I kissed several who had."—(Keeping in Touch.)

TO THE POINT

"Fixing your car?" asked the passer-by as a grimy man crawled out from under an automobile. "No," responded the grimy one with a withering look, "Merely dabbling in oil."

MORNING EXERCISES

The tired business man should take morning exercises to get care and trouble out of the system, says the Boston News Bureau.

1. Rise 7:00 a. m.

2. Stand in middle of room. Raise arms slowly overhead, take deep breath and say "Damn the Government," lowering arms in attitude of despair. Ten times.

3. Extend body, face downward, on floor. Cover eyes with hands. Kick heels, think of the railroads, and weep. Till dry.

4. Kneel. Wring hands. Meditate upon the labor situation and groan. 160 times.

5. Assume sitting position. Hands on hips. Sway gently to and fro and concentrate upon Mr. Burleson until a generous frothing at the mouth sets in. Till exhausted.

6. Collapse on floor. Grovel vigorously. Think of the income tax and gnash teeth as in anger. Ad. lib.

7. Note: Observe this simple regime every morning before breakfast and you will reach the office with most of the cares and troubles of the day already out of your system.

THAT TIRED FEELING

"Oh, Mr. Flipperley," she exclaimed, soulfully, "have you ever felt a dim, uneasy sense of oppression as if the mere weight of life were a burden too heavy to be borne by the chained spirit panting with psychic longing to be freed?"

"Why, yes," he responded, "but I thought it was the dandelion wine I made."

HE GOT THE JOB

A business man advertised for a boy the other night.

When he arrived at the office the next morning there were some fifty boys already in line.

He opened his desk and was just about to begin examining the applicants when his stenographer handed him a card on which was scribbled:

"Don't do anything until you see me. I'm the last kid in line—but I'm telling you—I'm there with the goods."

FRIEND HUSBAND

Several club ladies were discussing the virtues of their husbands.

"Mr. Bingleton," said one referring to her life partner, "never drinks and never swears—indeed he has no bad habits."

"Does he never smoke?" some one asked.

"Yes, he likes a good cigar just after he has eaten a good meal, but I suppose on an average, he doesn't smoke more than once a month."

Some of the ladies laughed—Mr. B. wonders why.

A DARN GOOD REASON

Crewe—"Good heavens, how it rains. I feel awfully anxious about my wife. She's gone out without an umbrella."

Drew—"Oh, she'll be all right. She'll take shelter in some shop."

Crewe—"Exactly. That's what makes me so anxious."

OLD STUFF

"Ma," roared the so-called head of the house. "Where in the demnition bowwows is my hat? It's a shame the way things disappear around this house. I would just like to know where that hat is."

"So would I," replied friend wife very frigidly. "You didn't have it on when you came home last night."

BEFORE THE WAR

Teetotaler—"Stay, my friend! Do you think that glass of vile filth will quench your thirst?"

The Festive Stranger (fervently).—"Good 'eavens, mate! I jolly well 'ope not!"

THE HUSBAND'S OFFENSE

A divorce case was in session and a former maid of the family had been called as witness.

"You will admit you overheard a great many quarrels between the defendant and his wife?" asked the Judge.

"Yis, sor, I do."

"Tell the Court, if you can," said the Judge, "what he seemed to be doing during these quarrels."

"Shure sor, said the maid, "he seemed to be doin' th' listening."

TOUGH LUCK

First Politician—"I don't think much of this suffragette business."

Second Politician—"Neither do I; it is liable to get so that a man will have to buy his wife's vote."

Friend—"Now, why are you crying?"

Bride—" My husband is so evasive. Every time I ask him how he likes my biscuits he tells me I have beautiful eyes."

Please hurry," said the wife impatiently to her husband. "Have you never buttoned a dress behind before?

"No," replied her husband also impatiently, "you never had a dress that buttoned before behind."

A negro was trying to saddle a fractious mule, when a bystander asked: "Does that mule ever kick you, Sam?"

"No, suh, but he sometimes kicks where I'se jes' been."—The American Legion Weekly.

BY THE SIDE OF THE ROAD

Let me live in a house by the side of the road
Where the automobiles race by—
Where there's fuzz in my throat and fear in my face
And a peck of dirt in my eye.
I would not sit in the Amen seat
And talk of the things I've seen,
I'd live right there by the broad roadside
And peddle my gasoline.

I'd see from my house by the side of the road
The automobiles come up
The long, long hill from the old red bridge
Where the valley lies like a cup.
I think it a part of the infinite plan
For them to oil their machine
In my new garage with the hot air tanks
Where I peddle my gasoline.

Let me live in a house by the side of the road
Where the trust magnate and his wife
Will pick their teeth with my chicken bones
And cackle to beat their life,
Where the chauffeur slick in his dust-proof coat
Shall pick him an inner tube
From the bunch I hang in my hayloft high
To show I'm a plain old Rube.

George F. Paul.

'WAY DOWN IN ARKANSAW

Jerry had a still. In three short days, or quicker,
He made a gallon bucketful of fightin' white mule liquor.
He gave his friends a drink apiece, the shuckless, lame and lazy,
And drove the whole confounded bunch stark and raving crazy.
They rolled in mud, they howled aloud, they fought with zeal and unction.
Indeed old-timers said it was a record-breaking function.
Oh, why will gents drink such vile stuff that eats holes in their stomachs,
And later leaves them laid away beneath lone, green-grown hummocks.

—Tennyson J. Daft.

GOOD BYE GASOLINE!

Rome—Dr. Pasticci, a noted chemist announces that he has discovered a method of cheeply producing liquid hydrogen. He says it may be used in driving automobiles, one gallon being sufficient for 250 miles and may also be utilized in railway locomotives and in the engines of ocean steamers.

Benton's Recipes

Restoring Damaged Brushes to Their Original Condition—Paint brushes which, through carelessness or unintentional neglect, have been allowed to get soggy or become hardened and unfit for use can be usually softened up by soaking them in hot turpentine, or in raw linseed oil brought very closely to the boiling point. Soaking the hardened brush for a few days in turpentine or benzine, or gasoline will often restore it to its original condition.

In the case of brushes allowed to become practically stone hard, restoration to a workable condition may be effected by soaking the brush for some time in the oil of pine or coal tar. This oil should be kept in an air-tight container on account of its evaporating nature.

Generally speaking, when coal tar oil, or hot turpentine, or raw linseed oil fail to soften up a hardened brush further remedies are useless. Varnish brushes may be softened up by the hot turpentine or linseed oil method, or by immersion in turpentine or benzine, but such brushes are very rarely fit, after softening up in these mediums for varnishing, except possibly on the inside of vehicle bodies.

The present day liquid varnish removers are very effective mediums in which to soften up a brush allowed to become hard. As a rule, paint brushes, upon softening up from a hardened condition, should be worked in oil paint as a means of more fully restoring their original elasticity.

To True Up Oilstones—Sprinkle coarse grain emery or carborundum, over a planed cast-iron surface, then rub the stone over this by hand. This will true up the face of any kind of an oilstone sooner than any other method.

Glues Which Resist Moisture—A glue cement that resists moisture is made by mixing with the least possible quantity of water 1 part glue, 1 part rosin and ¼ part red ochre.

Another glue which resists moisture is made of one pint glue melted in two quarts skimmed milk. Add powdered chalk to make it stronger.

A marine glue is made of one part of india rubber, 12 parts naphtha. Heat gently, mix and add 20 parts of powered shellac. Pour out on a slab to cool. When used it has to be heated to about 260 degrees F.

To Prevent Tools Rusting—A lump of unslacked lime, placed in a box with bright tools, will prevent rust, as it absorbs moisture. The lime should be renewed occasionally.

To polish Wood Handles—Rub with a piece of waste dipped first in linseed oil, then in shellac. After rubbing, allow it to stand, then rub again, dipping alternately into the oil and the shellac. This gives a very high polish, which will not scratch nor flake off.

Waterproof Cements—To make a good waterproof cement in a thin paste form, dissolve 1 ounce powdered resin in 10 ounces strong ammonia and add 5 parts gelatine and 1 part solution of acid chromate of lime. For waterproof cement in paste form, add to hot starch paste one-half its weight of turpentine and a small piece of alum.

A Fire-and-Water Proof Cement for Mending Stove Fire-Brick—Here is a cement which will repair fire-brick in stoves and furnaces, and which can be used even where there is an intense heat. Take 3 parts of fire clay and 1 part iron filings and mix with strong vinegar until a putty-like mass is formed. If the cement is used to fill up very small cracks and crevices, it should be thinner. If iron filings cannot be secured, fine iron borings will be just as good. If it is desired to use the cement in a furnace for melting metals, the following mixture will give better results: 1 part iron borings, 2 parts fire clay, and 1 part fire sand. Mix with vinegar in the manner described.

Alloy for Filling Holes in Cast Iron—Melt together, 9 parts of lead, 2 parts of antimony, and 1 part of bismuth, and pour this mixture into the hole, first somewhat warming the hole. This alloy possesses the quality of expanding when cooling, hence becomes solid in the holes when cold.

Coating Iron or Steel—Iron or steel may be given a permanent coating of yellow brass by using a flux of boracic acid and then dipping into a pot of melted spelter, afterwards wiping off the article while still-hot. The electro-plating process, however, is the best for this purpose. A coating of copper should then be first deposited on the steel, the same as if it were to be nickel-plated, and then follow with an electro-plating of yellow brass.

Cement for Fastening Tools in Their Handles—Mix one part beeswax, one part fine brick dust and four parts black rosin.

Annealing Steel—Cover the steel with fire clay and heat to a red heat. Then allow the steel to cool over night in a furnace or forge. This method will prove satisfactory when other means fail.

To Solder Aluminum—The great disadvantage of aluminium to the sheet metal worker is the difficulty encountered in soldering. This is caused by the formation of an oxide on the surface of the heated metal, the oxide preventing the solder from alloying with the aluminium. This difficulty can be surmounted by employing the following method:

Make a solder of 80 per cent tin and 20 per cent zinc, and use stearic acid as a flux. Tin the surface with the above, moving the copper bit backwards and forwards over the metal and flowing the solder. The film of oxide can then be cleaned off, and the coated surface can be easily soldered with the above named solder or ordinary tinsmiths' solder.

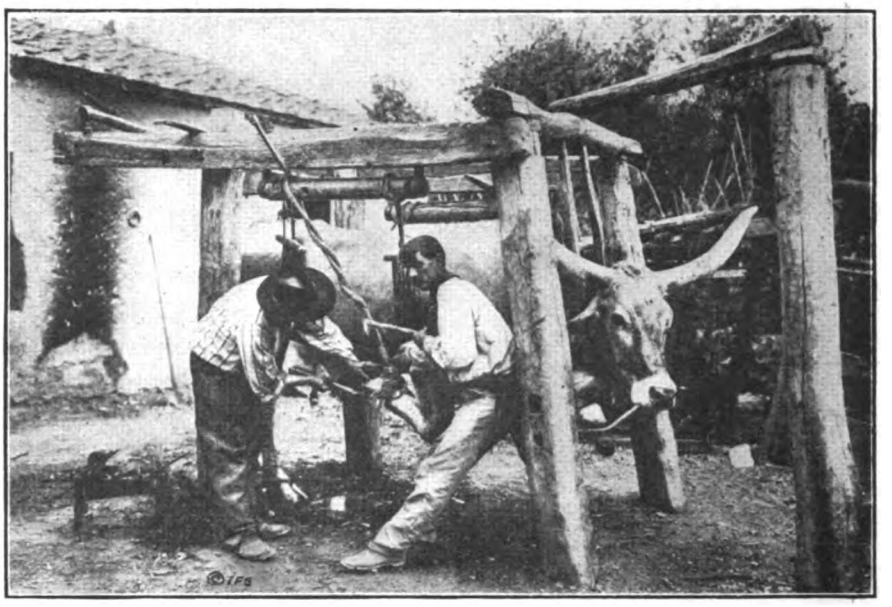
Non-Rust Soldering Solution—A good anti-rust solution for soldering metals where acids must not be used, is made by dissolving rosin in acetone, making a solution about as thick as molasses; it is applied in the usual manner.

Rust Joint Composition—A rust joint composition or cement may be made of sal ammoniac one pound, sulphur one-half pound and cast iron turnings 100 pounds. The whole should be thoroughly mixed and moistened with a little water. If it is desired to have the joint set very quickly, add one-quarer of a pound more sal ammoniac. Care should be taken not to use too much of the last named material, or the mixture will deteriorate.

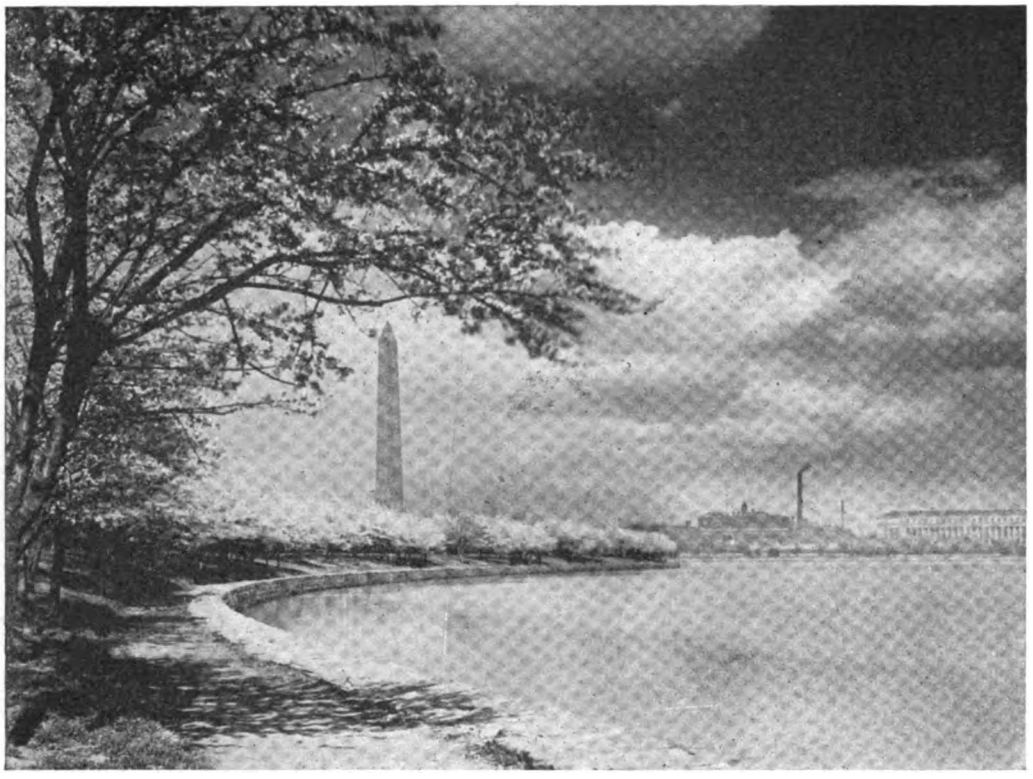
Black Varnish for Metals—A good varnish for finishing metals can be made by mixing 1,000 parts of benzine, 300 parts of pulxerized asphalt, and 6 parts of pure India rubber, to which is added enough lamp black to give the desired consistency to the mixture.

Lubricant for Drilling Copper—The best thing in my opinion to use for drilling copper, especially with small drills, is a piece of tallow. I have noticed a great number of receipts given, but I find that this simple means answers the purpose equally well or better than anything else.

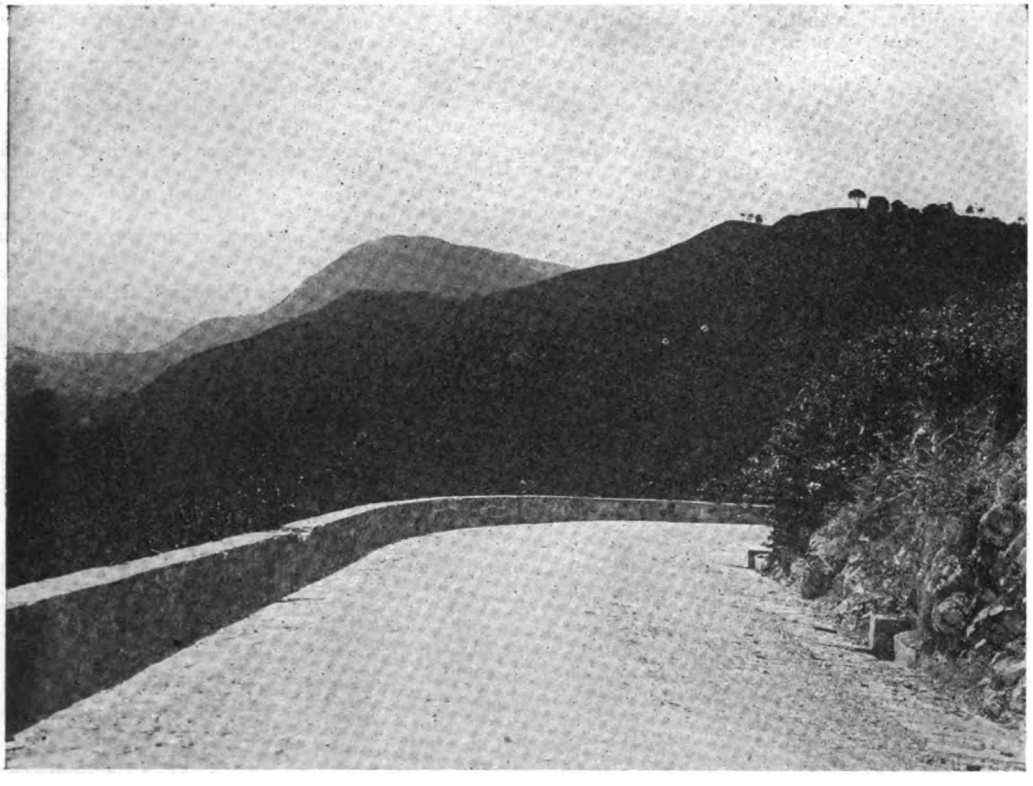
A NATIVE BLACKSMITH AT WORK IN HIS OPEN AIR SHOP ON THE ISLAND OF SARDINIA, ITALY



The Italian blacksmiths outdo their American contemporaries as observers of the safety slogans when it comes to shoeing. There are no hospital bills, as the result of shoeing at least, for the refractory horse or ox hasn't a chance in the world of causing any disturbance—just meek submission, that's all.



THE ROAD ALONGSIDE OF THE HISTORIC POTOMAC AT WASHINGTON



THERE ARE GOOD ROADS THROUGH EVEN THE MOUNTAINOUS ROADS OF CUBA

PALM AVENUE, IN

THE DESERTS OF ARIZ
GOOD

TY OF LIMA, PERU

THE WATER RESERVOIR ROAD AND TWIN TUNNELS IN WYOMING

THE CROSSING AT THE CONCONNULLY DAM IN THE STATE OF WASHINGTON

NOT BEEN SLIGHTED IN THE
AMPAIGN

(*Repairing Scored Cylinders with the Oxyacetylene Flame. Continued from page* 305.)

to handle, the next step is the grinding and polishing of the bore. This is sometimes a slow and tedious process, particularly if the shop is not any too well equipped. The easiest way to do this where there is no special machinery is to first grind out the surplus metal with a portable electric grinder such as is shown in Figure 2 of the illustrations. But the operator should be careful not to grind too deep. That is not deeper than the surface of the bore. In fact, it is safer to leave a very thin layer of surplus metal to be shaped out or polished off with grinding compound. In grinding, the wheel of the portable grinder should be supported on a lug shaped to fit the bore as it is almost impossible to hold it steady enough with the hands to prevent grinding hollow spots in the bore. A very fine grinding wheel should be used. The balance of the weld metal may then be removed with the portable rig by replacing the emery with a buffer coated with grinding compound.

Or the welder can make a hand lapping tool by sawing the solid end off of an old piston and fastening a large brace to it by the piston pin. This brace is similar to a carpenter's brace. The piston has a wedge shape slot sawed out of one side of it by which means it may be expanded and tightened in the bore as the metal is lapped out. This crude boring head is liberally coated with compound and revolved in the cylinder by turning the brace. It seems a rather slow process but it is really surprising how rapidly the compound eats the surplus metal. Unless the operator has made a hard weld, in which event he will no doubt have a tough time of it.

For the large cylinders a hand method of removing the surplus weld metal has been devised that gives good results if properly executed. It consists of casting a block of babbit in the bore of the cylinder on a side where the surface is smooth. This chunk of babbitt should weigh anywhere from ten to thirty pounds, according to the size of the cylinder. It is smeared with grinding grease and rubbed back and forth along the welded score to polish and wear down the surplus metal. Fresh compound is added from time to time. Of course the portable grinder is used first to cut down the surplus metal.

To be certain this method of lapping will not give as accurate results as though the cylinder was reground or rebored. Few shops have the necessary equipment for this operation, and then too, it will necessitate the use of oversized pistons. This method will work reasonably well, where carefully done, and will avoid a long lay up particularly in a busy time when the engine is badly needed, thus permitting its use until sometime when it can be more conveniently spared for the more extensive repair.

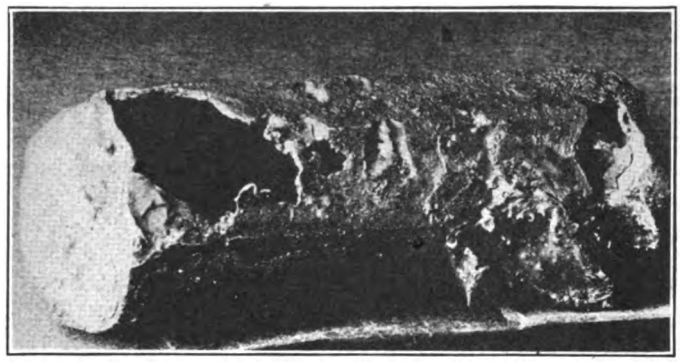
In the forgoing instructions I have purposely held pretty close to generalities because there are so many shapes and sizes of cylinders and the scored places are so different in many of them. Therefore each welder should try to apply the instructions to his particular job by making due allowances for the variations.

However, the fundamentals of the process are the same on a large job that they are on a small one.

Steel Melts From Inside

By G. P. Blackston

NEW things continue to happen, new inventions continue to be found, and new discoveries are occasionally made despite the oft heard proverb "There is nothing new under the sun". Perhaps in no field more than in the steel field, have greater, more far-reaching discoveries of scientific value been made in recent years. Only twenty years ago a man, whose name is found to live long in the records of mechanical achievement, made the momentous discovery that steel containing certain alloys possesses an entirely new and distinct property, called red-hardness. It was about this time that F. W. Taylor stumbled, as it were, while engaged in a work of an entirely different nature, upon this remarkable fact, a fact of so much importance that the new steel, which became known as high-speed steel, was the impetus that was responsible for the revolutionizing of the then common manufacturing processes. For this new steel was able to remove metal, when shaped into cutting tools, at so fast a speed and feed and at a depth of cut so great, that truly the world was astonished when its properties were demonstrated.



ONLY A SHELL REMAINS. THE METAL FROM THE INSIDE MELTED FIRST AND RAN OUT

And now comes G. P. Blackiston, and announces to the world that steel melts from the inside. Like Taylor's, Blackiston's discovery was an accident. We do not know what its value will be to the steel trade but will tell the story as it comes from the lips of Mr. Blackiston himself, whose desire is to give the information freely and let all who may, profit from it.

This new discovery was made by Mr. Blackiston, a practical steel man, while at work in a crucible plant. As is well known in the manufacture of crucible steel, the mixture for melting consists of definite and carefully weighed amounts of certain grades of wrought iron, blister bar, alloys and scrap which are packed in pots. These pots when filled and covered, are placed in a furnace which contains a number of holes—six pots, three deep and two abrest, being placed in each hole. The holes are then covered and the pots are subjected to a heat of about 3000° F, for a period of from two to three hours. After the mixture is melted, the pots are allowed to stand in the furnace until all the gas in solution has boiled out and the molten steel is then ready to be cast.

In the mixture used at the time that our discovery was made numerous pieces of octagon bar steel such as is used for chisels and

rectangular bar steel, such as is used for lathe and planer tools, were found. After the pots had been packed, placed in the furnace, and the melting was well under way, one of the pots broke and was immediately removed from the furnace and set to one side.

Let us examine briefly what was revealed by an investigation into the mass of metal found in this broken crucible, which had been subjected to the high heat of 3000° F. for a short time. After the pot had cooled, it was observed that chunks of metal were present which seemed to have the original shape they possessed at the time they were inserted in the pot. By tapping them with a hammer, a hollow sound was noticeable and upon further investigation, the pieces were indeed found to be hollow. They were carefully removed and are shown in the accompanying photographs, Fig. 1 and 2. It will be observed that the pieces removed from the pot are two hollow shells that have retained their original contour, except that in the process of melting the molten metal in the inside found a weak spot in the outer shell and passed out through the opening shown.

The reasons for this are not so obvious. As well known, pure iron has a higher melting point than steel and the more carbon there is in the steel, the lower its melting temperature. The outer layer of these bars of tool steel received the heat first, but this heat was, no doubt, immediately transferred to the inner portion, as the heat continued to be added, it is believed that the carbon was burned out of the outer layer and that it became, in fact, a low-carbon steel approximating iron itself. The inner layer still retained its carbon and would, of course, melt at a lower temperature which explains why it had entirely melted, while the outer layer was intact. This important discoverey was, of course due to the accidental breaking of the pot containing this certain mixture just at the right time; and the subsequent handling and investigation revealed this interesting phenomenon. We do not know where it may lead us. Perhaps the principle may be applied to the manufacture of articles now made in an entirely different manner, in a new and cheaper way.

OIL FUEL IN CHEMICAL WORKS

Mark Meredith

So far as is known the use of oil fuel in chemical works has not yet passed the experimental stage, but there is a wide field of usefulness for the employment of oil fuel to subsidiary processes in chemical works. One of the experimental uses to which oil fuel has been put is the heating of 3 in. cast iron melting pots containing charges of about 9 tons of caustic soda at a works in St. Helens, England.

Naturally before any results were obtained a good deal of experimental work had to de done and various types of oil burners were tried. Two types of burners were tried, the smaller being manufactured by Messrs. Fletcher, Russell & Co., which worked on the scent-spary principle" and the other, which was larger, being on the lines generally used in the Texas oilfields area for steam raising purposes. For small operations the first burner will be found sufficient for efficient work, and it uses compressed air, but the latter type is the best for large scale operations. The construction of this burner is exceedingly simple, and it can be employed with any kind of oil fuel, but

THE MELTING WAS STOPPED ACCIDENTALLY AT THIS POINT. THE EFFECT OF THE HEATING IS CLEARLY SHOWN

care must be taken to have the oil heated—by steam as it passed through the pipe of the burner. The combination of the oil and the steam, would then be projected in a finely divided spray. Amongst the fuels which can be used may be mentioned Mexican oil residue, gas-works creosote, tar from gas-works or producer plant, or a mixture of tar and pitch. A mixture of 75% pitch and 25% tar was successfully used. The difficulties experienced with this mixture however were mainly connected with the separation of tar on from the flame and the supply of such a fuel to the burner. To overcome the former difficulty in the absence of compressed air, an extra amount of air was introduced into the flame. This was done by fitting a simple type of ejector into the steam supply pipe near the burner to aid the process of burning with such a mixture it was arranged to superheat the entering steam and injected air by running a ½ in. U-shaped iron pipe into a standard "muffle" so that the accurate increased temperature of the steam and air supply was obtained.

The experiments proved conclusively the superiority of oil fuel for certain classes of work. For example, when a coal giving 15,000 B. Th. U. was directly compared with an oil giving 20,000 united and when both were burned to the best advantage, the oil fuel was found to have a practical efficiency of 2 to 1. Commercial profit and cost were not taken into account as the experiements were conducted from a technical efficiency point of view.

Burners of oil fuel naturally divide themselves into three classes: (1) Where the oil is sprayed by being expelled from the burner at a pressure of from 40 lbs to 120 lb per sq. in .: (2) Where compressed air is used to atomize the oil: (3) where steam takes the place of air. The two essential features in furnace constrution are connected with (1) the construction of a suitable muffle to contain the burner, and (2) the actual heating must be done with hot air, without contact between the direct flame and the vessel to be heated. There are certain dangers in the use of oil fuel, and to prevent back firing and the failure of the flame a small pilot gas jet should be alongside the man flame. This would instantly relight the flame. Also the risk of manufacturing lamp-black instead of heat could be guarded against by watching the supply of air.

Increased efficiency in oil firing is due to complete and rapid combustion, and a higher temperature and a lesser volume of flue gases, whilst there is also a considerable labor saving, one man doing the work of four. The experimental plant put up ran two years with very satisfactory results.

Thou shalt not clean machinery while it is in motion, says the National Safety Council.

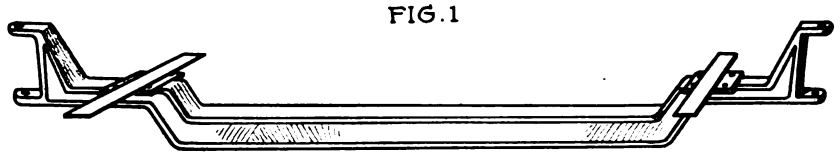
Practical Shop Suggestions

STRAIGHTENING AUTOMOBILE AXLES

by Merle E. Morgan

STRAIGHTENING automobile front axles which have been bent or damaged, either through accident or hard usage, is a job which belongs distinctively to the blacksmith. That is at least one phase of automobile repair work in which the man excells, who built and repaired the vehicles now being surplanted by the newer form of transportation.

FIG.1



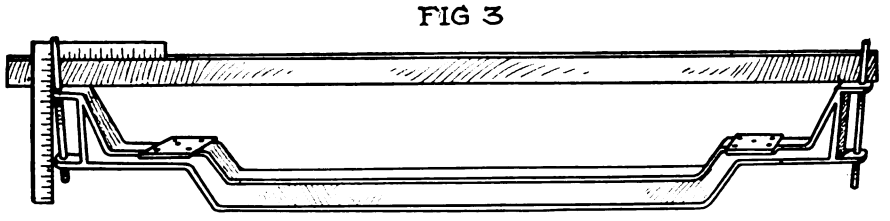
No great technical knowledge is envolved in resetting sprung or bent axles, to be sure. Just an application of plain "hoss sense" that's all; although there are some suggestions which greatly facilitate the work, and also give greater assurance that the repair part will work satisfactorily.

First, it is essential to find out whether the axle is bent between the spring rests. If so, the axle is heated at the bend and sprung until it appears straight. It is a comparatively easy matter to sight down its length and see that it is approximately straight. Then the spring rests are checked up. Figure 1, shows the first step. A piece of straight flat iron is laid on each of the spring rests, or better still, they may be held in place with a "C" clamp. Sighting across the two will readily disclose any twist in the axle between them. The next step is shown in Figure 2. The straight edge is laid across the two spring rest. This will show any twist or bend that could not be detected with the other method, and is the last step in checking up the parallelism of these two parts.

It is very essential that the position of the two spring rest be reasonably correct, otherwise when the axle is installed and the springs fastened down, they will be subject to a constant twisting motion. Many cases of spring failure and trouble can be traced directly to such a condition.

On those axles, which have been damaged through accident, the end of the axle which supports the wheel, is the one which in all probability will be sprung. Ordinarily only one end of the axle is damaged, thus the other end can be used in determining the measurement for the damaged end. Two rods of sufficient diameter to fit snugly in the holes, and of about 24" in length are inserted in the spindle bolt holes. Sighting across the top will show any twist, which of course should be corrected. This is done by heating the axle between the face of the spring rest and the spindle bolt, then twisting it until the rods appear to be in alignment. Next the axle is checked up by laying the straight edge across it, as shown in figure 3. A square is used against the straight edge and spindle bolt. Some cars effect the cambering of the wheel by setting the spindle bolt at a slight angle as shown in the drawing, while the most general practice is to secure this offset in the spindle body. A comparison with the undamaged end of the axle will show which design was used.

FIG 3



The last step is to see that the distance between the ends of the axle where the spindle body is installed is correct. The straight edge is again applied to the top of the axle as for the preceeding measurment. The distance is checked up on both ends by caliperring from the bottom of the straight edge to the places where the spindle body bears. It will be found virtually impossible to properly straighten the spindle bolt so that it will not either bind at some point or else be loose, should they be bent. It is better, wherever possible, to install a new one. If not, the old one may be straightened. Rolling it on a surface plate with the head extending over the side will indicate the location and extent of the bend.

A GOOD IDEA

If you and I each have a dollar and we exchange them, we still have only one dollar each.

If you have an idea and I have one too, and we swap them, then we each have two ideas.

You have an idea of how to make some handy device for doing some particular thing around the shop.

Send your idea to us, accompanied by a rough sketch so that we will not miss any of it's good points, and we will send you a nice crisp dollar bill for it.

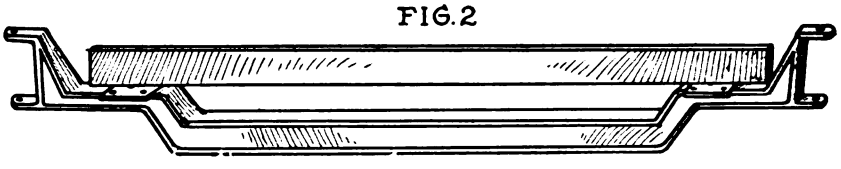
Then you will still have your idea, a dollar as well, and fifteen thousand others besides yourself will have been benefited.

Isn't it a good idea?

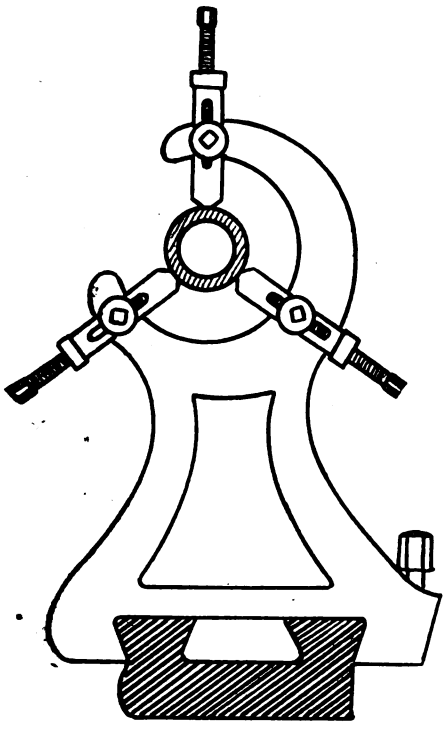
CUTTING AND THREADING LONG LENGTHS OF PIPE ON SHORT BED LATHES

This is a job that taxes the ingenuity of the operator, unless he is quite accustomed to that class of work. The first difficulty encountered in this particular case is that the standard steady rest as shown in the accompanying drawing is to small to accommodate pipe of more than medium size. This necessitates making a wooden steady rest, employing the same principles as those which are used in the regular tool. It is most important, of course, that it should line up properly, and that the bottom should be bolted firmly to the bed of the lathe. Next, the jaws of the chuck are reversed, so that they will engage the inside of the pipe instead

FIG.2



of the outside. This is necessary because the threads have to be run to the extreme end of the pipe. Since the jaws do not extend into the pipe over 5/16" difficulty was experienced in making the clutch retain its hold on the pipe, when



a cut was attempted. The pipe would invariably slip off. To overcome this trouble, a hook was made from a long rod, and then the other end of the rod was threaded. The hook was fastened on the end of the pipe in such a manner that the rod was inside of the pipe, while the threaded end of the rod extended through a hole in the chuck pulley. By means of a nut the pipe was drawn firmly up onto the chuck and held there during the machine operations. This detail is omitted from the drawing for the reason that it could not be seen when drawn so small. A light cut was taken to round up the pipe preparatory to threading, then the threading was done with a left hand threading tool.

Another difficulty that is often experienced in this class of work is that the jaws of the clutch will not open sufficiently to hold the work. This difficulty can be overcome by making an open ring such as is shown at the bottom of the assembly drawing. The ring should be made so that it will fit the inside of the pipe, and should be made from stock which is sufficiently heavy so that it will engage the chuck jaws properly.

George Abrey.

A NOVEL COTTER PIN EXTRACTOR

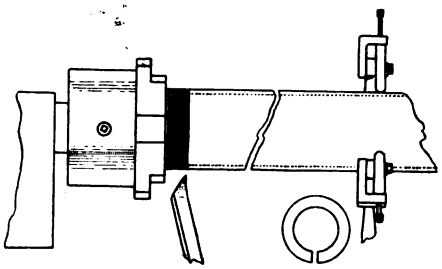
Making odd tools for odd jobs has always been more or less of a hobby with me. Many of them work to a very good advantage. Thinking that they perhaps may be of some help to the other fellow, I have passed the idea along to them, through our journal. Perhaps it may have been through watching the mechanic, who is poorly equipped with tools, trying to do a job; that has been somewhat of an inspiration to me I have often stood and marveled at the unusual things that are attempted with a screw driver. Poor old screw driver—it certainly catches the dickens when there is a shortage of tools.

Prying out cotter pins with a screw driver seems a particularly favorite way of skinning ones fingers and still leaving the pin in place. Here is a tool which I use for that purpose. It works very nicely.

The accompanying cut shows its simplicity. Only 4 pieces are used in making it. A piece of 3/8" rod, 3" of 3/8" pipe, a piece of round stock 1½" x 2½" and a small piece of tool steel from which to make the hook. An eye is formed in one end of the rod, against which the piece of pipe is welded. Next, a 25/64" hole is drilled through the piece of round stock. This allows it to slip easily onto the rod. Then the piece of tool steel is welded to the other end to form the hook.

To remove a cotter pin with it, catch the hook in the eye of the pin, slide the heavy piece of stock up and down the rod, bumping the stationary piece of pipe and the cotter pin is readily withdrawn.

Ford fly wheel cap screws are



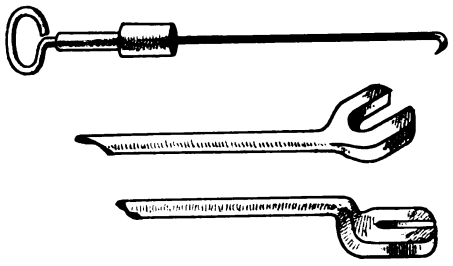
HOLDING THE PIPE WITH THE CLUTCH JAWS REVERSED

difficult to remove without the proper wrench. The accompanying illustration shows a wrench for that purpose, which can be very easily made from a Ford cylinder head cap screw and spark plug wrench. Simply heat the wrench up in the forge, closing in the jaws sufficiently and then give it the necessary offset.

James Baldwin.

A METHOD OF ANNEALING SMALL PIECES

Heat the piece as slowly as possible, and when at a low red heat



put it between two pieces of dry board and screw them up tight in a vise. The steel burns its way into the boards, and, on coming together around it, they form a practically air-tight charcoal-bed. When it cools off the steel will be found thoroughly annealed.

HEAT TREATMENT OF HIGH SPEED STEEL

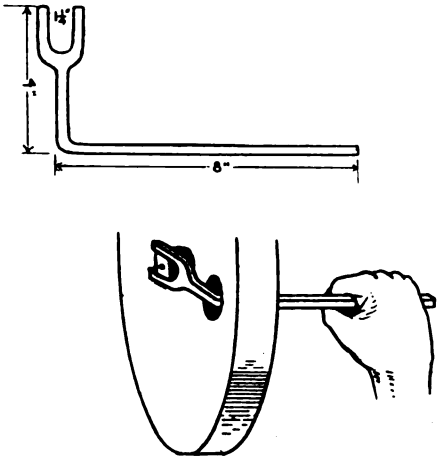
HEAT treatment for heavy milling cutters and forming tools, ranging in size from 6", 12" to even 14" in diameter, and from 3" to 5" thick, present somewhat of a problem to harden properly, particularly if the parts are of intricate design. One large manufacturing concern making cutters of the above description have standardized their heat treatment methods after considerable research work. They find that uniform and dependable result may be obtained when the parts to be treated are packed in fine granulated coke, which has been in the furnace once or twice before, and the filling the remaining space in the pot with new coke of similar quality.

The gas furnace is started around 9 o'clock in the morning. After an hour the pyrometer indicates a temperature between 1600° to 1700° Fahrenheit. At this point the pots are pushed in. The heat shortly after raises to 1800° F. and continues to gradually increase until at noon a temperature of 2000° F. has been reached. During the noon hour the parts are allowed to soak. At 1 o'clock the furnace is again started full blast, and held that way for the following 2 hours. Then a temperature of 2200° F. has been reached. An additional half

hour's heating brings the temperature the parts are withdrawn and plnged into Houghton's No. 2, Soluble Quenching Oil.

After the tools are thoroughly cool, they are placed in the oil tank, and the temper is drawn at a temperature varying between 500° to 700° F., depending on the work for which the tool is to be used.

When the heat treatment has



REO CLUTCH SPRING COMPRESSING TOOL

been completed, the tools have a deep black color, which, however, does not injure the smoothly machined surfaces. The cutting qualities of the tools are excellent, being extremely hard, and still tough enough to avoid breaking. Since this process has been successfully used for several years past, it is well past the experimental stages, and one should have no hesitancy in recommending it.

The pots in which the tools are treated are another departure from ordinary practice. They are made out of soft angle steel welded together. Test show them to be superior to the customary cast iron pots, as they out wear nearly three dozen of the latter.

E. M. Peterson.

Don't knock your tractor when it knocks. Make a stethoscope out of a rubber tube and a small funnel and find where the trouble is.

A BELT DRESSING

About as good a belt dressing as can be had is made by melting beeswax in neat's-foot oil in proportion of ½ lb. of wax to ½ gal. of the oil. To secure a good mixture, melt the wax first, then add the oil slowly, stirring constantly to get it thoroughly compounded.

TOOL FOR COMPRESSING THE REO CLUTCH SPRING

A lot of time and bruised fingers can be saved in compressing the Reo clutch spring while replacing the nut that holds it in place, by using the simple tool illustrated in the accompanying cut. The tool is made from 1"x¼" stock. The dimension are shown on the drawing, but the forked part of the tool should be twisted around 90 degrees to have it work properly.

James Baldwin.

TONGS FOR BATTERY TERMINALS

Battery terminals sometimes become set so tightly in their sockets that it is difficult to remove them. A pair of tongs which will make this task easy, however, may be made readily from an old pair of wide-faced pliers. After the faces have been hammered flat, if not already so, a slot is cut in one of them so that it can be placed astride the cable side of the terminal while the flat face exerts pressure against the other.

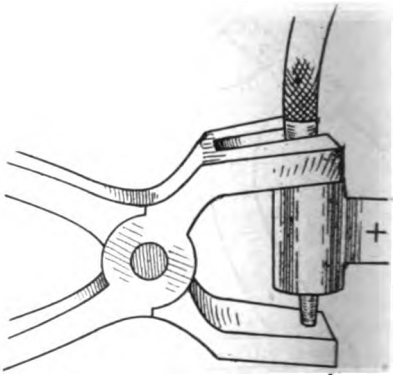
SHARPENING A COAL AUGER

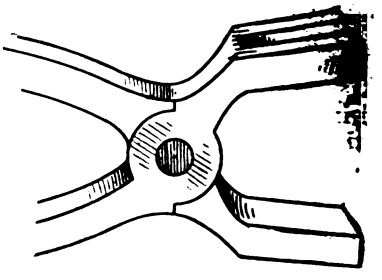
The application of the principles of blacksmithing are so wide and diversified, that many smiths are

Fig. 2. THE FIRST STEP IN SHARPENING THE COAL AUGER

totally unfamiliar with the work done by other blacksmiths. In fact the field is so wide that some of the things that the other fellow is doing proves just as strangely interesting as though the work was from another trade entirely different. Sharpening coal auger would be of little interest commercially, to the horseshoer. He would have little occasion to use the information; yet the process is an interesting one.

The first step is shown in figure 1. The twist is straightened out flattened and then split back for a distance of 2½". The center is trimmed out and the right hand is cut, first. The auger is then turned over and the opposite side is treated in a similar manner, thus





BATTERY TERMINAL TONGS

leaving the shears about ⅜" to ½" wide.

Now we are ready for the turn. Figure 2 shows it after it has been turned; an operation which is done on the horn of the anvil. The shears are so set that they are from 1½" to 2" apart. It is important that both sides be uniform and so shaped that a thin rule can be slipped through the center and will fit squarely.

The last cut shows the bit after it has been properly shaped. It will be observed that the cutting point is diamond shaped. Such a bit will cut into the coal and keep the core cleared out at the shears cut the way.

B. R. Pace.

Your body is a big part of your capital. Don't invest in the "Bank of Careless Habits," says the National Safety Council.

Some Practical Repair Suggestions

By L. E. Doyle

THE man who repairs automobiles has occasional jobs of soldering to handle. Soldering is an effective method for stopping leaks, etc., providing the work is done properly. A poor job of soldering is worse than useless; for it will not last any length

Fig. 2. TURNING THE CUTTING EDGE

of time, and usually serves to irritate both repair man and patron. There is a remarkable difference in strength between a properly soldered union, and a makeshift job. On the average, a large number of soldering jobs are handled correctly.

It isn't difficult to learn how to solder. An important essential is to thoroughly clean and scrape the surfaces which are to be joined together. Do not neglect this. Always heat the metal as near the melting point of the solder as possible while making the joint. The work will be easier and much more effective if the proper flux, for the particular job, is used. The "soldering fluid" has a wide range of usefulness, and for soft soldering is most common used. It is made by dissolving common zinc in full strength muriatic acid, then straining the dissolved zinc through a piece of cheese cloth, and adding an equal quantity of rain water. It stands to reason that the strength of a soldered joint is largely dependent upon the flux used.

"I have discontinued the use of any acid preparation in soldering electrical joints," remarked a mechanic. "Sooner or later acid will eat into the metal under a joint, and gradually loosen it. For use on brass and copper, I prefer Sal ammoniac. Resin is satisfactory for use on tinned iron, lead and tin. It also gives excellent results when used for insulating.

"I keep several soldering irons, which are made in various sizes and shapes for different purposes. I keep my soldering irons thoroughly tinned. I tin a soldering iron by filing the surface of the point until it is smooth and bright, then heating it. Then I melt a little solder on a smooth piece of metal, and mix in a small quantity of sal ammonia. I next rub the point of the soldering iron in the mixture of melted solder and sal ammoniac, until the mixture has adhered to the iron as far back as it has been cleaned. I never allow one of my soldering irons to become rough or pitted. Good work can only be performed with a smooth iron.

"There is nothing gained by over heating a soldering iron. When the solder flows readily, when coming in contact with the iron, the right heat is reached. If the solder doesn't flow freely, the iron is too cold. It is useless to attempt to solder a joint if the iron is too cold to keep the solder flowing freely. When soldering a joint, I fit the ends together as closely as possible."

Occasionally a car owner complains of irregular magneto action. When indications point to the trouble, it is up to the service man to "set things right." The most frequent cause of irregular action of the magneto is end play in the armature bearings, which means that the end motion of the armature may be sufficient to disarrange the action of the contact breaker, rendering the time of firing both irregular and uncertain. The insertion of a fiber washer to take up the slack will remedy the trouble.

"I have put new piston rings in a number of Ford motors recently," explained a mechanic. "Good rings, properly fitted, work a great transformation in the car's power and speed. The other day I overhauled a Ford, which was owned by a man who knew little concerning power development in a motor. He complained that his car had lost its pep, and didn't climb hills willingly. So I put a patent ring in the middle groove on each piston using standard, one-piece rings in the other grooves. I put in the patent rings to act as oil scrapers. When I had the car running again, the owner was gratified with the new power displayed by the engine.

"When a Ford is equipped with aluminum pistons, I prefer a somewhat wider gap in the rings, than where cast-iron pistons are used, because rings on an aluminum piston get hotter than on a cast-iron piston. The amount of gap required is the same for any style of cut; however a wider gap can be used without danger of leakage with the various styles of lap joint rings, than with the straight, diagonal cut style. I always test the gap at different points in the cylinder bore, as the bore occasionally wears more near the top than at the bottom. I always fit the gap at the smallest point of the bore.

Fig. 3. THE LAST OPERATION

Providing the ring grooves are thoroughly cleaned of carbon, and the rings fit snugly in the grooves, concentric rings may be used in place of eccentric rings without change in the pistons.

"I never force a ring into the cylinder. Providing it is clear all the way around, a ring should slip in easly. Proper lapping-in of piston rings is easy. I prefer a fine-

grain abrasive for the purpose. After I have put new rings in a motor, I make certain that they do not bind before allowing the car to leave the shop. I fill the crank case with clean oil, putting in a larger supply than is ordinarily used. I run the motor for a few minutes, then stop. After a few minutes have passed, I see whether there is any bind. If it works smoothly at this time, there should be no trouble providing the driver is careful to avoid over heating for the first few hundred miles. After a car has been overhauled, fitted with new rings, etc., I advise the driver to handle it with the same care he would give a car fresh from the factory. It occasionally happens that compresion is rather poor until the rings have worn in. More or less oil leakage also may result at this time."

THE TYPE OF COMMERCIAL BODY BUILT BY G. W. DASH, LTD., NEW ZEALAND, TO FIT THE CHASSIS OF THE "UNIVERSAL CAR".

A former blacksmith, who has cleaned and repaired cars and tractors extensively of late years, states that he finds vibration is the worst enemy of either cars or tractors. "Take automobiles, for example," he explained. "The effect of vibration in the motor is to loosen the different parts of the mechanism. The driver of the car soon is made aware of this, by the various noises which arise when the motor is running. Gradually the noise increases, until the driver is annoyed while making a trip. If the trouble ended with noise, it wouldn't be so bad; but noise is merely a symptom of the trouble, indicating looseness of parts which will sooner or later result in breakage, if the cause is not remedied. I have made a specialty of the noises which issue from motor cars, and in many instances am able to tell what ails a car simply by listening to the noises which arise when it is in operation. Several noises issue from the motor, and indicate engine trouble. The more common of these are valve clicks and slaps, which are easily located and determined by the regularity of their occurrence. The source of trouble should receive immediate attention. There is too much clearance between the valve and its seat. If the motor is of the overhead valve type, there may be too much clearance between lifter and push rod. Before adjusting the clearance to the correct distance, I heat the motor so the metal is expanded as it normally is when the car is in operation.

"During the past month I have traced noise in several cars to lifters being loose in their guides. In order to locate the trouble, I remove the whole lifter assembly. If a lifter is much worn, I replace it. Occasionally I am able to spring the guides slightly so they will grip the lifter tightly enough to remedy the trouble. I also occasionally trace noisy operation to the cam; the trouble being due to too much clearance between cam and follower. I remedy this trouble by fitting new followers. In order to determine whether noise is being produced by worn guides or valve stems, I remove the springs. If there is side play of the stem in its guide, I put in a new valve with an oversize stem. Side play may develop in the rocker arms of an overhead valve system, causing a slap. Where a worn arm bearing causes the trouble, I fit an oversize bushing in the rocker arm.

"Bearings in an engine may burn and flatten out because of improper lubrication. When fitting bearings, the main essential is to see that the shaft is not thrown out of alignment. This is particularly apt to happen where only one bearing is taken up. When the shaft is thrown out of alignment, noisy operation can be expected, because of the binding of one of the shafts in the transmission.

"I intend to give more attention to tractors this year than I have done in the past. The man who does repairing cannot afford to neglect tractors. I have over hauled a number of tractors. It is my belief that more tractors are damaged through neglect in keeping the piston rings clean, than any other cause. I have found several cylinders badly scored by rings which were wedged tightly against the cylinder walls by the mass of carbon which had been allowed to accumulate under the rings. I advise my patrons to have the carbon removed at least every six months. Cleaning the rings isn't a difficult task. I first mark the connecting rod cap so it can be put back to match both the connecting rod and the same side of the engine, then it will not be reversed on the crank. Having removed the cap, I push up the piston and remove it. Having removed the rings, I clean them thoroughly, also removing all refuse from the piston grooves. Having attended to all the rings, I inspect wrist pin and bearings. Farmers who are expecting long service from their tractors, must be instructed regarding regular cleaning. While a clean and properly adjusted tractor engine can be expected to give many years service; a neglected engine is certain to depreciate rapidly.

"It pays the average farmer to have a trained mechanic look after his tractor occasionally. The connecting rod and main bearings will then be kept properly fitted, which will prevent serious damage to the crank shaft. When over hauling a tractor, I remove cylinder head bolts, then take off head casting and gasket. I saturate carbon covered parts with coal oil, which loosens the carbon so it can easily be scraped off. When replacing the parts, I have them bright and smooth, as the accumulation of carbon is lessened when the surfaces are smooth.

"I believe a good mechanic can easily secure enough tractor work

to make his business profitable, providing he takes the trouble to show tractor owners the reasons why regular, and efficient, over hauling cuts down operating expenses and makes the machine last longer.

"The efficiency of a tractor is lowered when dust gains admittance to the working parts. Unless some device is used in the air intake to keep dirt out of the carburetor, more or less dust will get into the engine, where the particles which are taken into the cylinders will lodge under the valves, reducing compression. When dust mixes with oil, it forms a rough mixture which cuts out valve stems, valves, pistons and rings. Dirt in the carburetor frequently causes trouble by lodging around the needle valve, which makes accurate adjustment very difficult. Dust also clogs the fuel line, and is certain to interfere with proper governing of the engine.

"Air cleaners on tractors are essential equipment; they render operation less difficult, and greatly increase the efficiency of the machine, cutting down depreciation. There are two types of air cleaners —the dry and wet. I advise farmers to use tractors which are equipped with air cleaners. I also recommend that any dust which gains admittance to the carburetor and engine be removed as quickly as possible.

"When over hauling a tractor, I give attention to the fan. If the machine is equipped with a gear driven fan, I see that the gears are properly lined up, replacing any which are badly worn. If a fan is friction driven, I adjust the pressure so a ridge will not be pressed into the driving cone.

"I try out all the clutches; it is my plan to recommend that any parts which show much wear be replaced. I adjust the clutch levers so lost motion is eliminated. I see that shift levers are set so all gears mesh evenly.

"I clean all ball and roller bearings. Bevel gears are lined up, and the bearings inspected. Having cleaned the crawler track, I test all the pins and links, replacing defective pieces. I put the parts in order so drivers or treads do not rub: it is necessary to get the parts in line and adjust so lost motion and friction will be avoided. I give attention to the governor, making certain that all parts work accurately. Any pins or bearings which bind or cramp when in the running position will cause trouble. When working with throttle-governed engines, it is advisable to see that the wing valve operates properly under actual working conditions. I advise farmers to avoid working tractors which do not govern accurately, as lessened efficiency, heavy strains and excessive vibration will be the result if the machine is worked before properly adjusted.

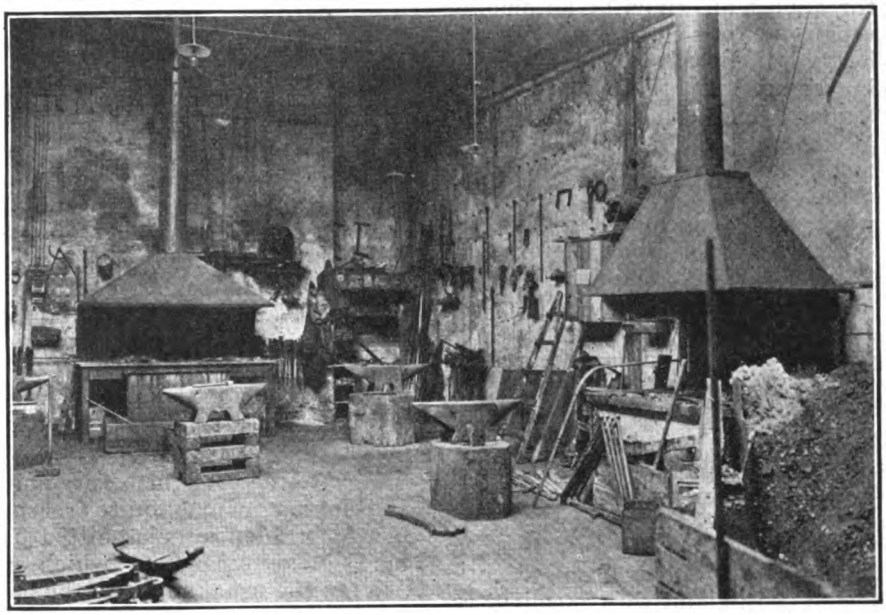
"I usually find accumulations of refuse in the bottom of a crankcase. Having removed the refuse, I remove all strainers and repair any holes which have formed. I test the gear oilers to see whether lubricant is fed accurately."

BLACKSMITHING IN THE HEART OF PARIS

THE blacksmith shop is no longer limited to the little wooden, or corrugated-iron shed, at the end of Main Street. And horse shoes are not the chief articles that come under the metal worker's hammer.

Today, the business of blacksmithing and welding is closely allied with the nation's motor transport system, and every well-equipped garage contains departments for this work. One of the largest and most complete of these is found in the big Louis Blanc garage, at Paris, where the Transportation Department of the American Red Cross handles and repairs all its motor vehicles operating in Europe. There are nearly nine hundred machines of all kinds bearing the Red Cross emblem in Europe, at the present time, 632 of these being directed from the Paris headquarters, and 260 attached to the Commissions in the field. The latter stretch all over the map of Europe, to Poland and the Baltic Sea in the North, and to the Balkan States and the Russian ports of the Black Sea, in the Southeast. Many of them have been transformed from the truck or tourning-car body, with which they left the factory in America, and now bear queer bodies, adapted for refrigerators, laundries, or delousing plants. But all are playing their part in the Red Cross program of relief and sanitation, and all of them come, eventually, to the big Paris garage for repairs and rebuilding.

This garage situated at No. 6 Rue Louis Blanc, occupies 13,500 square feet, and employs a staff of 175 workmen. At one time, it was a stable, through whose doors the horse-drawn cabs of the gay French city were wont to depart for the boulevards. Then came the war, and the necessity for housing the multitude of cars that came to France, to help back up the work of the armies of the Allies. Within a miraculously short time, automobiles of all makes and designs, from light passenger cars, to ambulances and five-ton trucks, were docked at the French ports, and some place had to be found to give them shelter and repairs. Then it was that the faithful horses and cabs were crowded out of the old stable on Rue Louis Blanc, and the blacksmith's anvils began flying with



THE BLACKSMITH SHOP OF THE RED CROSS AT PARIS

sparks from automobile springs and axles.

Since the Armistice, the work has increased. During the speed and tension of the final days of the War, little time was given to the repairing of motor cars. Where every minute counted in the terms of human life, it was cheaper to abandon disabled cars and to command new: but now has come the time for reclaiming these discarded wrecks of war. And the Red Cross, through its Transportation Department, is salvaging many of these faithful automobiles, and shipping them to Paris, to be repaired for future use in relief work, or to be sold, and their sales funds applied to new measures of relief.

In the last six months 999 major repair jobs have been completed by the workmen in this garage. And within seven months, 829 motor vehicles, which have been sent here for repairs, have been sold. The aggregate sales for eight months has amounted to 3,701,910 francs.

Besides the blacksmith and welding shops, there are departments for almost all kinds of automobile repairs, except casting. Light and heavy lathe work, milling and shaping are done in the machine shop; fenders, hoods, and radiators (and all articles of brass, tin, or sheet metal) are built in the tin and sheet metal shops; carpentry, woodwork, painting, upholstery, electrical, and motor-repairs (for both heavy and light machines) complete the departments of the Louis Blanc garage. Large stocks of tubes, tires, and spare parts are kept on hand at all times.

STRENGTH OF ELECTRIC WELDS

Electrically welded joints in ships' plates have been recently tested in England with excellent results, as regards strength. They are from 90 to 95 per cent. as strong as the original plate, where rivetted joints are from 65 to 70 per cent. only. In elasticity they are so far inferior to riveted joints, succumbing more quickly to bendings back and forth, than do rivetted joints.

Carlessness is at the bottom of more avoidable accidents than any other known cause, says the National Safety Council.

TO STOP PAYMENT OF A CHECK

THE drawer of a check has the right to countermand its payment at any time before it is paid or delivered to a bona fide holder for value. As almost all business men have occasion to stop payment of checks at some time in their business career, this rule is really more important than it may seem to be.

For instance, a check may be issued and mailed to the payee, and later on the maker of the check may discover that for various reasons the check should not have been sent. Or a check may be lost, stolen or mislaid. Whatever reason there may be for its nonpayment, the maker should notify the bank on which the check is drawn, giving a complete description of the check, and ordering the bank to stop payment on that particular check.

After the bank receives notice to stop payment, and through some error or fault of its own pays the check, the bank may be held liable for the amount thus paid, having no right to charge the amount of the check to the depositor's account.

Some banks, however, avoid liability for their negligence by having the depositor sign a printed form. These printed agreements usually contain a statement to the effect that the depositor agrees not to hold the bank liable should it pay the check on which payment has been stopped. Of course, if the depositor signs such a contract he releases the bank from all liability. It is, therefore, quite important that the depositor be very careful as to the contract he signs when he asks the bank to stop payment on a check.

A case was brought before one of the higher courts quite recently in which a depositor admitted having signed a card on which was printed the usual notice to the bank to stop payment on a check, and also the following agreement:

> "The ——— Trust Company will please stop payment of the above-described check. The undersigned agrees to hold the ———Trust Company harmless for said amount and for all expenses and costs incurred by it on account of refusing payment of said check, and further agrees not to hold the ———Trust Company liable on account of payment contrary to this request if same occur through inadvertence or accident."

At the trial it developed that the bank paid the check after it had received the notice to stop payment; also that the maker of the check did not have sufficient funds in the bank to cover the amount of the check. The bank, after paying the check, charged it to the account of the depositor, and then brought suit to collect the amount by which the account was thus overdrawn.

The defendant (maker) claimed that he did not read the agreement on the card which he signed, and that therefore he was not bound by such a contract. But the fact that the defendant did not read the agreement printed on the card did not affect the rights and obligations of the parties. He was assumed to have read the contract and to have assented to its provisions and agreed to be bound by its terms.

"By the great weight of authority the drawer of a check retains the right to countermand its payment at any time before it is paid or is certified and delivered to a bona fide holder for value. In the absence of an express contract its implied obligation to the drawer, the drawee pays at his peril when payment of the check has been stopped. The payee is not an assignee of the fund, and the bank incurs no obligation to him before its acceptance of the check. His rights are against the drawer of the check.

"Two decisive questions are presented: (1) Do the terms of the agreement include negligence? (2 Is it illegal for a bank to contract against the negligence of its employes in failing to stop payment of a check after receiving an order to stop payment? The word 'inadvertence' in the printed agreement embraces the effect of inattention, the result of carelessness, oversight, mistake, etc. The word 'accident' is used in the sense of a happening without the concurrence of the will of the person by whose agency it was caused. It is manifest the quoted words were intended to exonerate the bank from the kind of negligence shown by the record, and we are unable to see anything illegal, or anything opposed to public policy, in a stipulation or agreement which relieves a bank so circumstanced from the results of the mere inattention, carelessness or mistakes of its employes."

Queries-Answers-Notes

THIS department is the meeting place where you are free to ask for information, answer questions, discuss shop matters and business conditions and any other notes you feel would be of interest to a fellow mechanic. Make use of this Department as often as desired.

Shoeing Foundered Horse.—I would like to ask a few questions through the columns of your paper. In the last few years, I have had three foundered horses. Two were effected in the front feet, while the third one suffered from the disease in the hind foot. Did you ever hear of making a plate to press against the bottom of the foot, as soon as it was discovered that the horse was foundered? Would it press the bulge back? I have 350 horses to look after and shoe. It requires some work, particularly if they develop any trouble with their feet.

I certainly would appreciate someone who has tried a similar experiment advising me of the result, as one of our horses got so bad that we had to kill her recently, and if we are unable to secure some relief for another one we will have to kill him this Fall. I agree with some of the advice we receive through the papers, but there is some of it with which I cannot agree, so I would appreciate some good common sense on the subject.

O. N. Benninger, Pennsylvania.

Editor's Note:—

Regarding your experience with foundered horses, we agree with you that a great many of the so called remedies are of little or no consequence, and often leave the afflicted animal in worse condition than before the curative measure was attempted. The treatment of laminits is probably more varied than in any other disease, and yet a number of cases recover for even the poorest practitioner. We have never heard of the result of shoeing a foundered horse in the manner you described. It might have a tendency to press the bulge upward; but whether it would effect anything of a permanent nature, is speculative. It might tend to correct matters; but since it appears to be a painful operation, we are inclined to believe that it would increase the irritation and thereby aggravate matters. However, that is merely our opinion. We will publish the query in the hope that some brother smith, who may have tried the remedy, will give us the benefit of his experience.

Making a Three Horse Evener.—I have never been of any help to you before, but when looking over a recent issue of your paper, I came across the inquiry of a brother smith in regard to making a three horse evener. The accompanying illustration, which is self-explanatory, will give the necessary information, as it contains all the dimensions. We have found it to be a very good evener. It equalizes perfectly, and has no side drop. We make a great many for spreaders and wagons with hay loading attachments. It will work perfectly on any tongue rig.

C. W. Kistler, Iowa.

Cement for Setting Boxings in Wagon Wheels.—I wish that you would put an inquiry in your paper for a good cement or paint to use in setting the boxings in wagon wheels. I heard of some preparation, which is poured in around the boxing and when it cools it gets hard, holding the boxing to stay. Would some brother smith give me the benefit of his experience with any such preparation?

H. P. J. Oregon.

Making Dove-Tailed Switches.—Have been a reader of your magazine for several months and will say that it is worthy of praise, especially the Queries, Answers and Notes section. My difficulty in this case is a dove tailed switch. I see that there are many of them in use in the mines where motors are used, and as I am employed in a mine as a blacksmith, working at the car factory doing general blacksmithing, I may be called on to make one. If some of your readers who have dove tailed switches would supply the information requested, it would be greatly appreciated.

F. C. L., Pennsylvania.

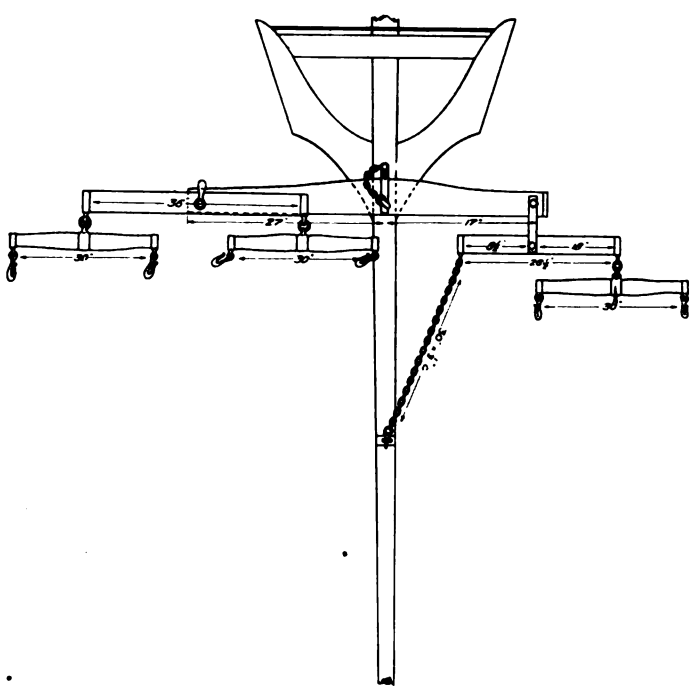
To Remove Broken Studs:—Replying to the query regarding removing broken studs, this is the way I do it. Make a left hand drill, center punch the stud, and then drill into it. In most cases the stud can be readily removed by this treatment. However, where the stud is rusted in or where it is extremely tight, it will be necessary to take a drill somewhat smaller than the stud and drill a hole to one side of the center, being careful not to run into the threads. After the hole is drilled clear through, jar the stud loose with a chisel and hammer. Little trouble will be experienced in unscrewing the stud with any tool that will fit into the hole.

G. A. Strom, Maine.

Self-Tempering Spring Steel Wanted:—Do you know of any steel manufacturers who make spring steel that does not have to be tempered? Would appreciate any information on the subject.

J. K., Pennsylvania.

Editor's Note:—We do not know of any spring steel that can be made up into springs without tempering. This is due to the fact that any tempering or hardening that might be imparted to the material by the maker, would be destroyed or offset by the heat necessary to work the stock up into spring leaves. The Ludlum Steel Co., of Watervaliet, N. Y., make a steel of rather unusual properties which they call Seminole. This steel possesses some unusual qualities, but whether it could be successfully used in making spring and whether the price would not be prohibitive, we are not in a position to say. They will gladly furnish that information upon application.

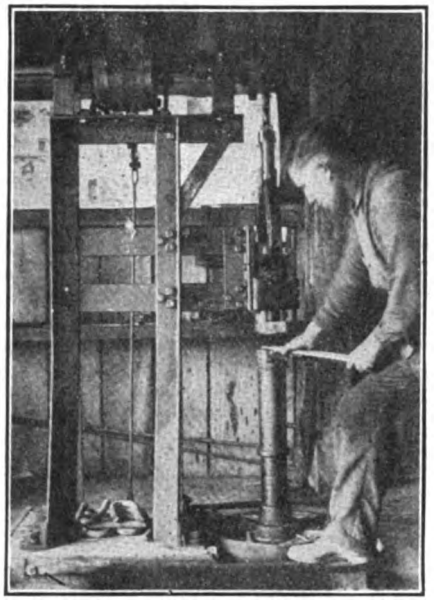


DRAWING OF A THREE-HORSE EVENER BY C. W. KISTLER

Making a Case Hardening Furnace:—I would like to ask through the column of your paper a few questions in regard to making a cheap case hardening furnace to be heated with coke, and also how to make another using town gas. I would also appreciate any information from your readers regarding the forging of connecting rods for motors. I get quite a number of these rods to make for both motorcycles and automobiles.

Aaron Clark, Singleton, N. S. W., Australia.

PRICES IN NEW YORK—Business in our locality has been exceptionally good; but we are seriously hampered through being unable to get help. We really need three men but are running with only one. Advertisements seem of little avail, as a six weeks ad has not located a man. The only solution to the help problem that has suggested itself to us is that we will have to get more for our work, in order to enable us to pay a wage sufficiently higher than in other trades, that it will be an inducement for the men to follow blacksmithing.



HOME-MADE POWER HAMMER BUILT BY B. R. PACE AFTER THE PLANS PRINTED IN AN EARLIER ISSUE OF THE AMERICAN BLACKSMITH. MR PACE SAYS, "FOR A LIGHT HAMMER IT CAN'T BE BEAT"

We are getting $2.60, $2.80 and $2.00 for 4 shoes; $5.00 for setting 4 buggy tires; $8.00 for 3" wagon tires per set of 4; $10.00 for 3½" and 4", and other sizes in proportion thereto.

John B. Lowe, New York.

TESTING STORAGE BATTERY JARS—I would like to ask you, if you can tell me of some good reliable way of testing the rubber jars used in storage batteries. You know that they are cracked and are leaking, yet when the cell is removed, it is a job to detect any leak whatsoever. What I want to know is how to test the jars when they are pulled out. I would be very grateful if you could give me any information. W. J. M., Australia.

It is almost impossible to detect a crack in these hard rubber jars by a visual inspection, even though the crack is sufficiently large to cause a perceptible leak when the battery is in operation. When the cell has been removed and thoroughly cleaned fill it with hot water; not too hot as it is apt to soften or distort the jar. The hot water will expand the crack sufficiently so that it can be readily detected.

How to Clean Spark Plugs Without Breaking Them—A simple expedient is to take a tablespoonful of common lye and put in about a quart of hot water in a porcelain or iron kettle. Do not use aluminum ware, as the lye has a very destructive effect on it. Put the dirty spark in this water, place over a slow fire and boil for fifteen to twenty minutes. After this time examine the plugs to see if they are clean. If they are not, blowing them out or wiping them is usually sufficient to remove all the carbon and leave the porcelains bright. After taking the porcleains from this solution they should be carefully washed in clear water and thoroughly dried before being put back into the cylinders. On no occasion should they be put into the cylinder wet.

LOOK OUT FOR THE GASOLINE CLAUSE IN YOUR INSURANCE POLICY

Many general repair shop owners who do not sell gasoline, but who occasionally do a certain amount of motor vehicle work, are not aware until a fire occurs that they are affected by the gasoline clause in their insurance policy. There are times when these cars which are being stored or kept on the premises while the repairs are being made, have gasoline in their tanks in a greater or lesser amount. This condition constitutes storing or having gasoline on the premises, and unless properly reported to the insurance company, their consent obtained and a notation made on the policy, will operate to void the insurance should a fire result.

There are no clauses in the insurance policy which are more rigidly enforced than the gasoline clause. Any merchant or repair-man who has any oil or liquid of greater flammability than kerosene on his premises should report the conditions and method of storing or using it.

An example of how rigidly this ruling is enforced, recently came to our attention through the decision of a Kansas court, against a merchant who allowed a car to be stored on his premises for several months. It was shown that while the car was stored there, the gas tank contained gasoline in various amounts. A fire occurred; but could not be traced to the car, as on that particular night it was out. Nevertheless, the court ruled that the policy had been violated through the storing of gasoline and consequently the insurance was not paid.

For the unthinking business man the gasoline clause is indeed a trap, as gasoline is used in so many commonplace ways. The best safeguard is to inform your agent of your particular conditions, and have him report it to the company and secure their consent; and further, if there are any changes in regard to your method of handling gasoline, report that as well. The old adage "Better be safe than sorry" never fitted any better place than here.

THE SAME TROUBLE THE WORLD OVER

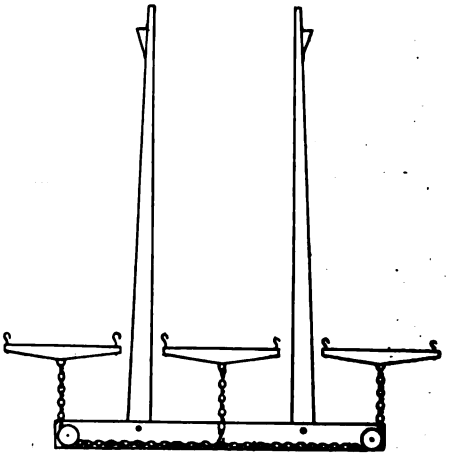
"Song Gon Pi closed his perpendicular paged account books with a sigh of relief. The annual balance taken at the New Year had shown a clear gain of 142,473 cash on his original investment of 450.000 cash, $47 and $150 at normal exchange rates; this from his shoemaker's shop in Chentu, China. Amid high-pitched pledges of loyalty and long continued service to such a successful employer, his twelve workers forthwith received a bonus of 6,000 cash each and thirty days vacation with pay. And the boards closing the front of the shop were slipped into place for the month's holiday. Thus ended the year of profit.

"Not so fortunate were the employees of Tong Gong Si, maker of pewter, not far away. He had spent all day before the New Year drumming up his debtors and avoiding his creditors. He had no profits at the hour of closing. There was no cash to give in bonuses. His men hesitated to contract for another year's work wih him, preferring to chance another employer. A Chinese workman contracts for a year's labor, changing employers only at New Year's if he is a good workman. Tong, though a splendid artisan, had started his pewter shop on a street away from the rest of the guild. Having no business experience, he was too generous in extending credit. And he was a poor salesman. The facts in these two actual cases, showed that the business life of the ordinary Chinese merchant is beset with the same pitfalls which lie in the path of the American merchant.

H. K. Richardson in "Asia."

Hardening Small Punches.—E. E. Neal in a recent issue of Machinery describes a process for hardening small punches or drills made of straight wire without having to straighten them afterward.

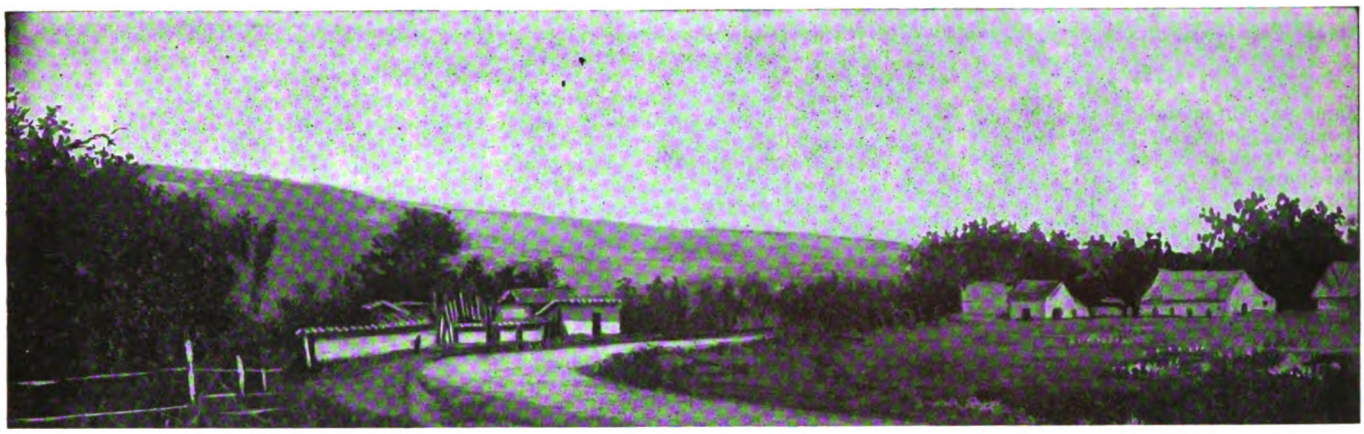
The process consists of rolling the wire, when at the proper heat for hardening, between two flat surfaces, such as a bench plate and a parallel from 2 to 4 inches wide. The operator arranges a bunsen burner as close as possible to the bench block and takes the parallel in the right hand and the wire to be hardened in the left. The wire is left long enough to handle, so that the end to be hardened can be passed back and forth through the flame. When the proper heat has been obtained the hot end of the wire is quickly placed on about the middle of the bench block, and rolled back and forth with the parallel. If one will take the pains to do this deftly, the result will be surprising, the wire being perfectly hard and straight. Wire up to ⅛ inch in diameter can be hardened in this way, but for wire from ⅛ down to 3-32 inch in diameter it is a help to smear the block with a thin coating of heavy oil or tallow, which assists materially in dissipating the heat.



DRAWING OF A THREE-HORSE HITCH BY J. R. DOWD

Making a Three Horse Hitch:—Replying to an inquiry in a recent issue of the American Blacksmith, regarding the manner in which a three horse hitch is made, I trust that the accompanying roughly drawn sketch will be of assistance to the party who made the inquiry. There is a pulley at both ends, around which the long chain passes, and is then hooked to the outside whiffletrees. A short chain fastens the center whiffletree to the center of the long chain, in this manner equalizing the draw of all three horses.

J. R. Dowd, Pennsylvania.



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BADGER MOTOR COMPANY, Milwaukee, Wis.

BLACKSMITHS LISTEN: Save time and money by doing your own auto and tractor blacksmithing with Toy's modern methods doing hard jobs easy. Forging and making solid welds, hardening and tempering to a standard, with colored tempering charts. All for one dollar. Samples free. **W. M. TOY, Sidney, Ohio.**

WANTED—To hear from owner of good Blacksmith Shop for sale. Cash price; full description. **D. F. BUSH, Minneapolis, Minn.**

FOR SALE—Blacksmith shop with tools two good houses, three acres land, good locality. I want to retire. Write
LUDWIG NELSON, Sister Bay, Wis.

FOR SALE—Good Blacksmith shop. Cheap Write. **W. C. ZIMMERMAN, Inman, Kansas.**

FOR SALE—14x6 Shepard Lathe, $275; 18x6 New Haven, $275; 24x8, $575; 22x12, $575; 28x12, $600; 30x18, $1100; Milling Machines, $125, $200, $250; 22x20 Iron Planer, $590; Prentiss Tool Co. Shaper, $350; Special Type Shaper, $200; 24 in. Geared Shaper, $350; Double End Heavy Emery Grinders, $20; Heavy Buffing Stand, $35; Buffing Head only, $20; 4 in. Centrifugal Pump, $50; Power Hack Saw, $12; 24 in. Wood Planer, $175; 8 in. Sticker, $225; Broom Handle Lathe, $35; Automatic Knife Grinder, $65.
BICKNELL MFG. & SUPPLY CO.,
Janesville, Wis.

FOR SALE—Cheap, only shop in town of 400 population. Well equipped, stocked with plenty of tools and material, and has 3 horsepower electric motor. Shop is 70x26 feet, with shoeing floor 20x26 feet. Would also sell new 2-story house equipped with electric lights and water works. **JOHN H. HUEBNER, Miles, Ia.**

FOR SALE—A Blacksmith Shop at Lansville, Ill. For particulars write
W. A. CRANE, Toulon, Ill.

BLACKSMITH SHOP WANTED—Send description. **C. C. SHEPARD,**
3351 Oakland Ave., Minneapolis, Min.

FOR SALE, RENT OR TRADE—Raney's Modern Shop. **BOX 226, Humphreys, Mo.**

ACCESSORIES AND SUPPLIES OF INTEREST TO THE TRADE.

One of the natural results of the tremendous increase in the number of motor cars, is the insistent demand for expert vulcanizers to carry on the tire repair business which has followed in the motor cars wake.

Among the tire repair schools that have set about to relieve this condition by training men in the art of repairing tires, with a remarkable degree of success, is the one which is being operated by the Haywood Tire & Equipment Company, Indianapolis, Indiana, U. S. A. It is an interesting group of men who gather in the classroom of this school on beginners' day, seeking expert instruction. In every class representatives from every section of the country present themselves, also dealers, men who want some good repair experience before launching out into the business, and often experienced repairmen.

This school furnishes a complete practical course; beginning with fundamentals, they demonstrate every step in scientific repairing. Occasionally they get men with no idea whatever, of how a tire is made—and some who have never examined a tire, but before these men leave our school they are master vulcanizers, competent to undertake any kind of repair, from a simple puncture to a re-tread. They are started at the same point in the practical work—cutting down sections of tires. After the student becomes skillful in this, he is instructed in building them up. Then they give him thorough instruction in the other various divisions of the business.

Individual instruction is given to each man and after two weeks experience they require all students to submit to an examination and issue a diploma to those who pass. That almost without exception, the students pass with high marks, is indicative of the thoroughness of our instruction.

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ACCESSORIES AND SUPPLIES OF INTEREST TO THE TRADE.

(Continued from page 38)

Because of the great demand for admission to these classes it is necessary to enroll several weeks in advance. Full particulars will be sent gratis by addressing the above mentioned school.

The Mayer Power Hammer is a product of thirty years experience in building power hammers. In it are embodied many new and exclusive features, insuring simplicity, ease of operation, perfect control and durability.

The Ram is a steel casting, perfectly balanced and carefully machined with extra large bearings for the hook or toggle bolts. It operates in "V" guides.

These Guides are extra long with wide bearing surfaces. They are adjustable to a thousandth part of an inch and at the same time are held in absolute rigidity when in adjustment, thus insuring perfect alignment of guides and dies and guaranteeing a smooth and silent ram movement.

The Ram Connection is so designed and constructed that it provides a perfect cushion at the upper extremity of the stroke and imparts a multiplied impetus to the downward stroke or blow of the ram. It is composed of two steel arms connected at the top with the adjustable steel cross head, a coil spring made from special high grade spring steel placed between the arms to give the proper tension, and two alloy steel hook bolts connecting the ram to the arms. One of these hooks bolts is provided with a nut and being connected to the arm with a steel knuckle provides the proper adjustment of the tension.

The Dies are made from high grade crucible tool steel properely hardened. They are regularly furnished in either standard flat forging face or rounded face for plow work.

The Bearings are extra hard cast iron which according to modern engineering practice, is recognized as the best material for this type of bearing. It obtains a glazed surface which reduces friction and insures long life. The crank bearing is extra long and is split and clamped in position by the forged steel connecting rod. The shaft boxes are cast solid with the main frame, doing away with separate box caps and bolts which continually cause trouble. These boxes are provided with removable bearings brushings which when worn by years of hard and constant usage, can be replaced at a fractional part of the cost of rebabbiting the old style bearing.

The Friction Pulley operates in connection with a taper friction cone and gives the operator perfect control of the speed and weight of the blow.

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ACCESSORIES AND SUPPLIES OF INTEREST TO THE TRADE.

(Continued from page 40)

Lubrication—Ram guide, contact surface of friction and crank bearing are oiled with a hand oiler, the latter being drilled and grooved. Front shaft bearing is provided with grease cup, the rear shaft bearing and the pulley bearing are both oiled by means of one grease cup screwed into the rear of the hollow shaft.

The Mayer Power Hammer is made in 4 sizes and is guaranteed to give satisfactory service. Further information may be had by writing to Kaukauna Machine Works. Kaukauna, Wisconsin. Ask for circular.

DYKE'S AUTOMOBILE ENCYCLOPEDIA—TENTH EDITION—JUST OFF THE PRESS

960 Pages, 3362 Illustrations
6,000 Lines of Index

This remarkable book has again been revised and greatly improved. It could appropriately be termed a "Repairman's Guide". In addition to its mass of information on automobiles, covering every detail from the construction and repair of the axle to the repair of radiator and top, many new subjects have been added. For instance; how to make electric tests of the starting motor, generator, battery, coils, magnetos, etc. In fact, the subjects are dealt with in such a simplified manner that one can almost understand by a mere glance at the numerous illustrations.

The storage battery subject is profusely illustrated, and anyone who can read English can soon learn how to diagnose trouble, dis-assemble, repair, assemble and recharge batteries. A feature of this instruction is a simplified explanation of the "cadmium test" of a storage battery. One naturally thinks of a very technical and complicated subject, but after reading this subject and a glance at the numerous illustrations the "tech" part becomes perfectly clear.

Then there are many other subjects which the average repairmen must know about, such as fitting pistons and piston rings, etc. In order to do this work intelligently he must know how to work in thousands part of an inch. This subject is so simplified, even the laymen could do this work, after studying the instruction.

The tire subject is very interesting. One learns the difference between the "molded" tire and "wrapped tread" tire. The difference between "fabric" tire and the "cord" tire, and the advantage and disadvantage of each. Such subjects as blow-outs, stone bruises, loose treads, etc., are thoroughly treated with an explanation of the cause and how to repair.

The subject of vulcanizing not only deals with the "sectional" method, but also the "wrapped tread" method. The equipment necessary to start into the tire repair business is also dealt with. In fact, many pages are devoted to the subject of, "how to start into the different branches of the automobile business," from building and equipping a home garage to that of one for business.

The book covers practically every phase of the automobile industry and deals with automobiles, trucks, tractors, motorcycles, airplanes, airplane engines, including the Liberty engine, fully illustrated.

There are supplements with 332 illustrations on the Ford and Packard car, part printed in colors. Every detail of the Ford is explained. For instance, how to rebuild a Ford and make it do 60 miles per hour; how to make every known repair from the axle to the engine.. The Ford new electric system is fully illustrated, in fact the illustrations go so far as to show the internal wiring of the "cut-out" and its principle of operation. There are also five colored inserts, a dictionary, and a lot of more valuable information too numerous to mention.

The author, Mr. A. L. Dyke, is a pioneer. He originated the first automobile supply business, published the first practical book on automobiles and manufactured and marketed the first constant level (float feed) carburetor in America. Mr. Dyke's latest origination is that of working models, of parts of the automobile, for instruction by mail.

This tenth edition sells for $5.00, and is sent postpaid by the book department of the American Blacksmith, Auto & Tractor Shop, Buffalo, N. Y.

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C. R. McFARLAND, Kingsville, Ohio.

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FOR SALE:—Automobile, Marine and stationary engines 1 to 100 H. P. Best makes, good condition, very low prices. State your power needs. We take engines in trade. What have you? Magnetos, coils, carburetors, mechanical oilers, water pumps, etc. Also car parts of every nature sacrifice prices. Write about your requirements.
BADGER MOTOR COMPANY, Milwaukee, Wis.

ACCESSORIES AND SUPPLIES OF INTEREST TO THE TRADE.

NEW STYLE "S" CURTIS OUTFIT

The Curtis Pneumatic Machinery Co. of St. Louis are offering on the market a new outfit known as their Style "S". The outfit includes an air comprssor with hand unloader and tight pulley, welded steel pressure tank with air gauge, drain cock and pop safety valve. The piping between compressor and tank is made specially substantial and of convenient pattern to save floor space and prevent breakdowns and trouble. Has an outlet cock made in five different sizes up to the usual Curtis standard of excellence, and is ideal for those seeking a complete outfit at a minimum outlay, for they will deliver more air than portable machines that cost from two to three times as much. The Curtiss Pneumatic Machinery Co. issue an interesting little booklet which is setn free to those interested. Write for it.

Inventors' Manualy—How To Make a Patent Pay—Hopkins, 120 pages, cloth binding Price $1.25, postpaid.

This book is designed to guide invenors in perfecting their inventions, taking out their patents and disposing of them. It is not in any sense a patent soicitors' cicular nor a patent brokers' advertisement. There are no advertisements of any description in the work. It is a book containing a quarter of a century's experience of a successful inventor, together with notes based on the experience of many other inventors.

New Second Edition Iron and Steel—Including allied industries and sciences by Hugh P. Tiemann, 514 pages, flexible pocket size, illustrated, postaid $4.00 This is a dictionary, an encyclopedia, a handbook on iron and steel all in one. The metallurgist, mill superintendent, salesman and other will find it of daily use.

The book presents nearly 8,000 terms and definitions of processes and equipment —so arranged that you can find exactly what you want quickly. It brings together and translates the varied nomenclature of the mill, the laboratory and the office. It defines the treatment or iron and steel and gives ample cross references. It supplies brief, valuable treatises on essential topics and also much special reference data.

The new second edition is almost twice as large as the first edition and is a practical handbook for the man who wants a brief, reliable guide and index to iron and steel manufacture and metallurgy.

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ACCESSORIES AND SUPPLIES OF INTEREST TO THE TRADE.

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No. 1 (STORM CYLINDER REBORING MACHINES)

The annual dull season for garage and motor repair shop is fast approaching and by the time that "old winter" has put in his appearance the pleasure driving will be over for the season and motor operation confined strictly to necessary business transportation. Often this decrease in operation compels the otherwise busy shop to shut down temporarily, or at least to become for the most part, a loafing place for the mechanics rather than a money making proposition.

The problem that confronts the shop manager is how to overcome this condition and keep his shop paying a profit the year around. There are thousands of old cars in every locality badly in need of rebuilding and thorough over-hauling and this "dull season" is the logical time for this work. The shop properly equipped for this class of work is always sure of profitable employment.

The Storm Manufacturing Company of Minneapolis, Minn., have placed upon the market a line of Motor Repair Equipment which, when added to the tools usually found in the ordinary repair shop will enable them to thoroughly renew the motor throughout.

As the cylinders and pistons form the power producing chamber and as they must be kept in good condition, cylinder reboring obviously forms an important part of proper motor re-building and the Storm Standard Reboring Equipment is wonderfully efficient for this class of work. It is admirably suited to the needs of the average repair shop, being extremely simple and easily operated and having a range of adjustment sufficient to take care of practically all makes and sizes now in common use. Its capacity ranges from 2⅝ up to 6 inches and is also put out in various smaller capacities to meet different requirements.

The cutters are of a new Duplex Spiral type, which take an alternate right and left hand shearing cut and are adjustable to take any oversize. They are carried in the cutter head, which is provided with upper and lower center bearing and with positive feed.

The tools are self centering and one operation rebores and finishes a cylinder to the required size, a very valuable feature.

The Storm connecting Rod Tool is an ideal equipment for testing and for straightening and reaming the bearing, producing in a moment's time a perfetly aligned and mechanically perfect, true bearing. The important new and exclusive feature of this tool is the supporting lugs and screws and the new bearing reamer. The reaming is a time and trouble saving feature, producing a new bearing much more accurate and in much less time than by any other method.

The new Storm Main Bearing Babbitting and Boring Tools, which are now being put out for renewing the Ford and Fordson main bearings, are simple and substantial. Each comprises a heavy, substantial jig held in correct position by special aligning arbor passing through cam shaft holes, as shown. A special babbitting arbor, with improved provision for pouring the metal is provided. It is constructed to provide ample surplus metal to insure the pouring of a perfect bearing at each operation without difficulty and without dangerous pre-heating. The boring bar, provided with twelve special cutting edges and a positive feed cuts away the surplus metal and leaves a new, perfect bearing in the exact position of the original, as produced at the factory.

Leaky valve seats and worn stem guides are the source of much trouble and annoyance and require real attention, if the motor is to be considered thoroughly rebuilt. It is practically impossible to get anywhere near satisfactory results where the valve stems fit the guides loosely and where the valve seat has become widened as they will thru constant wear and numerous regrindings.

The Storm Valve Port Renewing Tool remedies all these defects by enlarging the port, reaming a new perfect seat and a new stem guide so that when new valves with oversize stems are installed the valve system will be in perfect shape, same as a new motor.

Many shop men do not realize how easily

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ACCESSORIES AND SUPPLIES OF INTEREST TO THE TRADE.

(Continued from page 42)

a piston may be forced out-of-round and otherwise injured or a connecting rod sprung or bent while using the ordinary bench vise for assembling. If these parts were more often tested for accuracy, more special piston vises would be used.

The Storm Piston Vise or Clamp is a neat, simple, and inexpensive tool especially adapted for holding the most popular sizes of pistons, having quick adjustment from 3 11-16 to 4 inches, this taking in Chevrolet, Ford, Dodge, Fordson and other motors of similar sizes.

The Storm Mfg. Co. of Minneapolis, Minn., will send further information and catalog to any interested person if they mention the American Blacksmith when writing.

Metal Worker's Handy Book of Receipts and Processes, by William T. Brannt, author of "The Metallic Alloys" 5½ by 7½ inches, cloth binding, price, $3.00, 590 pages, 82 illustrations.

Somewhere, in some American or foreign technical journal appears just the process or formula that will meet your need of the moment; but unless you are master of several languages and possessed of unlimited time, there is small hope of finding it. The editor of the Handy-Book has performed this service for you. He has searched innumerable books and periodicals for the best they have to offer; his trained judgment has allowed very little of interest and importance to the metal worker to escape, and any desired item may be found here in a few seconds.

The utmost pains have been taken to insure the accuracy and efficiency of the receipts, so that with ordinary care as to quantities and manipulation the results may be implicitly relied upon. Under Alloys, all applications, both utilitarian and artistic, are given, from gun metal, bearings, and brasses to jewler's alloys and statuary bronze. There are numerous pointers and annealing, hardening, and tempering, on bronzing and coloring, and on casting and founding. Processes for electro-depositio of various metals are plentiful and dependable, and there are cements for all imaginable purposes. Wire, an important product, receives adequate attention, and the machinery for its manufacture is described and illustrated.

This latest edition has entirely new chapters of Flame Welding and Cutting; Thermit Welding; Electric Welding; Galvanizing, Schoop's Spray Process; Die Casting. Altogether about forty pages and twenty new illustrations have been added to the work. The treatment prunes out mere technicalities and omits everything not essential; a single article often embraces data from many sources, thus telescoping the most valuable related facts into the smallest compass—an inestimable service to the busy man.

Synopsis of Contents: Chapter I. Chemical Relations of the Metals. II. The Most Important Metallic Preparations, and the Chemicals used in the Metal Industry. III. Directions for the Determination of the Constituents of Metallic Alloys. Impurities of the Technically most important Metals, etc. IV. Alloys and Amalgams. V. Annealing, Hardening, Tempering. VI. Bronzing and Coloring. VII. Casting and Founding. VIII. Cements. IX. Cleaning, Grinding, Pickling, Polishing. X. Decorating, Enamelling, Engraving, Etching. XI. Electroplating, Brassing, Coppering, Galvanizing, Gilding, Nickelling, Silvering, Tinning, etc. XII. Fluxes and Lutes. XIII. Lacquers, Paints, and Varnishes. XIV. Soldering and Solders. XV. Welding and Welding Compounds. XVI. Wire Manufacture, Brassing, Coppering, Electro-plating, Galvanizing, etc. XVII. Miscellaneous. XVII. Flame Welding and Cutting. XIX. Thermit Welding. XX. Eecltric Welding. XI. Galvanizing, Schoop's Spray Process, Sherardizing. XXII. Die Casting. INDEX.

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BADGER MOTOR COMPANY, Milwaukee, Wis.

A BARCUS SHOEING STOCK to trade for 1 fire electric blower or large emery stand.
CLYDE CONRAD, Chambersburg, Ill., Box 177.

FOR SALE—A shop, equipped with modern, power driven machinery, building and equipment quite new. Plenty work. Price is right.
C. W. STREBEL, Arlington, Minn.

FOR SALE—Two Upholsters "Singer Sewing Machines" 8 inch arm. Price $35.00 each.
CRAM & SON, Geneva, N. Y.

ONE LITTLE GIANT TRIP HAMMER 50 lbs. Head, one Emory stand, one Stoddert Tire Shrinker, one Renolds Tire Bolting Machine, one 12 H. P. Sando Gasoline Engine. All in good condition.
LOUIS NEHRT, Coldwater, Kans.

FOR SALE—Blacksmith shop in La Maille well established and up to date equipment with electric power for particulars address.
W. A. CRANE, La Maille, Ill.

SAVE MONEY and time doing your blacksmithing making solid welds and doing hard jobs easy with Toys modern methods on blacksmithing.
Hardening and tempering all tools to a standard with colored tempering charts showing the color each tool should be, all for one dollar. Send for free samples.
W. N. TOY, Sidney, Ohio.

ACCESSORIES AND SUPPLIES OF INTEREST TO THE TRADE.

"BARCUS HORSE STOCKS"

Many Blacksmiths will find it a very good investment to purchase a Barcus horse stock for wild and vicious horses. Each year many Blacksmiths are killed. others injured for life, trying to shoe wild horses without a stock.

The Barcus stock consists of two frames hinged to the wall about two feet six inches apart, the average width of a horse, and being hinged they will adjust themselves to the correct width as it is best to let the frames come close to the sides of the horse.

The frames being made in the form of a triangle makes it impossible to break them down, and yet you have perfect freedom of room while operating on the horse's foot.

The frames are hinged to the wall, and when not in use can be swung close beside the wall of the shop, entirely out of the way; also makes it perfectly easy to get a horse between the frames,—you simply tie the horse to the wall and swing the frames beside him. There is a rope breast band permanently fastened to one frame which comes across to the other frame and fastens with a cam. which limits the forward movements of the horse. It is necessary to have a girth as some horses lie down.

There is an automatic clamp, which fits on the foot. and it can be raised in any position desired by the Blacksmith while shoeing the horse, thereby you take no chances. For further particulars and information write the Barcus Mfg. Co., Wabash. Indiana, mentioning the American Blacksmith Co., Buffalo, N. Y.

"ANTI-BORAX BRAZING AND WELDING FLUX"

Anti-Borax is used for brazing and welding of cast iron brass, and cast-iron, aluminum, or crucible cast steel, by oxy-acetylene, are some of the best fluxes on the market. They soften the welds, exclude the bubbles and remove all impurities from the metal.

(Continued on page 42)

ACCESSORIES AND SUPPLIES OF INTEREST TO THE TRADE.

(Continued from page 38)

E-Z Welding Compound is used between the laps of welds and is conceded to be one of the best on the market for welding all grades of steel. It welds at a low heat and sticks at a low heat and leaves no scale.

Anti-Borax Welding Flux for Cast Iron. Anti-Borax Welding Flux for cast iron acts as a cleansing agent, removing all impurities in the metal and the weld. It also prevents formation of oxide and causes a fine granular and more ductile structure of the weld, thereby reducing liability of shrinkage cracks in the metal at the weld when cooling to minimum.

For further information and particulars, write; Anti-Borax Compound Co., Fort Wayne, Indiana, U. S. A., mentioning the American Blacksmith Co.

"GILL PISTON RINGS"

Trucks and pleasure cars are constantly having engine trouble, which is caused by fouled spark plugs. and carbon trouble. both of which can be overcome by the use of the Gill Piston Ring It is made from single pieces castings of a special gray iron, and are machined to absolutely accuracy. You will find the Gill exceedingly simple to install.

The Gill is a simple one-piece ring which requires little or no fitting, thus affecting a saving in gasoline or lubricating oils. adds power to your motor and prolongs the life of your car

For further information write to the Gill Mfg. Co.. 352 W. 59th St., Chicago, Ill., mentioning the American Blacksmith Co.

"BICKMORE'S GALL CURE FOR HORSE"

A blacksmith can add a great deal to his income by selling "Bickmore's Gall Cure" for horses. No farrier should be without Bickmore's at any time. It can be used with equally good results on other animals. It is a splendid remedy for common Mange. It can be used for healing cracked sore teats on cows, on poultry, for scaly legs, wounds and sores.

Bickmore's Gall Cure has been successfully used on human flesh for burns, bruises, ring worms, eczema, or other skin troubles. The wonderful healing qualities make it valuable in many cases, and it will be found the greatest of use at all times. For further particulars and catalog., write the Bickmore Co., Old Town. Maine. mentioning the American Blacksmith Co.

"ROTO ELECTRIC BLOWER"

Don't waste time blowing your forge by hand. Do you realize that you spend from two to five hours per day blowing your forge. If you install the Roto Electric Blower you can save this time. Your time at only .50 per hour and two hours per day means $1.00. The Roto blows your forge and leaves your hands clean for other work, and makes your work much cleaner. It is equipped with 1/6 H. P. motor fully enclosed. absolutely dustproof, no holes for ventilation or dirt to get in. It is air cooled, will not overheat, and is equipped with a guaranteed oiling system, and aluminum fan gives a whirlwind's blast with a minimum weight on bearings. For further information, write the Rosewater Electric Co.. No. 5516 Kinsman Road, Cleveland. Ohio, mentioning the American Blacksmith Co.

"ROWE SCREW CALKS"

Rowe screw calks are manufactured from the highest grade of material especially made for them, according to their specifications. A core of tool steel is surrounded with softer stock, rolled into billets and drawn thru wire.—during this operation the two materials are welded together. The calks are made on automatic machines, and when shoulder is formed, the steel cores enlarge at that point, thus anchoring the center permanently in the calk, absolutely preventing the center from dropping out.

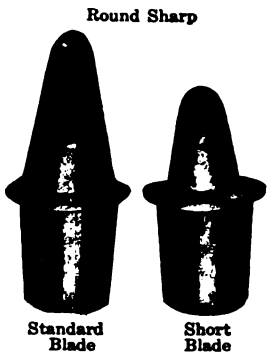
After being threaded, the calk is hardened by a process that affects the tool steel center, leaving only the outer portion soft, so that the calk is self sharpening when in actual use, as the outer portion being soft wears faster than the hardened tool steel center. Rowe Drive calks are drop forged from special analysis material, and hardened so that the edge is diamond hard yet not brittle. The temper is drawn from the edge, making the blade tough and leaving the shank soft, so that it will fill in the shoe holes. Shank is ribbed to prevent calk from turning in shoe. Rowe Drive calk are correctly designed and accurate in size of the shank and blade.

Rowe Drive Calk are put up in cartons of 50 each, and packed for shipment in strong wooden boxes containing 1,000 calks of size and style.

The same careful attention given the production of screw calks is used in producing the Presto-O Grip all chain Unit. It is made from two lengths of chain and three lock links out of regular stock carried by all jobbers. For further particulars concerning these articles, write Rowe Calk & Chain Co., Plattsville. Conn., mentioning American Blacksmith Co.

(Continued on page 46)

The weight of a heavy man suspended from this calk failed to budge it.



The same man's entire weight failed to twist this calk so much as a hair.

DIAMOND Calks

Fit Absolutely Tight

don't twist in the shoe or fall out, and we know it because—

FIRST—We make them so accurate that the calk holes and the calk shanks don't vary 1/10000 of an inch in diameter.

SECOND—The extra heavy reinforcing around the calk hole adds 50% to the grip of the calk.

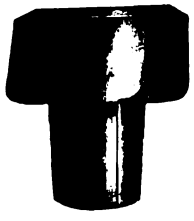
THIRD—The small ribs on the calk shank bite into the sides of the calk hole and prevent twisting.

FOURTH—We've made severe tests in our shop which show that the weight of a heavy man suspended from the calk can neither pull it out nor twist it so much as a hair.

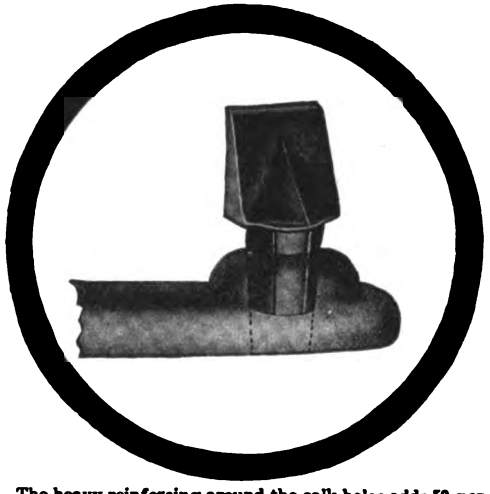
FIFTH—Users of Diamond Calks unhesitatingly testify to their accuracy of fit, and—

There's a Diamond Calk for every purpose

Diamond Calk Horse Shoe Company
DULUTH, MINN.



The shanks and calk holes are so accurate as not to vary 1-10,000 of an inch in diameter.



The heavy reinforcing around the calk holes adds 50 per cent to the "grip." The ribs on the shank absolutely prevents turning or twisting.

ACCESSORIES AND SUPPLIES OF INTEREST TO THE TRADE.

(Continued from page 42)

"ADMIRAL WLELDING EQUIPMENT"

The success of a welding business depends to a great extent on the apparatus made for this work.

The Admiral welding torch is a marvel of simplicity, efficiency, and economical operation. It is so constructed that a perfect mixture of gases is secured, which insures not only a material saving of gases, but enables you to make a better weld, on less time than with a torch requiring a heavier pressure. The tips are made of copper, which is universally recognized as the best material for this purpose and are interchangeable.

Admiral Carbon Remover: This carbon removing torch is a special design and is one of the best tools of its kind on the market. It carries a pilot flame of acetylene, thus doing away with the use of matches, swabs or wax tapers. Its construction makes certain every particle of carbon will be removed from the cylinder, and job will be finished in half the usual time.

Welding glasses: The lenses of these glasses are colored in such a manner as to form the best protection for the eyes from the glare of the Oxy-acetylene flame. For further particulars and catalog, write the: Admiral Welding Machine Co., mentioning the American Blacksmith Co.

"GIANT GRIP TRACTION EQUIPMENT FOR MOTOR TRUCKS."

Your motor trucks are not delivering 100% efficiency if they are not equipped to pull thru deep mud, sand, snow, or gravel without a stop.

Your truck may not encounter such a road condition for weeks, but one lay-up at a mud-hole will cost enough to convince any truck owner that proper traction equipment is necessary equipment, it is actual insurance against loss of truck time. And lost truck time means a profitless overhead in labor, equipment, and fuel. By advising model and name of your truck we will be pleased to inform you what equipment you should use. For further particulars and information write: Challoner Co., Oshkosh, Wisconsin. mentioning American Blacksmith Company.

"STAN-PAR" SPRING SERVICE

Much might be said concerning the vital importance of the right spring suspension if motor cars are to be serviceable, and comfortable and meet the wear and tear of the average road It is apparent to everyone, however, that efficient springs not only save the motor and other parts of the car from unnecessary injury, but they also contribute to the life of the tires by easing the shocks they must undergo and giving a buoyancy to the load they carry. The difference between good springs and poor springs is a matter of economy, therefore, even before we come to the important fact that poor springs will not stand anything but the lightest service, or possibly not that. They have no reserve for the unexpected shock or strain.

Stan-Par springs are not built to meet competitive prices Each spring is made to fit the particular model and type of car listed from authenic data, not guesswork All springs are made from high grade steel, triple heated and all tempered. For further particulars and catalog, write Standard Parts Co., Cleveland, Ohio, mentioning the American Blacksmith Auto & Tractor Company

"THE ROSE TIRE PUMP PATENT"

The Rose Tire Pump, by eliminating friction, insuring a full supply of air in pump with a positive pressure, and no leakage in the pump valve, simple heavy steel construction throughout. The Rose tire pump with its patent valve has reduced the labor of inflating tires, making the job easier, quicker and surer. It produces that the Rose Tire Pump is all that the name implies.

THE ROSE SHOP GREASE GUN

This is another of the good Rose products. Every garage man or motor truck operator in the world should buy a grease gun. It will relieve them of all the dirt and troubles incidental to lubricating their machines successfully This gun can also be used in cleaning transmissions and differentials. It will inject and draw out all the gasoline and dirt.

These guns are made from heavy steel with a steel arm on each side to make them easy to operate. They cannot be damaged in any way by hard knocks. It will suck up thru the nozzle all kinds of oil and most grades of grease. It fills easily with hardest grease after nozzle is removed. For further information write the J. H. Haney & Co., Hastings, Nebraska, mentioning the American Blacksmith Co.

Here's Proof of "The Universal Service"

ALASKA or Atlanta—no matter where you do business—you'll find one of the 40 Prest-O-Lite Plants and Warehouses your best and handiest source of acetylene supply.

Wherever repairs are needed, there you will find good welders using and depending upon

Prest-O-Lite

DISSOLVED ACETYLENE

The Universal Gas With The Universal Service

Prest-O-Lite Service goes wherever you can go; does any kind of a welding or cutting job for the least time and money cost.

Write for the Service Plan, It's Interesting

THE PREST-O-LITE COMPANY, Inc.
General Offices
30 East 42nd Street, New York

Kohl Building, San Francisco

In Canada
PREST-O-LITE CO. OF CANADA, Limited
Toronto

P.W.-501

ACCESSORIES AND SUPPLIES OF INTEREST TO THE TRADE.

"CHAMPION SPARK PLUG CO."

The spark plugs with which the Overland Model 90 was equipped when it made its record-breaking, seven day, non-stop, sealed-in-high-gear run recently at Oklahoma City, still are giving the efficient service after a total of nearly 10,000 miles of gruelling road travel.

This was disclosed a few days ago when the car arrived at the Willys Overland Factory, in Toledo following a 1200 mile trip from Oklahoma City.

The original Champion Spark Plugs never have been replaced since Model 90 left the home factory a little more than three months ago. In the interim the car has established a new world's record for seven day non-stop run by offically registering 4370.1 miles and has traveled an additional 5,000 miles in touring over some what uncertain roads of Oklahoma, Missouri, and other states.

The motor came through the seven day run with a perfect score. It ran continuously and not once did its cylinders so much as miss an explosion

Drivers attributed this to the dependable performance of the Champion plugs, which, at the conclusion of the long grind, showed little evidence of the test to which they had been subjected.

The Champions continued to demonstrate their dependability in the car's additional travel, which embraces a tour of the entire state of Oklahoma a journey thru the rutted roads of the Ozark Mts. and a trip across the state of Missouri, Illinois, Indiana, and part of Ohio. Examination a few days ago disclosed that they are still capable of efficient service for at least several hundred miles.

The Champion Spark Plug Co., of Toledo has outlined a production program for 1919 which is intended to surpass all previous records.

The program call for the production of 35.000,000 spark plugs, which is 10,000,000 more than were made in 1918. With this increase in production the Champion Spark Plug Co., will continue to market 65% of all spark plugs produced in this country.

To provide for this increase in output the Company has enlarged its present factory buildings and added to its factory equipment.

The Champion Spark Plug Company is a $5,000,000 concern employees approximately 700 worker in the main plant and 750 worker in the insular plant in Detroit, Mich.

For further information and catalog, please write the: Champion Spark Plug Co., Toledo, Ohio, mentioning the American Blacksmith Co.

"STAN-PAR" SPRING SERVICE

The relationship of correct spring suspension in motor car construction to real service and riding comfort is self evident yet few realize the important part which springs play in motoring.

To thoroughly absorb and neutralize the severe shock and strain to which the average road subjects the motor car is of vital importance.

Spring service is not confined to giving the motor vehicle its riding qualities but also to giving it a true economy in greater tire mileage and longer mechanical life thru perfect bouyancy and resiliancy.

Stan Par Srings are built not to meet a competitive price but to accomplish the maximum in spring service. With this in mind the results of a thorough study of every individual motor car need plus correct engineering principles have been incorporated in Stan Par Springs.

For full particulars and catalogue address Standard Parts Co., Cleveland, Ohio, mentioning The American Blacksmith Co.

GIANT GRIP TRACTION EQUIPMENT FOR MOTOR TRUCKS"

Motor trucks are not preared to give a 100% efficient performance at all times if they are not equiped to pull through deep mud, sand, snow, or gravel without a stop.

Your truck may not encounter such a road condition for weeks but one lay-up from this cause will convince any truck owner of the economy of proper traction equipment. Insure yourself against every possible loss of truck time and consequent increase of profit eating overhead. We would be pleased to meet your special requirements and on receipt of information stating made and model of your truck will advice what equiment we would recommend. For further particulars address Challoner Co. Oskosh, Wisconsin, mentioning The American Blacksmith Co.

"THE ROSE TIRE PUMP PATENT"

The secret of the Rose Tire Pump is in the patent valve. By eliminating friction and leakage it insures a free easy action and positive pressure at all times.

It is another Rose product and is all that the name implies.

The Rose Shop Grease Gun is another labor saving device. Its value in facilitating the work of lubricating and cleaning differentials and transmissions makes it indispensable to garage men and truck operators. It is built of heavy grade steel. is easily filled and practicaly indestructable. For further information address, J. H. Haney Co., Hastings, Nebraska, mentioning The American Blacksmith Co

(Continued on Page 44.)

ACCESSORIES AND SUPPLIES OF INTEREST TO THE TRADE

(Continued from page 40)

"ADMIRAL WELDING EQUIPMENT"

If your business is welding you can not afford to use anything but Admiral Weld-Equipment. The Admiral Welding Torch is so constructed that a perfect mixture of gases is secured, insuring not only a material saving but a quicker, better welding job. The tips are made of copper, the best material for this purpose and are interchangeable. It is a marvel of simplicity, efficiency and economical operation.

The Admiral Carbon Remover has been specialy designed to end carbon removing troubles. It carries a pilot flame of acetylene thus doing away with the use of matches, swabs and wax tapes. It removes every particle of carbon and cuts the usual time required in half.

The lenses of these glasses are so colored as to form the best protection for the eyes from the glare of the Oxy-acetylene flame. For further particulars and catalogue address, Admiral Welding Machine Co., Kansas City, Mo., mentioning The American Blacksmith Co.

Whisler Mfg. Co. Jointer heads save time, money and lumber. The increase cost of wood stock and lumber compels the wood worker to use such tools as will save material. This company claims that with the use of their Jointer Heads any kind of rough lumber can be dressed to suit any particular job.

Wood workers are requested to make their problems known to them and they will endeavor to show how a saving can be made. Circulars and prices will be sent on application to the**Whisler Mfg. Co. Gibson, Iowa.** when mentioning the American Blacksmith.

ACCESSORIES AND SUPPLIES OF INTEREST TO THE TRADE

JENKINS VULCAN SPRING COMPANY ANNOUNCES CHANGES OF PERSONNEL

T. B. Jenkins, president of the Jenkins Vulcan Spring Company, of Richmond, Ind., announces the following additions to the personnel of the organization.

Mr. D. T. Hersey, has commenced his duties with the Jenkins Vulcan Spring Company as sales manager, with his office at general headquarters of the company at Richmond, Indiana. Mr. Hersey was formerly assistant general sales manager for the Splitdorf Electrical Company, Newark, New Jersey.

Mr. A. L. Ellis is now production manager. Mr. Ellis is one of the pioneer leaf spring makers of this country, having been associated with the production of leaf springs for over twenty years. He comes to the Vulcan Company from the spring division of the Detroit Steel Products Company.

In line with its established policy of maintaining complete stocks at numerous points readily accessible to dealers, the Jenkins Vulcan Spring Company has just opened a new branch at 2043 West Broad Street, Richmond, Virginia. The addition of this latest branch makes a total of eight of this company's own direct factory branches with strategic locations throughout the United States, as follows:

Jenkins Vulcan Spring Company, 6th & Washington Ave., Richmond, Indiana.
Jenkins Vulcan Spring Company, 1206 Hennepin Ave., Minneapolis, Minnesota.
Jenkins Vulcan Spring Company, 48 Auburn Ave., Atlanta, Georgia.
Jenkins Vulcan Spring Company, 538 Franklin St., Reading, Pennsylvania.
Jenkins Vulcan Spring Company, 2043 West Broad St., Richmond, Virginia.
Jenkins Vulcan Spring Company, 819 Boylston St., Boston Massachusetts.
Jenkins Vulcan Spring Company, 1312 McGee St., Kansas City, Missouri.
Jenkins Vulcan Spring Company, 2216-18 Commerce St., Dallas, Texas.

From any of these branches the dealer can get any spring called for, with a minimum of delay. The branch stocks are replenished from the reserve of 100,000 springs at the factory.

COMPLETE PRACTICAL MACHINIST

The Complete Practical Machinist needs no introduction to the mechanical world. The instant recognition given its first edition grew into universal popularity with each succeeding edition. This enviable reputation among other works of its class has been sustained through 19 editions, each edition bringing the work abreast of and even in advance of the latest methods and improvements in machine shop practice.

The last edition, the 20th, compiled and revised by the original author, Mr. Joshua Rose, M. E., takes its rightful place as the "Machinist Bible". It's sterling merit has been greeted with a quick welcome by practical men throughout the metal working trades, indicating an even greater distribution than ever.

Its scope has been greatly enlarged, embracing now, chapters from "The Cutting of Tools for Lathe and Planing Machines" to "How to Set a Slide Valve", written in the language of the machine shop, and illustrated by fine engravings. Throughout the classic the explanations are as clean cut as the tools they describe. The book recommends itself to the earnest mechanic and machinist seeking to increase his efficiency and thereby his earning power, as well as to the advanced and skilled workman who finds such an aid to his own knowledge indispensable. No metal worker's library is complete without a copy of this useful work.

The book measures 5¼ x 7½, is bound in cloth and contains 547 pages, 432 illustrations, and sells for $3.00. Henry Carey Baird & Co., Inc., Publishers of Mechanical and Industrial Books, 116 Nassau Street, New York, N. Y.

UNCLE SAM'S SCHOOL OF MOTOR MECHANICS

John B. Woods

A goodly number of first class truck and tractor mechanics were made by the army during our recent visit in France. Officers suddenly found themselves possessed of great powerful machines, which they never had even seen back in the States, and they

ANOTHER TYPE OF THE MODERN JUGGERNAUT

immediately got busy and found men to run them and keep them in shape, for they knew if they did not somebody else would be putting in a claim for the machines by virtue of being better able to make use of them. That was the governing condition, to make best use of all the good new equipment. So it came about that young chaps who never had done more than steer touring cars along country roads were shoved into overalls and put to work upon giant tractors under the guidance of certain experts, who are always to be found for any kind of an emergency in any body of first class men.

And now that the fuss is over, and the mechanics have gone back to their wealthy parents or to jobs where their new trade can earn money for them, or have remained in the army as several have done, Uncle Sam is profiting by his experience and is conducting a school for other young men who want to learn a good trade. Of course he is building around the nucleus of old experienced men who staid with him after the emergency was past. And naturally enough the man who wishes to profit by the chance to learn must enlist in the branch whose work most appeals to him. But the modern army is greatly different from the old regular establishment, and an enlistment in this new aggregation is so full of promise in many ways that it cannot be considered as anything but a course of education.

They used to say that an army fought on its belly. Now they must change it for an army of today certainly fights with its gasoline tanks. A hungry man at the firing line is worth more than one well fed who is fifty miles away, for motor trucks can bridge the distance. Tractors in their various forms have changed the very conduct of war. They bring up the heavy artillery and anti-aircraft. They convey food and munitions to places where the wheeled vehicles cannot go, and with their protecting walls of steel they go ahead with the first wave of shock troops and mow down the enemy and destroy his morale. Naturally enough where there are tractors there must be men who know their insides and dispositions.

You cannot escape the motor vehicles in the new army. Even if you join the cavalry you probably will find supply trucks following your practice hikes, and and if the ground is broken and the roads are not numerous your forage and grub may follow you on caterpillars. The artillery has its truck and tractor mounts and its wheeled batteries drawn by caterpillars. The Ordnance has its motorized repair shops and other gasoline craft, and offers probably the best chance for the mechanic who wishes to specialize in emergency shop-work. There is the Motor Transport Corps, which is charged with the transportation of an army under war conditions. Over in France the Quartermaster Corps handled the motor equipment until the new transport branch was organized. They always will have need of the best in motorized equipment for moving food and clothing. There are so many duties devolving upon the Engineers, that they require all the types of transports known to warfare. In the Air Service, or Aviation Section, or whatever its latest name may be, one will bump up against the same variety of equipment, depending upon local conditions under which it operates. In fact all through the army the motor expert is the man of the hour. And his position will become firmer and more important as time goes on and the army develops.

Down at Shreveport the other day, I wandered out into a field beside the railroad tracks and found a train load of motorized army equipment, in process of unloading. There were a dozen or more flat cars loaded with all kinds of engines of destruction and a few for reconstruction, as for example a complete mobile machine shop on three trucks. As I walked up they were teaming one of the old style British tanks down the gang plank, and despite its colossal size, that animated fortress cray-fished its way to the ground and wallowed away without the least difficulty or confusion. When the racket stopped two mechanics crawled out through a hole in the steel wall and sauntered up to the next one, a Whippet Tank awaiting removal. Then came one of Ford's finest, with two fliver engines to make it go. They played with this one a bit, chasing a few loafing negroes about the lot to show how quickly the light tank could turn. Then they brought down a battery of Seventy-Fives, with a tractor to pull the guns, and after that, the mobile machine shop. There was one long rifle with its tractor, and an eight inch howitzer mounted upon its own caterpillar, a wonderful new piece of ordnance. Last of of all came a great awkward German wheeled tractor, not a beautiful machine but quite powerful, according to the sergeant in charge. After the tanks had been gassed and oiled the soldiers crawled into their various places and drove through the streets of the city in a noisy but interesting parade.

A HEAVY HOWITZER MOUNTED ON A CATERPILLAR

They had their repair shop with them and knew how to make use of it. And at that they were no better than any man can be who inclines toward the army training and goes into the work with the idea of making the most of his opportunities. There was a time when a hitch in the army was considered as something of a final course in the technique of being a tough; it fitted the man for another enlistment and not much else. But now it offers him the training that will fit him for the big job of modern times.

ACCESSORIES AND SUPPLIES OF INTEREST TO THE TRADE

A. L. ELLIS

now production manager of the Jenkins Vulcan Spring Co., Richmond, Ind. Mr. Ellis has recently taken up his duties with the Vulcan Co., coming from the Spring Division of the Detroit Steel Products Co. His experience in the production of leaf-springs extends over a period of twenty yeras.

Mr. Ellis will have full charge of production to meet the demand of more than 8000 VULCAN dealers scattered throughout the United States and Canada.

BIG OIL TANK RUNS WILD

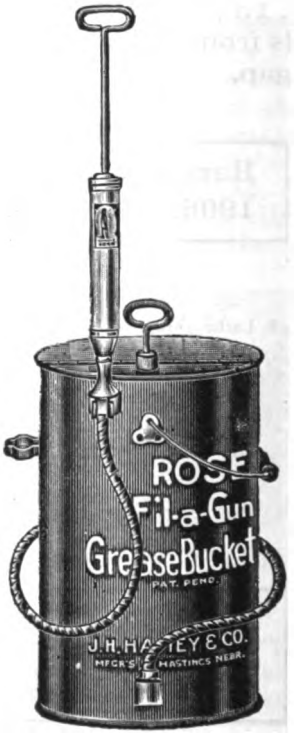
In a little Alabama town where the Welded Products Company, of Birmingham, was recently engaged in setting up one of its big oil storage tanks, the population witnessed the strange spectacle of a runaway tank in action. The tank, a great cylinder of the oxwelded type now superseding the riveted tanks in many places, was being lowered to its concrete foundation when the stay lines snapped, resulting in a sheer drop of a dozen feet. The empty cylinder bounced like a rubber ball from the hard base, which was several feet above the ground, hurtled to earth and started on a cross-country sprint that was not halted until it had flattened out a tool house in its path and plunged with resounding clangor a distance of two hundred yards across an adjacent field, where, its momentum spent, it rested.

The remarkable feature of the accident was that the tank, which was seemingly headed to certain destruction, was found on examination to have sustained no injury beyond a few dents in its metal plates. These were easily hammered out after the tank had been rolled back to its foundation and mounted. The oxwelded seams were intact and unimpaired at every point, no leak developing anywhere in the structure.

The staunchness of the big tank, which has a capacity of 15,000 gallons and which is 24 feet in length by 10½ feet in diameter, is attributable to the welding process used (oxy-acetylene).

THE FRANK ROSE MFG. CO., formerly the J. H. HANEY, & CO., of Hastings, Nebraska, have placed on the market a style of Grease Bucket which will be known as the ROSE FIL-A-GUN GREASE BUCKET.

The Grease Bucket has a new feature not found on any other device of its kind on the market.



Attached to the side of the bucket on a special carrier is a ROSE topper nozzle Grease Gun which can be placed on the special hose nozzle and filled completely full with a single stroke of the bucket pump.

The Gun is used to lubricate universal joints, cam gear cases, etc., that cannot be lubricated with the hose. The bucket also pumps direct to the gear set and rear axle assemble through the hose.

U. S. and Foreign Patents pending.

ACCESSORIES AND SUPPLIES OF INTEREST TO THE TRADE

The Tuthill Spring Company is another of the old, long established manufacturing concerns that uses young blood to boost every branch of the organization. Harold T. Moore, recently of the A. E. F. in France, where he served with the motor repair corps in the field, has been made Production Manager of the factory at Chicago. Mr. Moore's experience in making repairs, especially in the use of replacement springs or every sort of service truck and motor car, fits him for excellent service in the factory that builds Titanic Springs, used in greater numbers for replacements than all other makes combined.

Another recent appointment to the factory staff is George Boehm, who becomes Factory Superintendent.

D. S. Campbell, secretary of the company, is still another example of young ambition and ability early recognized. Mr. Campbell began as a Titanic Spring salesman, "Sold" himself into a position inside the office, became Sales Manager, and in addition to that, is now Secretary.

NOTICE TO OUR SUBSCRIBERS.

Many of our subscribers and readers undoubtedly noted our failure to show the trade-mark of the Jefferson Electric Mfg. Company in their March and April advertisements. To this company and our subscribers we wish to make due apology. Their well known trade-mark is here shown with an article which will be of interest to the electrical trade.

TRADE MARK

JEFFERSON COILS.

The Automobile Ignition Coil situation has, in the past, been a serious problem for jobbers, dealers and service stations, owing to the multiplicity of types on the market. Many jobbers and dealers have had to pass up the Coil Field almost entirely, because of the large and varied stock of Coils that would be necessary to take care of all requirements.

The Jefferson Electric Manufacturing Company of Chicago have recently placed on the market a line of Battery Replacement Coils and Fittings which are sufficiently flexible to displace any type of coil on battery-equipped cars. The extreme flexibility of Jefferson Coils is obtained from several features, which include the Fittings, Adjustable Caps, Terminals and Mounting Arrangements.

With a small stock of Jefferson Coils, any service station, garage or repair shop will be prepared for any emergency. Heretofore, it has been necessary to lay up a car for perhaps several days while a new Coil was being obtained. Now, however, any car can be placed in service within a few minutes. It is only necessary to remove the old Coil and connect the Jefferson.

Starting conditions require a Coil that will produce a hot, intense spark when the battery is at the lowest ebb. Jefferson Coils are guaranteed to take care of this extreme condition.

To aid jobbers, dealers, service stations and garage men, the Jefferson Electric Manufacturing Company have compiled a folder containing complete and authentic data covering all standard Battery Ignition Systems. This folder lists all makes of cars from 1912 to the present date, and gives the year, model, type of ignition and style of Jefferson Coil to be used for replacement. This folder will be sent free of charge to any dealer, garage, service station or jobber. Request should be addressed to the Jefferson Electric Manufacturing Company, Congress and Green Streets, Chicago.

NEW NAME IN OXY-ACETYLENE FIELD

The Oxweld Acetylene Company, of Newark, N. J., and Chicago, has recently extended its manufacture of oxy-acetylene apparatus and equipment to include 'EVEREADY" welding and cutting outfits.

"Eveready" is a new name in the oxy-acetylene field, but the apparatus is not new, excepting for certain refinements of design, having been used extensively in the metal-working trades for several years under the name of "Prest-O-Lite" apparatus.

The new name was adopted by the Oxweld Company to suggest the ready convenience, adaptability and general-purpose uses of the equipment. The apparatus is designed to use exclusively with compressed acetylene in cylinders, thus providing the welder and cutter a compact and complete portable outfit.

Eveready outfits and supplies are moderately priced and are sold through distributors direct to the retail trade.

Effect of Certification of a Check

RALPH H. BUTZ

The object of certifying a check is to enable the holder to use it as money. The drawer or indorser of a certified check cannot, after its delivery, revoke it or stop payment upon it by notice to the drawee not to pay. A bank that has received a certified check for deposit and has credited the depositor with the amount of it, is a bona fide holder and may enforce payment of it notwithstanding it may, before payment to the depositor, have received notice that the check was fraudulently obtained by the depositor.

By the law merchant of this country the certificate of a bank that a check is good is equivalent to acceptance. The object of certifying a check, as regards both parties, is to enable the holder to use it as money. A person takes a certified check with the same readiness and sense of security that he would take the notes of the bank. It is available also to him for all the purposes of money. Thus it continues to perform its important functions until in the course of business it goes back to the bank for redemption and is extinguished by payment.

It sometimes happens that the drawer of a check which has been certified notifies the bank to stop payment. The bank, however, has no right to refuse payment of a check which it has certified, as the following case proves:

In this instance the purchaser gave a certified check to the seller for goods which proved unsatisfactory to the purchaser, who then asked the bank not to pay the check. Upon the bank's refusal to pay the check the seller brought suit against the bank to recover the amount of the check.

The court held that the bank had no right to refuse payment, for when the check was certified it ceased to possess the character of a check and represented so much money on deposit payable on demand to the holder. The certification operated the same as though the bank had actually paid the money to the holder and he had immediately deposited it to his own credit.

In this decision the court said: "We find no authority for the proposition that a bank may resist the enforcement of its contract of certification in order to make a setoff available to its depositor. By common use such checks are treated for most purposes as the equivalent of cash. It would be an unfortunate rule that would impair their ready acceptance in the transactions of commerce. If the holder of a check, after procuring it to be certified by a bank, may be required to litigate the question whether the maker of the check had a right of counterclaim or setoff, the transaction has been safely closed until the cash has been collected. That has not heretofore been supposed to be true. The bank virtually says that the check is good; we have the money of the drawer here ready to pay for it. We will pay it now if you will receive it. The holder says no, I will not take the money; you may certify the check and retain the money for me until this check is presented. If the bank may resist payment whenever the drawer has omitted to take advantage of a right of setoff, the holder's safety is illusory.

"By the certification the bank enters into an absolute undertaking to pay the check when it is presented at any time before it becomes barred by the statutes of limitations, and the bank is stopped to deny that it possessed sufficient funds of the drawer to pay the check. It cannot be doubted that the certifying bank intended these consequences, and it is liable accordingly. To hold otherwise would render these important securities only a snare and delusion."

WHERE IS THE CUB?

What is the public going to do for blacksmiths in the future, there are very few men or boys learning the trade. One can go into the large or small towns and see only men of middle age, working at the fire. Personally, I know of four men, who are from 25 to 45 years of age, who were so impressed with the possibilities of blacksmithing, that in spite of the fact that they had never served a day's time learning the trade, they got a set of tools and started up a shop. Such men, despite their inexperience, take away a certain amount of work from the regular blacksmith, and all because people like to experiment with new comers.

It takes a man with the average amount of grey matter, from three to four years to perfect himself in the trade, and he carries about as many tables of weight and measures and expansion and contraction as any other mechanic.

There are all kinds of books on blacksmithing which are of course a big help, but a man would be decidedly out of luck, if he had to stop while shrinking a tire and go hunting through a book of tables for the proper amount of draught. Suppose one of these book mechanics should get a plow in the shop; one that had connected with a rock or stump and the beam was sprung up and over towards Jones'. What would he do? He might find directions for such a repair in some almanac, but it's a two to one shot that he wouldn't. Give me the man of a few years experience every time.

Old Timmer.

METAL CLEANING

The keeping of polished metal parts bright is a point which exercises the minds of both the mechanical and domestic possessor of such articles as are finished bright, and very largely both classes of persons concerned fall into the same errors. Thus, with lacqured goods which only want to be sponged over with water and dried with a soft leather to keep them in good condition for years, either ammonia or strong alkaline washes are used which remove the lacquer by chemical action, or abrasive polishes are used which remove the lacquer mechanically. With bare metals also acids are used instead of decently made abrasive polishes, and because they clean quickly the after effects are not considered until they are too bad to easily rectify. As a rule very little is needed to keep bright metal in good order if regularly cleaned, as a wad of hard thread waste and mineral lubricating oil will clean off several days' dirt, and with whitening, rotten stone, or extremely fine emery, plus "elbow grease", dirt of many weeks' accumulation is easily removed.

Mark Meredith.

Athens, Greece — Policemen of this city have an effective method of curbing speeding autoists. They carry planks studded with long, sharp nails and drop them in front of machines that are going fast. The chief of police finds the system is cheaper than maintaining a motorcycle squad.

WANTED AND FOR SALE

Want and For Sale advertisements, situations and help wanted, five cents a word. Send cash with order. No charge less than fifty cents. The small cost of these advertisements prevents our investigating and guaranteeing them. WE WILL NOT knowingly accept any but reliable ones.

WANTED—To hear from owner of good blacksmith shop for sale. State cash price, description. **D. F. BUSH, Minneapolis, Minn.**

AUTO-TOP AND SEAT COVERS $7 UP—parcel post prepaid. Easy to apply. Catalogue and samples free. **AUTO EQUIPMENT CO., 12 Canal, Cincinnati, Ohio.**

BLACKSMITH WANTED—To locate in good live growing town of about 300; large territory to draw from. Splendid opportunity. Shop can be bought or rented. Address **SECRETARY OF COMMERCIAL CLUB, Tolstoy, So. Dak.**

FOR SALE—Good house, five rooms, new, one acre land, large Blacksmith shop well equipped, four good out buildings and garden. Easy terms and a bargain to good man. Write **GEO. N. LAUFER, Baldwin, Illinois.**

FOR SALE—Blacksmith mach. shop, 2 acres plenty work, good prices.
Box. 86, Longbranch, Wash.

"WANTED AT ONCE"—A-1 Blacksmith and Mule Shoer in well equipped shop. Steady all year work to right man, at good wages. Apply to **GEO. E. STOCKING CANNING FACTORY, Rochelle, Illinois.**

ATTENTION!—Write us when in the market for Wheels, Hubs, Spokes, Rims, Shafts, Bows, Whiffle-trees, Crossbars, Springs, Axles, Dashes and Trimming Goods. We have a complete stock and our prices are right.
NESS BROS. & CO., York, Pennsylvania.

BLACKSMITH SHOP FOR SALE—Good house and barn. If interested don't miss it. Send for full particulars and description.
ROBERT BOWDEN, Clifton Springs, New York.

FOR SALE—One No. 1 (large size) Little Giant Punch and Shears; One House Spoke Auger machine with Wood hollow auger in it. One Tree Bender; One twelve H Sandow Gasoline engine; One Six H Gasoline Engine.
LOUIS NEHRT, Coldwater, Kansas.

ACCESSORIES AND SUPPLIES OF INTEREST TO THE TRADE

JENKINS VULCAN SPRING CO., PASSES 10 YEAR MARK

July 15th, 1920, marks the tenth anniversary of a pioneer in the spring replacement field—the Jenkins Vulcan Spring Company, of Richmond, Indiana.

Although it is now ten years since the company assumed its present corporate form, Vulcan springs had their beginning sixteen years ago in Sumter, South Carolina, where they were fitted to the famous Cadillac single-cylinder model.

The Jenkins Vulcan Spring Company today is operating a large plant which is devoted exclusively to the manufacture of high grade springs for replacement purposes. This is the only plant in the world devoting its production exclusively to spring replacement, with an organization specializing on that class of work, studying carefully the needs of the business as to quality and types of springs, maintaining a distribution which places

MR. T. B. JENKINS

the needed springs within reach of any motorist without delay.

T. B. Jenkins, President of the company and the original founder of the business, commenced his business career as a bicycle dealer, having a very small shop in Sumter, South Carolina, immediately after his discharge from the Army at the close of the Spanish-American war. The business was very small in the beginning, but at once began to realize substantial growth. It was in 1903 that Mr. Jenkins embarked in the automobile business as a side line to his bicycle business. In a few years the bicycle business was closed out and his entire effort and capital directed toward the building up of an automobile agency.

The very first springs that were sold for replacement purposes were sold in 1904 for the Cadillac one cylinder car, for which car Mr. Jenkins had the agency in a number of counties. These springs were made under contract by a spring maker in the North. The roads in the South were very bad and there was much spring breakage, requiring a stock on hand at all times for the models in current use.

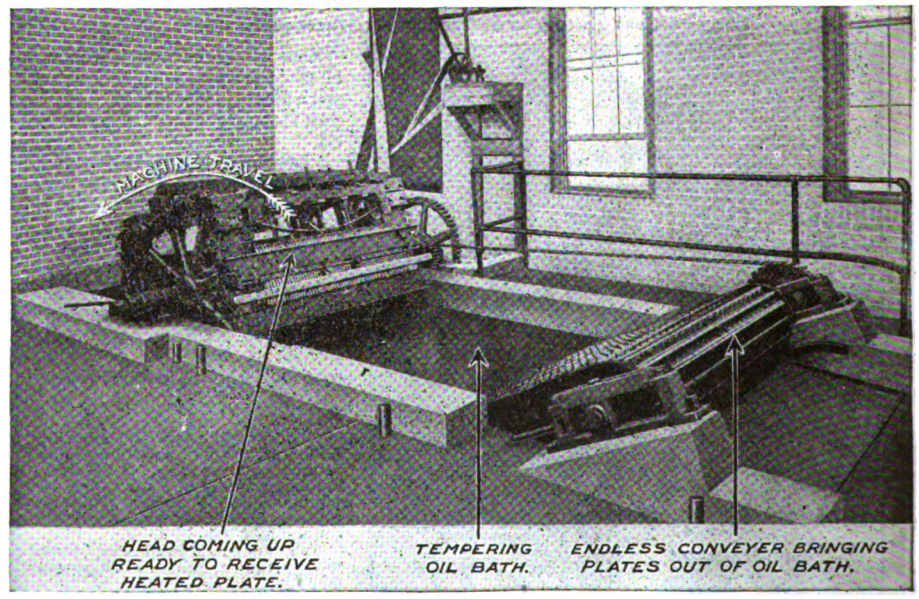
From the very beginning the possibilities of this particular department of the automotive business were recognized, and the stock of springs was enlarged as rapidly as possible, to insure the widest service that could be given.

In 1907, the trade name VULCAN was chosen as being representative and easily remembered. As early as 1908 there were several thousand springs carried in the Sumter, South Carolina stock, and shipments were made freely into seven or eight states from that establishment.

Following insistently his idea of developing this business to its fullest extent, Mr. Jenkins closed out entirely his automobile sales business, and just ten years ago on the 15th of July, 1910, it was decided to enlarge the scope of the business and to deal exclusively in spring replacements on a national scale, with headquarters and factory in Saint Louis. From that date, the business was known as the Jenkins Manufacturing Company and realized substantial growth, keeping pace with the growth of the industry as a whole.

In October, 1917, the company was reorganized with a capital stock of $500,000, the new corporate name being the Jenkins Vulcan Spring Company. Factory and headquarter, were located in Richmond Indiana, the present center of activity for the Company, which now operates seven of its own branches in the principal strategic centers of distribution, Several hundred of the most influential jobbers in the United States are carrying full stocks of VULCAN springs, and thousands of dealers are prepared to supply quickly an exact duplicate of almost any broken spring.

The company advertises extensively in about twenty of the principal trade papers, and in leading periodicals of national circulation, such as the Saturday Evening Post, Literary Digest, etc. The production today is approximately 600,000 springs per annum. The stock of springs that must be carried on hand for a proper maintenance of the service is nearly 4,000,000 pounds, about 30% of which is distributed in seven branches, the remainder in the stock rooms of the company in Richmond.



Mr. Edgar F. Hiatt, Vice President and General Manager, formed his connections with the business about one year ago. Mr. Hiatt has been Prsident of one of the leading banks in Richmond for a number of years, and is a business man of recognized vision and ability. Mr. Hiatt foresook a banking career of acknowledged prominence and high promise to come actively into the manufacturing and distributing field, which offered even greater

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ACCESSORIES AND SUPPLIES OF INTEREST TO THE TRADE

(Continued from page 42)

possibility of substantial development.

Recently the company has connected with it in the capacity of Production Manager, Mr. A. L. Ellis, who is probably one of the most experienced production executives in the leaf spring industry in this country. Mr. Ellis has been more than twenty years actively engaged in leaf spring production, and before coming to the Jenkins Vulcan Spring Company, was for twelve years Superintendent of the Spring Division of the Detroit Steel Products Company.

MR. EDGAR F. HIATT

In charge of the Sales Department, as Director of Sales, is Mr. D. T. Hersey, a sales executive, of wide experience in the automotive accessory field. Mr. Hersey was for a number of years actively connected with the Splitdorf Electrical Company in the capacity of Assistant General Manager of Sales. There are few executives in the automotive industry with a wider acquaintance among the principals engaged in accessory distribution.

The replacement spring business has reached very large proportions and is today one of the principal factors in the automotive industry. It is estimated that there are several million springs broken annually in the United States, the breakage being directly traceable to three causes: First, Poor workmanship in the springs themselves: Second, Irregular surfacing on the roads: Third, Overloading.

MR. A. L. ELLIS

There are other causes, such as excessive speeding and improper design of the springs themselves with reference to the work they are called upon to perform, and neglect of the spring, as, for instance, inattention to lubrication and the tightening of clip bolt nuts, etc.

A trip through the Jenkins Vulcan factory is a most interesting and informative experience. The equipment is modern in every respect, and some of the special machinery used is of the company's own exclusively patented designs, with marevelous capacities for both production and quality. The entire production is being constantly Brinnell-tested, and the testing laboratory is complete in every detail.

The manufacture of springs in itself is a most interesting study, and the layman is accustomed to taking for granted a number of things, with reference to the making of the spring, which, as a matter of fact, require the closest possible scrutiny and care.

It is with truth stated that a man can lift in one hand $1,000,000 worth of watch hair-springs. That value represents little more than the skill and care exercised in manufacture, and inasmuch as one man can lift such a large value, it is sufficient argument that the raw material itself is insignifiant except as to correct formula of analytical content. In like degree it is important that the utmost care be taken in the making of a thoroughly good automobile leaf spring. This is the guiding principle of the Jenkins Vulcan Spring Company—to build them with the utmost care.

The results of this policy have shown themselves clearly in the performance of Vulcan springs. VULCAN methods of manufacture have put strength and endurance into a part of the car on which comfort, service, and even safety, depend. The realization of this fact by the motoring public is demonstrated in the steady growth of Vulcan sales.

MR. D. T. HERSEY

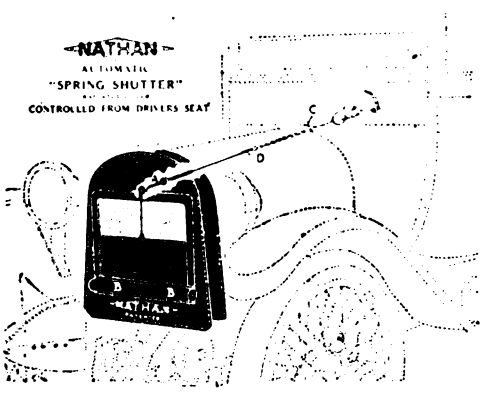
Added to this quality is the widespread service afforded by VULCAN distribution. A spring for any make or model of car is available without delay throughout the greater part of the United States and Canada. More dealers are constantly being enlisted in the VULCAN ranks, and the company will not rest satisfied until they have met in the fullest measure the requirements of their slogan, "In every Town for Every Car."

F. S. Tuthill, president of the Tuthill Spring Company of Chicago, manufacturers of "Titanic" Springs, has left for an extended business trip through Oriental countries. He will visit Hawaii, Japan, China, India and Korea. Mr. Tuthill will call on all the Tuthill Spring connections in the Orient and will make a study of trade conditions throughout eastern and southern Asia.

OXWELD WINS DISTINGUISHED SERVICE AWARD.

The Oxweld Acetylene Company, of Newark, N. J., Chicago and San Francisco, are justly proud of the distinguished service award tendered the Company by the War Department of the United States. The award reads: "The War Department of the United States recognizes in this award for distinguished service the loyalty, enerygy and efficiency in the performance of the war work by which the Oxweld Acetylene Company aided materially in obtaining victory for the arms of the United States of America in the war with the Imperial German Government and the Royal Austro-Hungarian Government." The award is signed by the Secretary of War and the Assistant Secretary of War, Director of Munitions.

A NEW AUTOMATIC RADIATOR COVER



NATHAN "Spring Shutter" Radiator Cover is operated from the driver's seat. It is easily attached and offers the best method for regulating temperature of motor, inasmuch as it operates from the bottom up (Radiators freeze at the bottom first).

MOTORS are designed to run most efficiently and economically at just below boiling point. RADIATORS are designed to keep the temperature of the motor below boiling point. To obtain the correct tempertarue in cold weather, an adjustable radiator cover is needed.

The Nathan "Spring Shutter" Radiator Cover permits frequent adjustment with very little effort, not requiring the driver to leave seat. It is regulated from dash board.

With the Nathan "Spring Shutter" Radiator Cover, unlimited adjustment can be made from the driver's seat, even while car is in motion.