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BLACKSMITH & WHEELWRIGHT AND TRACTOR REPAIR JOURNAL

Devoted to the interest of Blacksmiths, Wheelwrights and Wagon Builders.

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BLACKSMITH AND WHEELWRIGHT

and TRACTOR REPAIR JOURNAL

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Practical Horse Shoeing

Various Methods for Treating Horses Afflicted with Navicular Disease

"THE lameness is most marked on leaving the stable, but diminishes as the animal moves; after some considerable time, however, especially if the pace be rapid, lameness returns." This disease occurs oftener with riding horses, perhaps, than with any others. If the case is an old one, the hoof may be contracted. If one presses on the heels or on the main parts of the frog, the horse will feel pain. It may be that the flow of blood is not increased to any considerable extent and that the hoof does not appear especially warm. But there may be pain in the flexor tendons in the hollow of the heel. Besides, there may be a thickening of these tendons at this point. Contraction is likely to set in, if the hoof be oblique. On the horny wall, slight rings may sometimes be detected. If much weight is put upon the hoof, the horse is apt to feel pain. This is especially the case, if the frog is prominent and if in addition the hoof is shoe-less. The muscles of the shoulder and upper part of the leg may sometimes lose size and waste away.

The causes of this disease are supposed to be severe strains which may be occasioned by rapid and severe work where the streets are hard and rough, or frozen.

The outlook is not very reassuring, once one is convinced the horse has navicular complaint. He can not very well be fully cured under any circumstances. Even if the causes be removed and the disease by this means or any other be checked, full recovery is not to be expected for the reason that the changes that have already taken place are permanent. "The animal's work is thus greatly diminished."

Any treatment that is applied has simply a reduction of the evil in contemplation and not an absolute cure. The thing to do is to seek by some means to reduce the pressure at the gliding region where the perforans

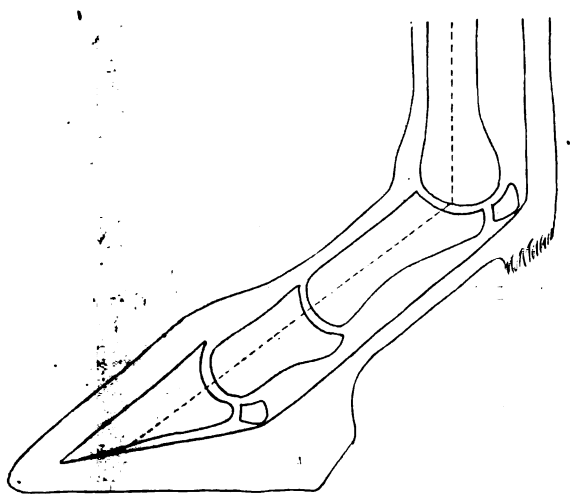


Fig. 1. Showing Normal Relations of the Bones of the Foot and of the Flexor Perforans Tendon.

tendon slides over the navicular bone. If the case is in its early condition and inflammation is present, it is all right to reduce this inflammation. In order to reduce the pressure between the tendon and the navicular bone, one seeks to bring about a change in the way the perforans tendon pulls on the coffin bone. The navicular bone is right back of it, and one seeks to get the pull less vertical. If successful the result is a lessening of the pressure.

Here are three diagrammatic views. In the first, the perforans tendon pulls at an angle of, say, 40 degrees to the horizontal. This is sufficiently steep to cause pressure against the little navicular bone. In the second view, the pull is at a steeper angle. Naturally, this tends to cause the tendon to press severely against the navicular bone. The object in view now is so to trim the hoof as to get a flatter pull on the perforans tendon.

First, take the shoe off. Then the whole

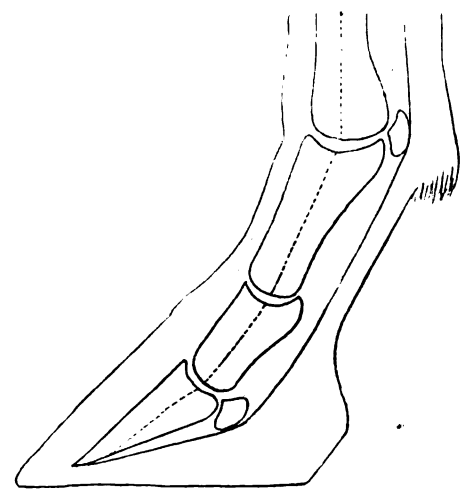


Fig. 2. Formation Causing Increased Strain on Navicular Bone and Perforans Tendon.

hoof is to be immersed in a poultice and kept immersed, for, say, 48 hours. Every now and then the poultice may be moistened with lukewarm water to keep it soft. The object here is to soften the hoof and give it opportunity to spread.

The next thing is to trim the hoof. This will require care and attention. The under surface of the hoof has to be changed. One cuts away horn at the toe and leaves it on at the heels. One seeks to obtain what we have in the third view. Here, it will be noticed, the pull of the perforans tendon from the coffin bone to the fetlock joint is flatter than in either of the other two cases. The result is a reduction of pressure against the navicular bone.

This matter of trimming the hoof is so important that perhaps it will be well for me to go over it again from another point of view, with the object of making sure that the reader fully understands. Let him look at all three views. In the first, the front of the coffin bone is pretty well in line with the coronet and upper pastern bones. In the second view, the front of the coffin bone is flatter than the coronet and upper pastern. What is wanted is to get the front of the coffin bone steeper than the coronet and upper pastern bones. This is shown in the third view.

Now, to get the front of the coffin bone to make a steeper angle with the ground, one cuts the under surface of the hoof so as to make a bigger angle at the toe of the hoof. By looking at the third view and comparing it with the other two, one may see that this angle is larger in the third view. Cutting away horn under the toe and leaving it on under the heels produces this result.

The frog is now pared to suit the bearing surface at the heels. A flat shoe is put on. This shoe is given thin heels and is provided with bar clips. It is put on and dilated, say, to 1/8 inch. The toe should be given the roll form.

The feet are to be kept well moistened during the next month or six weeks. Good straw should be provided for the bed. If the form permits, the hoof should be dilated over again once or twice. To prevent the horn from getting dry, fat or some suitable ointment may be used. This precaution is generally to be taken, whatever else is or is not done. In cases where a long rest is impossible, the coronets may be blistered over and over again with a "1 to 8 ointment of biniodide of mercury.

"As neither shoeing nor the use of the firing iron, nor of blisters completely restores the action, neurectomy has, for many years been resorted to as a remedy." This surgical operation with the long name—*neurectomy*—is one which proceeds by severing the nerves. It is a drastic remedy.

In order to understand just what happens, it is necessary to understand something about nerves in general. They are in animals and people the telegraph wires which connect the brain (or some other nerve center; as for example the one in the small of the back) and the surface of the body. The nerves receive impressions at the body's surface and transmit some kind of a report to the brain.

Thus, if I touch something hot, a "message" rushes off at once to my brain. It passes along or in a nerve. When the brain recognizes what has happened, it sends another quick message. This one travels on or in nerves, but in the opposite direction. The brain is, in fact, telegraphing the muscles of my finger and arm to stop touching t hot thing.

With horses, it is just the same as with people. The nerves serve as conductors

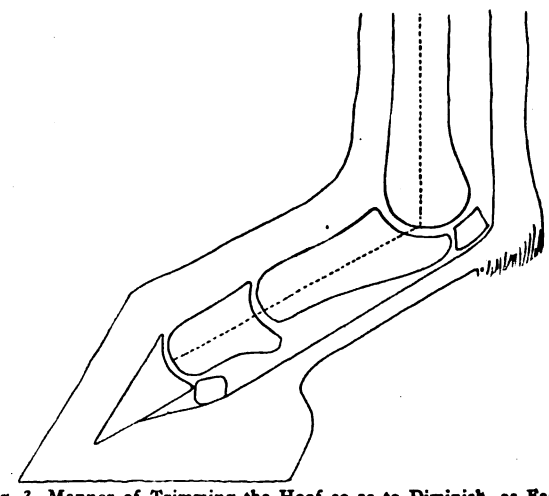


Fig. 3. Manner of Trimming the Hoof so as to Diminish, as Far as Possible, the Effects of Navicular Disease.

along which messages rush back and forth. So, then, if the proper nerve or nerves are cut, the horse with navicular disease will cease having pain. It is just the same as when a telegraph or telephone wire is cut. Messages cannot be sent. Because the pain is over, the horse may now be put to his usual duties.

On the other hand, there are disadvantages. Pain is a splendid thing in nature. If it didn't pain me, I would probably pay but little attention to small happenings to my body. I would think nothing of hitting my finger with a hammer, of sawing into my hand, of getting my foot under a horse's hoof, of cutting away a bit of my thumb, etc. The body would in time show the effects. Nature provides a remedy by means of the nerves and the pain which they make possible. I might easily keep my hand on a

hot piece of iron, if it didn't hurt. But pain makes me careful. Pain comes on at once. It starts in just as soon as I do a little something that is wrong. And so, I keep my body in some proper condition.

Now a horse which has been treated for navicular disease by the severe remedy of cutting a nerve or two will cease to have pain from the disease. But he will also cease to have a pain from other things as well. He gets careless with his foot because it doesn't hurt him to do this and that. "When the animal, especially if a hunter, is used on hard ground, the pedal or navicular bone may be fractured." He wouldn't treat his foot so roughly if it always causes pain as soon as he began to do careless things with it.

With the nerves cut, he strikes the hard road in the wrong way and suffers no pain. So he keeps on doing wrong things. Although he doesn't feel pain, the foot may be injured nevertheless. As stated above, he may now fracture either the navicular bone or the coffin bone by his carelessness. However, the horse may have the disease so bad that his pain is too great to be readily endured; and so it may seem best to take the risk of future happenings.

As to shoeing—bar shoes are not to be used at all. Ordinary shoes are usually the best, particularly if the heels of the shoe are thickened or if heel calks are employed. The idea is to throw the weight forward and consequently off the heels of the foot. This should usually tend to relieve the navicular bone and the neighborhood of that bone. The effects of concussion—when the hoof strikes the road—will now probably tend to transfer themselves from the navicular bone to the coffin bone.

Sand Cracks

The material of the horny wall grows downward and at a slant. Similarly, a tree grows vertically upward. Both the horny material and the wood of the tree are fibrous in the direction of growth. The wood may easily be split in this direction. Even the weather may develop a crack along the fiber direction. So with the horny wall. It is more or less liable to a splitting in the direction of the fibers. Such a crack or fissure

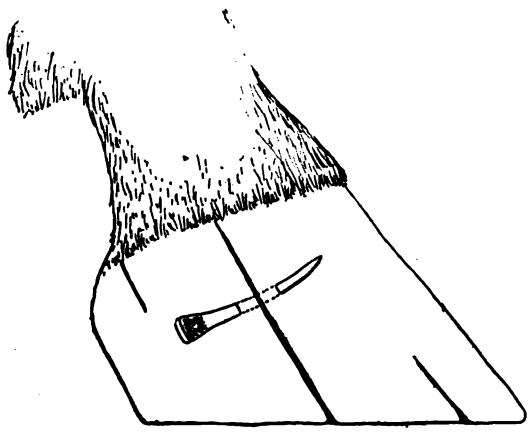


Fig. 4. Hoof Exhibiting a Coronary Crack, a Plantar or Low Crack, and a Complete Deep Crack, the Latter With a Nail Ready to be Clinched.

is a *sand crack*. It may not go all the way through, just as a weather crack in a timber may not involve the full thickness. It may be long or short, deep or shallow. And it may have various positions on the hoof. The position, depth and length determine the seriousness of the case.

There are sand cracks belonging to the toe; others belonging to the heel or heels; others belonging to the quarter or quarters; and finally others belonging to the bars.

Sand cracks may be in the neighborhood of the coronary band, or they may be in the vicinity of the bearing edge of the hoof. Some cracks extend all the way through the wall; others have very little depth. Some reach from the coronary margin to the bearing edge.

Usually, a sand crack is easy enough to detect. It is, in fact, ordinarily unnecessary to consult Sherlock Holmes. But, there are times when more difficulty is experienced. The crack may have just started down fro[m] the coronary band and may accordingly be insignificant enough not to attract attention Then, there may be a crack, only it has b obliterated from having been filled in with grease or the like. If the hoof is to be examined for sand crack, the first thing to do is to get it thoroughly cleaned up. Sometimes a long and deep crack will let blood through, especially if the horse is being hard worked at the time. Naturally, such a crack is easy to find. The animal may or may not show lameness.

If the crack goes all the way through the horny wall and is quite an old one, the edges may be quite prominent, and may even overlap. This condition is easy to see, even though the full extent of the trouble may not at once be evident.

By beating out the tip of a horse-shoe nail, one may form an instrument suitable for measuring the depth of sand cracks. However, some cracks are there, although the edges are close together. The depth o[f] such a crack is not so easily determir Some cracks gape, while others are narrow.

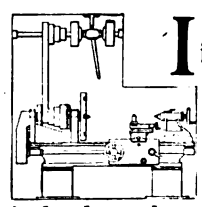
There are several ways in which sand cracks may come into existence. Thus, if the coronary band has been damaged, the character of the wall itself may undergo changes in consequence. Then excessive tension at the coronary margin has been given as a cause both for sand crack of the toe and for sand crack of the quarter. The former occurs in cases where the hoof is "upright"—that is, steep. The latter takes place with hoofs that are flat and contracted.

If the wall is weak, cracking may occur because the wall is unable to withstand t[he] effects of using the hoof. When the weight of a horse comes on the hoof, there is a swelling from the inside. This probably operates to produce sand crack when the wall is weak and other conditions favor. Then, the shock of the hoof coming down or the hard road may also play its part.

The Evolution of The Wheel

How the Present Wheel Was Evolved From the Ancient Log of Wood

BY V. RADCLIFFE



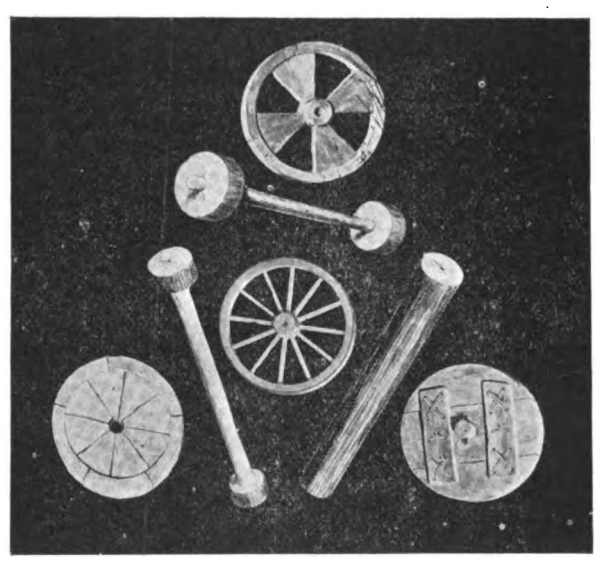
IF WE stop to think, we realize that there was a day when wagons were unknown. Sleds, made of flat boards bound together and dragged along the ground, were the first means of hauling. This was indeed a slow process in comparison with our heavy trucks of today drawn by two or four horses.

The Egyptians were the first people to improve upon the flat bottomed sled. Two cylindrical logs were placed under the sled and a third used as a feeder. This method required fewer men and moved the load more rapidly. The only drawback to this method was that the logs rolled from under the sled and had to be replaced so very often.

This was the beginning of the development of the modern wheel. From the solid log, inventive minds worked until the wheel of today was conceived and manufactured.

The first step was to cut away the center to form an axle, leaving the solid round log ends intact. This improved roller was fastened to the sled with pegs to prevent it from rolling from under.

Next the wheel was formed by the cross section of a log fastened rigidly to an axle. The axle and wheel were soon found to work more successfully, if the wheel were permitted to revolve upon the axle.



Showing Various Stages of the Evolution of the Wheel.

This permitted improvement of the wheel. Three boards laced together with tongs and cut to a proper side and roundness was the next step. Following came the wheel made of boards placed radially. Here man could make his wheel the size he desired and need no longer cut four wheels from the same log, or scour the forest for logs of the desired diameter.

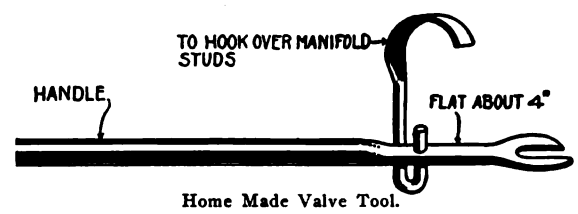
These wheels were cumbersome and heavy so spaces were left between the radially placed boards. Here we have the forerunner of the spoked wheel. These boards were made smaller and the spaces larger for a time, then the cylindrical spoke placed at certain angles from the axle was manufactured, and around the completed wheel the protective metal band was placed.

This phase of development is a very small item in the evolution of travel which is being portrayed on the screen by the Harry Levey Service Corporation in a film entitled "The Porcelain Lamp." The picture deals with travel from the days when man walked barefooted to the present day Train-Auto-Areo travel, showing each and every progressive step in a natural setting and employing either actual conveyances or where this is impossible, using a cardboard working model in conjunction with the mechanigraph.

TOOL FOR REMOVING FORD VALVES

By R. L. Prindle

A USEFUL tool for the removal of Ford valves may be made from a piece of steel, 5/8 inch round and about twelve or fourteen inches long. One end is flattened out for about four inches and then drilled one-fourth of an inch, and the flattened end is



Home Made Valve Tool.

then notched as shown to permit the insertion beneath the valve locking washer.

A piece of one-quarter inch rod is then bent at both ends, one end passing through the one-fourth inch hole in the lever and the other being used to hook over one of the manifold studs. By using this tool (lifter) Ford valves may be removed without removing either manifold.

A wise man worries over a lot of things that a fool never thinks of.

Welding a Tractor Pulley

The Blacksmith is Claiming This Class of Work for His Own

BY DAVID BAXTER

THE repairing of worn and broken tractor parts is fast becoming the blacksmiths' most important line of work. So rapidly is it becoming important that many blacksmiths are preparing to specialize in it; they are installing machinery and special tools and otherwise getting ready for the work. Not only in the farming districts is this true but also in industrial and other centers. The tractor is being adopted by contractors, builders, loggers, fruit growers, threshers, and many others who have hauling to do, or power work of any kind.

They are therefore wise blacksmiths who prepare in advance by learning all they can about different kinds of tractors, and by learning all they can of how to repair them. The repairing is bound to come, since the tractor is probably the most abused and hardest-worked piece of machinery that is made, and therefore the quickest worn and broken.

Now in attempting to handle all classes of tractor repairing there is one tool the blacksmith should have. It is the oxy-acetylene welding and cutting torch. In fact this is the only tool with which a great many of the tractor repairs can be made. The smithy may weld broken parts that are made of forged steel or wrought iron on his anvil, but when it comes to welding brass, aluminum, cast iron, and cast steel, he needs the welding torch. In fact he must have it or pass up a profitable line of business.

Consider for instance the belt pulley shown in the accompanying photographs. A perfect repair cannot be made without the welding torch flame. The broken spoke in this wheel must be welded to repair it satisfactorily and the welding must be done with the torch as the wheel is made of cast iron. Of course the spoke could be repaired by riveting a patch or brace on it, but the work would be only a makeshift; no matter how tightly the rivets were drawn there would be some play that might result in a break any time, while an oxy-acetylene weld would make the spoke whole again.

Now, as suggested by the title, the purpose of the present discussion is to show the blacksmith how to weld the broken pulley. Or rather, to show him how the welding was accomplished, since there are several minor parts of the process that may be altered to suit individual shop conditions. Of course it must be taken for granted that the reader is familiar with the fundamental principles of torch welding and the various equipments essential to the process because there is not sufficient space here to cover the whole topic.

First, a description of the job will aid in understanding what had to be done to facilitate the work. This wheel was a cast iron belt pulley about fourteen inches in diameter with one spoke cracked as indicated in the pictures. That part of the spoke through which the crack ran was about two inches wide and half an inch thick. Thus the job was to weld a crack half an inch deep and two inches long, approximately.

As with most cast iron jobs, this one was given a certain amount of preparation previous to applying the welding flame, so as to facilitate work and insure a better weld. This preparation consisted of grooving out the crack to nearly the full depth of the metal thickness. In other words, the iron of both sides of the crack was removed to shape the crack to form a groove. Enough metal was removed to make the groove a little wider at the top than the thickness of the spoke. This groove was cut the full length of the crack, sloping gradually almost through the metal.

The grooving was accomplished on a portable emery grinder fastened to a rack on the work-bench, the process being the easiest way to make grooves in small castings. The emery wheel employed was one having a sharp wedge shape face. The grooving of this pulley is clearly indicated in Fig. 1, while Fig. 2 shows the spoke grooved ready for welding. A space of the surface on either side of the groove was also ground free from all rust or surface impurities in order to prevent them from interfering with the weld,

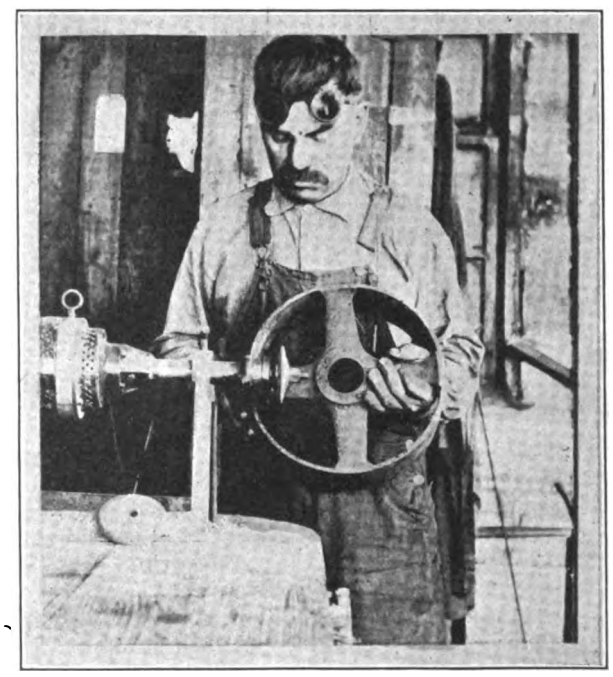


Fig. 1. Preparing for Welding by Grooving the Crack on an Emery Wheel.

either in gaseous or solid form; the surface on each side of the groove was cleaned thoroughly.

After thus preparing, the next step of the repairing process consisted of arranging the casting for preheating as this was essential to prevent the casting from being cracked by unequal contraction when the weld cooled. It was necessary to heat the wheel previous to welding to prevent the contraction of the

Fig. 2. Showing the Location of the Fracture and Extent of Grooving.

cooling weld from cracking or warping the wheel.

A few words here in regards to the action of the heated weld may make the reason for preheating clearer: When the filler metal used to fill the groove is melted it is fully expanded or occupies its largest space. Then when it cools it shrinks until it occupies its smallest or its normal space, providing of course that nothing prevents or tends to prevent the shrinkage. From this it is easy to see that if the fully expanded weld metal is attached to the spoke on both sides and it shrinks as it cools it will naturally pull upon the spoke metal. Then if the spoke is too rigid to be drawn inward it must crack in its weakest part; this may be in the weld or some other portion of the spoke. To overcome this action the spoke or the rim, or the whole wheel, must be expanded so it can shrink when the weld does; so the contraction of the wheel metal will follow the contraction of the weld metal inward.

On larger castings or wheels the expansion may be localized or confined to certain parts but for wheels of this size it is simpler to heat the whole casting. Therefore this job was arranged for preheating so the heat would envelop the whole wheel, and therefore expand the whole of it.

By heating the wheel previous to welding and keeping it hot during the entire process of welding, the wheel metal was expanded when the weld metal was added. Then by allowing both to cool at one time the shrinkage of both would be in unison. Or, it might be put this way: the contraction of the wheel squeezes inward upon the weld.

The preheating arrangement is shown in Fig. 3. This is probably the simplest device that can be used, although there are several ways to preheat such jobs. One is no doubt just as effective as the other if the fundamental principle is adhered to; if the whole wheel is heated slowly and evenly throughout.

The device illustrated consists simply of elevating the wheel enough to permit a portable gas burner to be placed beneath it. A circular wall of fire brick is placed so it will engage the rim of the wheel and hold the casting above the burner. The bricks are so placed that they will confine the heat of the burner to the inside of the wheel and still permit the rim to heat equally. In this picture part of the brick wall is set aside in order to show the gas burner.

After the preheating device was arranged the next step was to heat the job. First the

Fig. 3. Arrangement of Preheating Device.

gas was lighted and allowed to burn slowly for a while in order to prevent danger of strains due to sudden expansion. When the gas flame was burning properly the casting and brick work was entirely covered with pieces of asbestos paper as is shown in Fig. 4. This covering was for the purpose of confining and conserving the preheating, thereby hastening the process and eliminating danger of unequal heating. The asbestos also served to protect the torch operator from the uncomfortable heat. And to protect the heated casting from chance draughts of cold air, especially when the weld was near completion, because it is essential that a job cool evenly after it is welded.

After the asbestos covering was adjusted the gas was allowed to burn with greater pressure to fill the enclosure with flame, and was permitted to burn until the whole casting became dull red, a condition that was ascertained by peeping beneath the covering from time to time. While it was heating the operator selected the proper torch size, and supplies needed for the job.

Selecting Tools and Material

A medium size nozzle was selected and fitted to the torch. A large nozzle or tip would have furnished too much heat and might have burned instead of welded. A small size one would not supply enough heat to keep the metal molten and at the same time furnish enough for conduction; which acts in all welding; the heat is carried away from the weld by conduction faster than it can be applied by the welding flame if it is not correct. A medium size flame then was the one chosen to strike a balance in both cases.

The supplies used were flux and filler metal. The former in powder form, applied by dipping the filler rod in a pot of it and quickly returning it to the weld. The latter in the form of round cast iron rods three sixteenths of an inch in diameter, eighteen inches long. The flux was supposed to make the metal more fluid and to cleanse it of slag and oxide. And the filler rod for the purpose of filling the groove with new metal, carefully knitted to the pulley metal.

The flux pot was placed within convenient reach of the operator. An extra filler rod handily placed in event the other became too hot to handle.

By the time these things were arranged and the regulators set the casting was hot enough to be welded. A piece of the asbestos paper directly over the red hot groove was torn aside. The torch was lighted on the heat of the groove by first turning on the acetylene until there was no smoke present in the flame, then turning on the oxygen until the flame contained a sharp blue tongue. This tongue of flame was then adjusted by regulating both gases until the blue flame became a short blunt white cone. The white cone thus formed was the neutral welding flame correct for cast iron work. It was not only neutral at the start but was tested and maintained throughout welding.

Whenever the white cone showed indications of becoming shorter and round, or whenever the sharp tongue commenced to show, the acetylene was increased and then both gases were readjusted. This was done while holding the flame away from the weld.

Melting the Groove

The neutral flame was quickly applied to one end of the groove and revolved in a circle about an inch in diameter. Then as the metal commenced to get white hot the flame was concentrated in smaller circles, barely covering the width of the groove and the end of the filler rod, which was then brought in contact with the flame. As soon as the bottom of the groove melted and flowed together a bit of filler rod was melted and deposited in the melting groove. At the same time the flame was slowly worked to another part of the groove. Which was melted and filled in the same manner. Then another portion was treated; and another, until the full length of the groove bottom was fused level. No attempt was made to entirely fill the groove the first time over; just a layer covering the bottom was applied. Then another layer was added to this; being very careful to see that the sloping sides as well as the metal already added were in a molten and fluid state before depositing more metal.

Where a third layer is added it also furnishes a slight surplus of filler nicely rounded above the spoke.

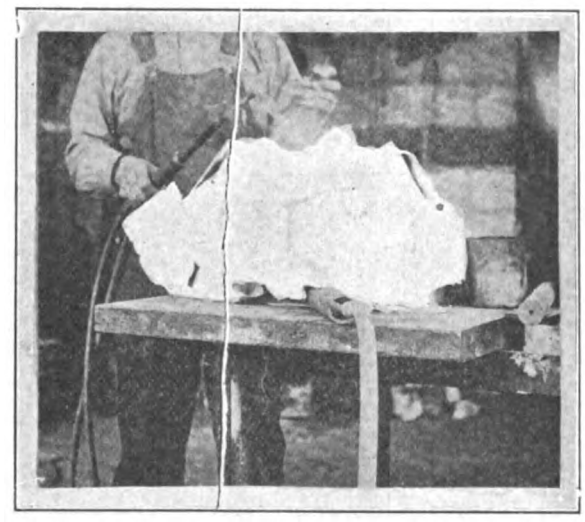


Fig. 4. The Job is Covered with Asbestos to Promote Even Expansion.

This rounding of the surplus metal was achieved with the pressure of the welding flame by blowing the fluid metal so the high spots would flow into the lower places; the flame was manipulated something like a paint brush.

During the welding the flame was kept in almost constant motion, swinging back and forth across the groove; or revolving in tiny circles; or advancing and retarding as the condition of the weld demanded. Not only for the purpose of guiding the melting but to prevent the burning of the metal. If one portion seemed to be melting too slowly the flame was applied more gently; if the weld seemed too fluid the flame was drawn back. A constant watch was kept over the flame and melting metal at all times.

The filler too, received its share of attention, being almost constantly in motion, either churning in the weld or flicking bits of dross aside. At no time was it permitted to drip into the weld but was fed directly into it; literally pushed beneath the surface of the molten weld. At the same time guarding against melting too much filler for the weld to assimilate.

The flux was applied at frequent intervals by dipping the red hot or melting end of the filler rod in the flux pot and quickly depositing the bit of flux on the weld. Enough flux powder adhered to the rod each time to flux each bit of filler next deposited.

As soon as the last layer of filler had been smoothed over the torch was shut off and laid aside. Then a piece of asbestos paper was placed over the weld opening. The casting was allowed to heat a few minutes to even up expansion before turning off the gas burner.

Then the pulley was permitted to remain under cover until almost cold. Thus forcing it to cool slowly. The asbestos covering prevented the heat from radiating rapidly, thus causing the inside of the enclosure to all remain the same temperature and keep the casting at an even temperature. This slow cooling caused slow contraction and thereby afforded opportunity for the rim to shrink in unison with the shrinking weld. The rim squeezed inward upon the spokes and hub as fast as they contracted, figuratively speaking.

If the welder is a beginner he had best turn such jobs as this belt pulley over, to doctor the under side of the weld, before covering the job for its final cooling. This inverting of the pulley is done as soon as the upper weld is finished, without waiting and without turning off the gas burner. Then the job is quickly covered again with the paper before applying the flame to the lower side of the spoke. This part of the welding is practically the same as the other part. The poor spots are re-melted and filled by twisting in the filler metal.

A HANDY WRENCH ATTACHMENT

NO matter how many solid wrenches are about, there is always room for the adjustable wrench—and the fact that a man needs to have only one with him under a car to handle a number of nut sizes makes the adjustable wrench the favorite in most cases. This applies with equal force to the car owner who is doing his work at home and to the shop man.

The chief objection to the adjustable S wrench, or the monkey-wrench, is its changeability; a touch on the screw or the jars of service turn the screw enough to make the opening too large or too small, though for the first pull or two it was a nice fit. This is particularly exasperating when the tool is being worked at arm's length or out of sight. If only the screw would not move, the S wrench would possess most of the desirable features of the solid wrench.

The simple little attachment shown herewith will convert the adjustable wrench into a satisfactory solid wrench for the time being. A No. 8 tapped hole is put into the head of the wrench for a round headed screw which holds a spring which may be made from a piece of a hack saw blade. The blade must be softened to drill the hole through and while it is hot it is given a slight "camber" and the end is turned up for the thumb spot. The camber of the spring causes it to hug the screw with enough pressure to prevent its jarring, but the pressure is not so great as to interfere with being turned around out of the locking position by the thumb when so desired. This attachment is well worth a trial—usually the owner feels that it pays for itself in an hour's time.

Small Florida Shops

Second Installment of This Article Told in Mr. Hobart's Interesting Way

BY J. F. HOBART

LAST spring when I wrote you about smith shops in Clearwater, Florida, and told about the progressive colored shop there, three blacksmith shops were in operation—or near operation—one shop, an old one, barely existing—although its location was the best of the three, being close to railroad station, post office and the business center of the town while the other shops were located at some distance from the center of activity.

The old shop had two forges at the time of my visit, one for carriage work, the other for shoeing. But the shoeing fire took more job work than shoeing, for horses were getting scarcer every day and the carriage fire was taking on all the automobile work which came along. On the first day of December, I had occasion to visit that two-fire shop again. I wanted a bit of work done—A starting crank bent up for a motor boat engine—but when I got to the shop, there was no smithy there!

All of the old wagons had vanished from the corner of the shop yard and right in the middle of the open space was what appeared at first sight to be an immense concrete tire-setting block at least fifteen feet across! I looked at the affair several times, trying to figure it out. There was the hole in the exact middle for hubs to project into and the sides all sloped nicely and gradually toward the central hole. But who would want a tire-stone five yards square?

Then I looked inside the shop. The mid-

An Old Shop's New Sign.

side forge was gone. The shoeing forge in the corner by the door remained but the anvils were gone, likewise the slack tubs, the benches, shoes and all the "atmosphere" of the blacksmith shop. A nice plank floor had been laid over the entire floor surface save where the old forge remained. The shop walls had been swept and whitewashed until I hardly knew the place. It was at the dinner hour and no one was in the shop so I returned to the sidewalk and—the mystery was explained—Between a tree and a newly erected post swung a pendant three-board sign which told what had happened. The place wasn't a smithy any more, it was an *Automobile Laundry!*

An Old Shop's New Sign

The shop had been changed over from shoeing and wagon work to automobile washing and polishing. The big tire-setting platform was a wash-block—and a fine one too—large enough so that no sand could ever spatter from ground upon any car under treatment upon the block. The sign was made of three pieces of board, chain attached to each other and to a piece of 2-inch steam pipe to which had been erected between a stout yellow pine post and a big live oak tree. The pipe was flanged to the post but the end next to the tree was simply slipped over a piece of three-quarter-inch rod which had been driven horizontally into the tree at the proper height.

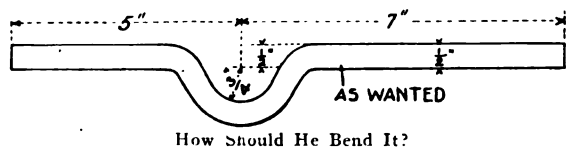
The proprietor came from his dinner while I was looking at the sign. He "allowed" that he was just starting in, and that business was coming along fairly well. But it surely did look as though auto laundrying might be a very quiet proposition when it is remembered that there is not a teaspoonful of real mud in all of Florida—nothing to make mud of save water and sand and that don't seem to work as well as in Virginia or in Illinois!

Seems to me that right here is a good hint for some of the smiths in shops where the loss of shoeing and vehicle work has left the shop too large for the business and the smith with more time on hand than he likes. Why not put a part of the shop into the automobile laundry business? Shoeing and wagon work, what there is of it, could be handled same as before. In addition to filling in the spare time at a considerable profit, the auto wash shop also affords a mighty good chance to make a profit on accessories, oil, gas and all the other auto perquisits. And furthermore, what a splendid opening it will make for any smith who wishes to do so, to work right into auto service work and repairs.

Why not do service work to an automobile as well as for a horse or a wagon? The blacksmith is the logical person to take care of road motive power and vehicles. He is doing it now and doing it well too, so why should he not take care of the gasoline horse and wagon as well as of old "rackabones" and its rattletobang vehicle? Better look at it in this light, Mr. Smith, and fill the empty corners of your shops with the most profitable business in the world and a business which will endure until the airship has chased the last automobile off the face of the earth—yes, and off the sky too!

A Simple Smithing Problem

But I was after a smith to bend a piece of one-half-inch round machinery steel which was to be polished and plated after having been bent, therefore no hammer marks or other defacement could be tolerated. The sketch—"How Should He Bend It?"—shows what was wanted and I had to hunt up another of the Clearwater smiths to get the job done. Accordingly I "beat it" to another smith shop a quarter of a mile out of the city and found that improvements had



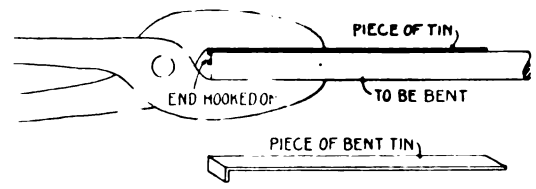
How Should He Bend It?

been made in the shop since I was there last spring. Then, the shop had a soft dirt floor. Now, there is a smooth and stout plank floor over two-thirds of the shop, the part around the fire being left dirt-surface, while the rest of the shop has been planked over.

The end of the planking laid about sixteen inches above the old dirt floor and proved the handiest ever for doing work upon, the smith standing on the dirt and fitting work placed on the planking. It surely beats all the trestles ever made, for work don't shake off or the supports occasionally give way as is often the case with trestle-supported work. Shoeing, to the extent of two horses at a time could be done on the dirt beside the forge but other work, carriage ironing and repairs and more than two horses together—mighty scarce now-a-days,—were handled upon the level plank floor.

This shop like nearly all the smithies in Florida, had doors on all sides and many windows. In fact, sections of the shop sides, many feet in length, were hinged at the top and could be swung outward and upward and supported thus by placing a stick underneath the raised edge of the wall-section which usually was made about four feet high and eight to ten feet long. As many of these wall-sections would be swung outward as the weather required, for not often is it necessary to close a Florida shop against rain or cold.

There being so much *open-work* around the shop, and as Florida winds often come from every point of the compass within a very short time too, it was necessary to provide some kind of a windbreak for the forge fire. During some of the Florida showers, which are often a bit cyclonic, the wind starts usually from the southeast and then travels entirely around the points of the compass before the shower is over. This is due to the whirling action of the wind and as the shower-center passes along, it brings with



Working Length Without Punch Marks

it in turn, winds from each and every direction as stated, hence the necessity for a peculiar wind-break or guard for the forge.

Such a guard was made by placing sheets of corrugated galvanized steel on end, riveting then to a light frame and to supporting feet at the lower end, by means of which the device could be stood upright on the forge and readily shifted to any side of the fire as wind conditions might require. The screen certainly proved effective even though rather bothersome to move around on the coal and dirt which covered the top of the big forge. Told the smith that I wondered why he did not weld up a few feet of tire iron into a ring which could be permanently located around the fire. The screen could be made to slide around on the ring and further supported by a chain or wire and a swivle, from a point exactly above the fire. With such a rig, the screen could be easily moved around the fire as wind conditions required.

The Bending Job

As shown by the engraving—"How Should He Bend It?"—my job was a bit of half-inch cold-rolled steel in which three bends were required. The central bend or offset was to be an inch deep and must fit a 1½-inch circle. The smith placed the bit of steel—which I brought—on the anvil and reached for a centerpunch to mark the place for the first bend. Then I "called" him!—"No punch or hammer marks on that job, Mr. Smith! The steel *must* be smooth when you are done with it."

How to locate a bend on the hot rod without center-punching as big as a chipmunk's eye was a *poser* until it was suggested that a strip of tin be cut, the end bent over and hooked over the end of the rod and grasped with the tongs which held the rod. This is plainly shown by the engraving—"Working Length Without Punch Marks"—and the strip of tin with its bent-over end is also shown in detail by the same picture.

This kink served instead of the punch marks, but the smith took that heated rod to the anvil, placed it over the horn and then hammered it full of dents and flat places as shown by the picture—"Red As Bent—And Spoiled"—I took a look at the job then hiked to the neighboring machine shop and procured another piece of cold rolled steel which the smith succeeded in bending according to sketch, and which when done showed neither hammer-dent, anvil flat or vise-jaw mark.

Now, Brother Smiths, write to me or to the Editor of Blacksmith & Wheelwright and tell how the smith did the job without marring the surface of the steel? Tell in your letter how the job might be done. Then after all tell the best way. I will tell you how the smith did it.

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Our Editor's Letter

IN this letter I'm going to preach a little sermon, using as my text the words; "It isn't what you *say* that counts, it's the *way* you say it." I'm fairly sure that the text itself needs considerable comment, else I shall be entirely misunderstood.

All of us are familiar with the loud voiced man who is always ready with an answer to any problem and we also know many men who have but little to say on any subject, but when they do say it, they are speaking wisdom. We know in our own minds that the loud voiced fellow is nothing but a "wind bag" and that half he says is wrong and we know that the other fellow is usually right, but despite this, the loud voiced fellow gets most of our attention. As a matter of fact the loud voiced fellow usually gets the attention of everyone when he is in a group of people.

When I listen to one of those loud voiced fellows and watch the faces of the crowd around him I am reminded of a big rooster in a hen yard. The big rooster finds a fat worm and immediately he raises his voice to advertise the fact. "Hoo-ray!" he seems to say, "I've found it, I've found it; come on girls, let's have a feast!" and after all of the hens have gathered around him he gobbles up the dinner himself. He goes through this same performance fifty times a day and the hens all gather around him each time to watch him eat. Each time, the hens seem to think that at last they may be allowed to share in the treat; but they never do. The rooster has learned that he can tell an obvious lie and be believed, if he tells it in the proper way.

And so it is with the loud voiced fellow, he can jump to any conclusion, right or wrong, and he will always have an admiring audience while the quiet man of wisdom sits in a corner talking only to himself. All of this seems to prove that it is not what he says that counts, but the way that he says it.

There will come a time, however, when everyone will realize that the loud voiced fellow is nothing but talk and then they will cease to crowd around him; they will realize that the quiet fellow is dependable. Unfortunately, by this time the quiet fellow has become wholly discouraged and hardly believes in himself; or else is so morose that he keeps his own council and will say nothing.

The men who make a success of business have studied both the methods of the loud voiced man and the man who sits in the corner and says nothing. These successful men are the ones who understand the full meaning of the text. These men not only know what to say but are clever, always, in the way that they say it. And this is the whole point of the text.

It does not matter if you have the wisdom of Solomon and the canniness of Schwab, you cannot make an impression upon your fellows unless you say what you have to say in the correct way.

In business it is the man who creates a good impression that succeeds, therefore it follows that the creation of that impression is the goal toward which all of us should strive. No matter how that impression is created, the end is the same, we reach the goal. If you are one of those quiet fellows and your competitor can make people think that he is wonderfully wise, then your business will suffer. He may only hurt himself in time, but then it may be too late.

No matter what business you are in there is a way for you to secure the respect of your customers, but something more than respect is needed for you must create in their minds the idea that you know more about your work than anyone else. They must get the impression that you know more than you tell. And you cannot create this impression if you tell nothing.

I think that I have made my text clear insofar as the first portion is concerned—"what you say"—and now to the latter portion of "how to say it."

I can best illustrate my point by telling a story which was related to me by a certain school teacher; a teacher who nas the reputation both in the school and among the graduates of being one of the best in the city. The department in which my friend teaches is devoted to the study of automobile repair work and there are, perhaps, twelve other teachers. In that department there are about twenty-four gasoline engines mounted on blocks ready for operation as required in the classes for instructive purposes.

During the lessons, the students are required to start the various engines from time to time and to make such adjustments as may be necessary to operate the engines properly. The instructors, on the other hand, throw the engines out of adjustment and derange the mechanism in order to see if the students are familiar with their lessons. If the students are puzzled by any particular problem and cannot solve it, only then do the instructors show them the trouble and how to remedy it.

My friend, some time ago, hit upon a clever scheme to impress his students with his ability as a mechanic. He made a habit of going to the opposite corner of the room while one of the students cranked a refractory engine. He would listen carefully and without hesitation tell the student the trouble even though another instructor had made the trouble. He did not need to see the engine or examine it.

Now you can imagine the effect of such a feat upon a class. A few demonstrations of this marvelous power were enough to cause the greatest respect among the students and such respect was naturally reflected by the heads of the school. It was not so much *what* he said but *how* he said it, that counted. He had created a situation which would seem to indicate a deep fountain of knowledge on his part and so gained the respect of all his pupils. Other teachers could tell what was the trouble with the engine, perhaps, but they needed to make a close examination before speaking. What they said did not matter or make half the impression that my friend made by his little trick.

And a trick it all was. My friend simply arranged a code with one of the other teachers who would hold up certain fingers in certain ways to impart the information; an easy thing to do because the other teacher could mingle with the students and examine the engine closely.

I trust I have made my text clear and that my sermon has been instructive. Before giving your opinion upon anything be sure to state it in an effective way. Set your stage and prepare your audience. If you are given a problem to solve in your business do not, in the fullness of your knowledge, blurt out the answer, but weigh it carefully before you speak—then say it for effect. Remember, always, that what you say only counts when you say it properly.

Fellows Who Know It All

IN this issue our friends will read a letter from one of our old subscribers, who lives in Maine, to the effect that he often notices articles written "by some young fellows who think they know it all." Our friend goes on to state that, "the men who know how to do work, know enough to keep their mouths shut."

Unfortunately our Maine friend is entirely correct in one statement when he says that experienced people have the bad habit of keeping their knowledge to themselves. Fortunately, however, most of our old friends believe in the golden rule and are willing to help others. Still more fortunately the coming generation evidently are evidencing *this* same spirit.

Our lives on this earth are very limited; we live nearly 20 years before we are able to support ourselves. We work and live for 40 more years trying to accumulate enough to support us in our old age and from the age of 60 until we die we are often dependent upon our relatives or friends for support. Nearly half of our life, then, we may be dependent upon others.

At no time during our existence can we survive unless we have help. We depend upon the grocer and the market for our food; upon the carpenter for our homes; upon the merchant for our clothes and finally upon the undertaker for our burial. Has our Main friend ever thought of life in this way?

What little we can do, each of us, to help our fellows, we should do cheerfully. Why should we keep our mouths shut if by opening them we can help others? If we know of some way to lighten the burden of our fellow man, why not tell about it? By so doing we do not harm ourselves but on the contrary we feel happier by so doing.

We feel sorry for our friend in Main who evidently thinks that the closed mouth indicates wisdom. We are of the opinion that those same young friends, of whom he speaks, will grow to be successful men just because they are willing to tell what they know in an endeavor to help others. They may be wrong, but we all make mistakes, but if they are, then they will be corrected.

A free interchange of ideas makes for prosperity. The man who sits with closed mouth soon learns to sit with closed ears. Experience teaches us that we cannot get something for nothing and if we are unwilling to give our knowledge to others we cannot expect to receive knowledge from them.

We feel that our friend from Maine, who has commented upon some of our youthful wisdom, should treat us to some of his ideas.

The few men who get to the top of the ladder of success need good men at the foot of the ladder to steady it.

SMALL FLORIDA SHOPS

(Continued from Page 13)

have done it. Then, after you all tell the best ways of executing this bit of work, I will tell you just how the smith did it!

Smith-Shop Rivet Heating

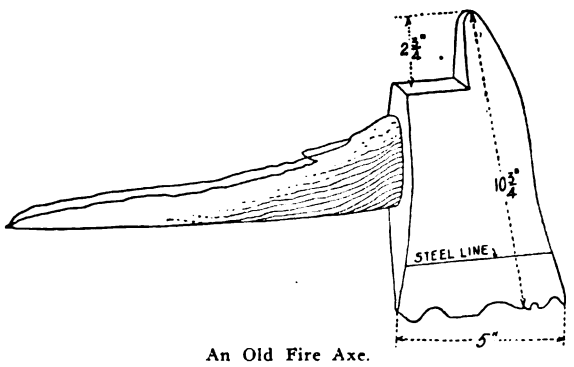
I said there were three blacksmith shops in Clearwater—or used to be—but there are other shops there although these other shops do not do shoeing or much wagon work. These other shops are in machine shops and garages and aside from shoeing, they do anything and every kind of work which is offered to them or which they can get. In one machine shop smithy they were heating rivets in a regular forge fire for that shop did a bit of steam boiler work now and then.

They had a piece of three-eighths-inch thick boiler steel about eight inches square which was punched or drilled full of 5/8-inch

Rod as Bent—and Spoiled.

holes spaced about one inch apart. Perhaps the holes had been drilled. At any rate they were there and a workman put a whole lot of coal on the fire, laid the plate on top and dropped a one-half inch rivet into each hole then let the fire "soak" until a rivet was needed which was pretty often as two men were driving the rivets by hand, in a small cylinder.

The piece of perforated metal did not become very hot. It showed a dull red in places but whenever a rivet was withdrawn from one of the holes, the point of the rivet was a glowing yellow color and was good and hot without being in the least burned. The plate kept the heads of the rivets from being heated, something desirable because a cool head will remain hard and not drive flat as



An Old Fire Axe.

when the rivets are heated all over by being thrown into the middle of the forge fire, and the heads heated as hot as the points.

In another shop, not however in Florida, I saw a variation of this method of rivet heating. A piece of stove pipe, apparently about six inches in diameter, was placed over a round stick of wood and a dozen or more holes punched in the pipe near one end. The holes were all punched within an inch of each other. Then the perforated pipe was placed on end on top of a green coal fire and well banked around with wetted fine coal. Some coal was dropped into the pipe and rivets were inserted through the holes then more coal and more rivets were put in. The fire was kept rather low so as not to burn or melt the stovepipe.

When once the fire had been well started, the blast was shut off and the stovepipe acting as a chimney drew through the pipe and the coal, enough air to keep the fire burning as briskly as desired. Indeed, at one time, the smith had to place a bit of sheet iron over most of the top of the stovepipe to prevent the fire from overheating the rivets. This device heats rivets in good shape but the stovepipe being made of very thin metal, will not last long and will quickly burn out. The flat perforated plate is preferable to the vertical perforated stovepipe for rivet heating, although were a pipe to be made of plate of a quarter-inch or more in thickness, it would last much longer than the thin stovepipe.

In some ways, the vertical tube is to be preferred to the horizontal plate, one reason being that the fire can be easily replenished as required by dropping coal into the open end of the vertical pipe while to renew the other fire, the plate must be removed entirely.

Here's "Axing" a Question

Thus far this winter, I haven't bought any firewood. Perhaps you think that being in Florida no firewood will be needed, but there is where you get in wrong, for lots of wood is needed here. Sometimes it gets cold, and it is a mighty *mean* cold too. The mercury often drops to 40 degrees as the tail ends of northern storms sweep down this way and when a man is cold in Florida, he is sure cold all the way through—and back again—and lots of firewood is needed occasionally for heating as well as for cooking. And firewood, sawed, split and delivered costs only $18.00 a cord—that's all!

But I haven't had to buy any wood thus far. I go along the shore of the Gulf of Mexico with my skiff and little out-board motor and bring home wood by the boatload. One day I found a 48-foot log 24 inches thick at the butt. But one day I found—on shore though—an old fire axe something as shown by the engraving. It is 10¾-inches long or high, has a 5-inch blade and weighs about six pounds with the bit of broken handle still in the axe. There is apparently a good width of steel back of the cutting edge.

Now, Brother Smiths, please suggest how to fix up or change over that old axe into something useful. Might plug the eye and split the axe into a couple of log-splitting wedges. But perhaps other and better uses may be suggested for the tool. And here is another—While you are about it, cannot some of you suggest things of use and value which can be made from the old axes which may be found in nearly every shop, woodshed, barn or junk yard? There's a whole lot of mighty good stock lying around useless in old axes, so let's see who can suggest the best uses for them and while about it, tell how to forge the old axes into the more desirable articles which you suggest. Begin with Hobart's old fire axe and when that is disposed of, let's hunt out and make over some more tools which have outlived their usefulness as chopping axes.

Platform Gears

Detailed Instructions for Making Simple Platform Gears

ONE of the advantages of a platform gear is its convenience when vehicles are compelled to turn short, and for allowing the horse to be turned at right angles with the body on platform. When the wagon is backed up with the rear end against a city curb, or some platform for loading or unloading, the perch prevents the complete turning of the wheel, and as a result more space is required for turning or for standing than when the platform gear is used. Many of the platforms are too expensive for the cheaper class of wagons, and are somewhat complicated in construction, thus removing them from the smaller vehicles and from shops where men have not had an opportunity to study the mechanical construction. It is possible, however, to make platform gear that has all the advantages as to strength and use of the most complicated. Such platform gears are not novelties, but there are many parts of the country where they are not used and where their introduc-

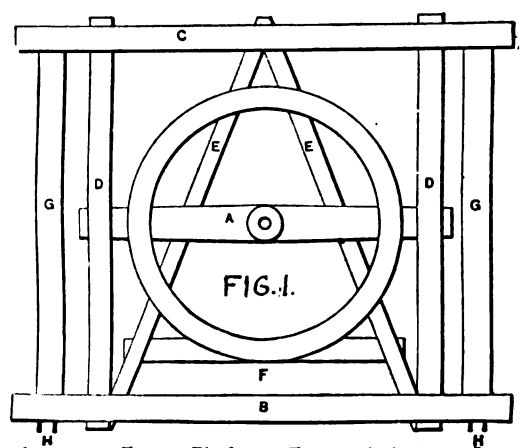


Fig. 1. Square Frame Platform, Frame Entirely of Straight Timbers.

tion would be valuable to the builder of light, cheap platform wagons.

The principal feature of such a platform is the lower frame to which the bottom fifth wheel is attached and which is supported by the half elliptic side springs. One of these is shown by Fig. (1) It consists of a frame nearly square in its general proportions. A, the bed; B, the drawbar; C, the spring bar; D, side connecting rods; E, futchels; F, tee bar, the principal use of which is to provide a support for the forward edge of the fifth wheel plate; G indicates the location of the side springs. The bed, A, for a light platform should be 3 inches wide in the center and 1¾ inches at the ends, flat on the top, but swept on the under line, making it 2½ inches deep in the center and 1¾ inches at the ends. The drawbar, B, 2 inches wide, 1¾ inches deep; spring bar, C, 1¾ inches

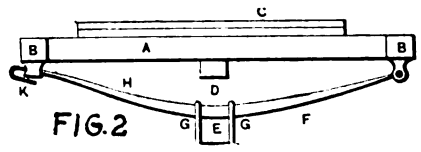


Fig. 2. Side View, Showing Spring Attachment.

square; side connecting bars, D, 1½ by 1¾ inches; futchels, E, 1¼ by 1¾ inches; front of the bed, A, and 1½ by 7/8 inches back; the bar, F, 1¾ inches square. These dimensions make a level frame, top and bottom, except the bed, A, which is thickened at the center to give sufficient strength for the support of the king bolt. The only mortises are those through the bed, A, for the futchels, but these may be dispensed with by cutting away the futchels on the underside to reduce them to 7/8 inch and lapping them into the top of the bed with a 3/4-inch lap, the 1/8 inch being cut from the futchels so as to allow a shoulder at the back as well as at the front of the bed. If the front shoulder is set into the face of the bed it will greatly increase the strength of the frame. The rear ends of the futchels are cut to face square and lapped into the top of the spring bar, as shown. All laps should be equally divided as to thickness. The ends of the drawbar and spring bar must extend far enough to take the spring ends, the springs being placed not more than 3 inches from the collars of the axle. The width of the frame over all at the bars, D, to be of the same width as the body.: Owing to the strain from the springs, the drawbar and spring bar must be plated with iron their full length. The lugs for the shaft eyes, H, may be welded to the drawbar plate, or to a separate plate, bolted to the top of the bar T; plates at other points, properly secured by bolts, will serve to give the required rigidity to the frame. The fifth wheel plate, K, should be 1⅛ inches wide and 5/8 inch thick, bolted to the frame with countersunk head bolts. A socket plate is necessary for the king-bolt bearing.

An end view of the lower platform is shown by Fig. 2. A, the side bar; B, ends of drawbar and spring bar; C, fifth wheel

plate; D, bed, showing the drop at the center; E, axle; F, side half spring; G, half round clips by which the spring is secured to the axle; H, spring eyes; K, slide eye, to provide for the elongation of the spring. Fig 3 shows the top platform, which is bolted to the frame of the body. The bed, A, is 3 inches wide at the center and 1¾ inches at the ends, 2 inches deep in the center and 1¾ inches at the ends. The front and back bars, B, 1¾ inches square; the straight nutter bars, C, 1¾ inches square; these serve mainly as ties to hold the bars in place while ironing the frame. As will be noticed, this platform has no cross spring, the two half springs being all that is required. The full spring eye at the front end and the loop at the back end of the spring, made by turning the main leaf of the spring, furnish the required provision for expansion of the spring when the vahicle is loaded, and are far more simple than the toggle eye.

The dimensions given are for a light platform such as would be used on a small truck, but they may be increased for a heavy truck or decreased for a "Democrat" wagon, a vehicle that serves the double purpose of a light market and a family wagon.

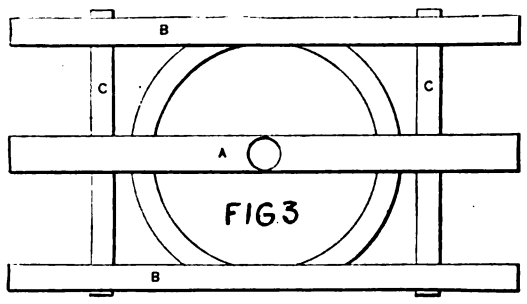


Fig. 3. Top Platform for Gear.

Another style, one that can be used for one or two horses and which is eas easily made as the one shown, is illustrated in this connection. Fig. 4 shows the lower platform which, as will be seen, is constructed with straight futchels, and has a jaw for a pole. A, the bed, which is short, extending only to the straight side futchels; B, the center futchels for pole; C, side futchels; D, drawbar; E, spring bar; F, lower fifth wheel plate. In constructing this the bed should be 3 inches wide, 2½ inches deep in the center and 1¾ inches square at the ends. The center futchels, each 2 inches wide at the rear of the jaw, tapered to 1¼ inches at the spring br, and 1⅛ inches at the front end of the jaw. The jaw opening to be clear of the jaw plates, 3 by 1¾ inches thickness; front of the bed, A, 1¾ inches; back of the bed, 1⅛ inches. The side futchels, C, 1¾ inches deep and 1⅞ inches wide; drawbar, 1¾ by 2 inches; spring bar, 1¾ by 2 inches. The drawbar must have an arch in the cen-

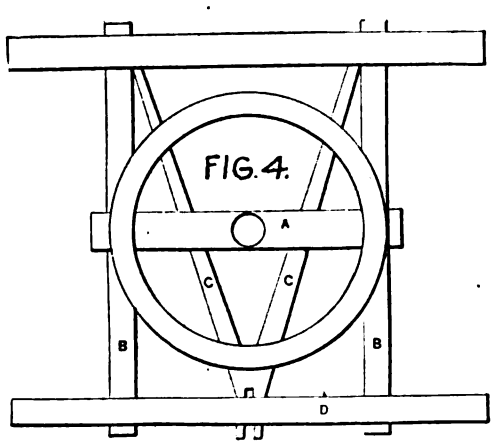


Fig. 4. Platform for Team, Showing Straight Futchels and Pole Jaw.

ter of 1¾ inches in the clear, as it rests upon the center futchels and is bolted to them, and stayed by a truss bar which is bolted to the drawbar from the ends to point X, and extends under the jaw between these points. The bolts that secure the drawbar pass through this truss bar. The side futchels are stub tenoned into the drawbar and secured by T-irons on the top. The side and center, futchels meet at the rear ends and are lapped together in the spring bar. The length of the drawbar and spring bar are governed by the spread between the springs, as the ends of the latter are secured to them. The spring bar must be plated its full length, and branch T-plates must be bolted to the top to secure the bar permanently to the ends of the futchels. The fifth wheel plate should be of 1⅛ by ⅝-inch steel and secured to the frame by countersunk bolts at each point of contact with the wood, and in no case should the diameter of the fifth wheel be less than 22 inches; 24 or 26-inch circles are none too large, as these circles carry all the weight of the load and the larger they are the more stable the platform and the less the danger from injury when the wheels are turned from their direct position.

Fig 5 shows the top platform from the underside, which consists of three bars. The

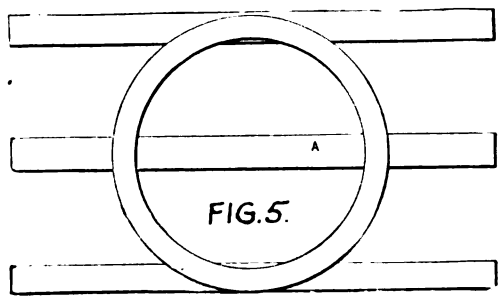


Fig. 5. Top Platform for Gear, Showing Under Side.

main bar or bed, A, should be 2 inches thick in the center and 1¾ inches at the ends. The front and rear bars 1¾ inches thick throughout. The depth of the bars to be governed entirely by the height the body is to be above the top of the wheels; this is determined by the height of the wheels and whether the platform is to ride flat or to drop at the rear end. The general form of the cross bars is shown by Fig. 6. The bearings, A, to be so placed as to rest upon the fifth wheel plate. Use a socket king-bolt plate.

Good seasoned white oak is the best wood by all odds for the frame of these platform gears, but when this cannot be had, use any other species of oak except red; this latter is more easily affected by moisture and iron rust than any other, and even at its best lacks the strengh requisite for platform gears. Use white lead freely at all joints. This will go far toward keeping out moisture, and when hard serves to add stability to the frame.

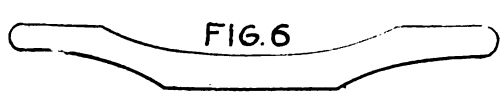


Fig. 6. General Form of Bars to Top Platform.

If each peice of wood is well coated with hot, raw linseed oil before it goes into the hands of the blacksmith its durability will be greatly increased, while a plentiful application of white lead in bolt holes will act as a further prevention from the injurious effects of water. A platform gear treated with white lead and oil, as we have recommended, and then painted with red lead will outwear three gears made up without the oil or lead and painted with some cheap pigment and oil.

In For It

Judge—On the Bassans docks at Bordeaux, France, an old-time Sergeant of a negro regiment was having trouble with a detail of men of his own race, who seemed inclined to loaf on their work of loading boxcars with provisions for the army of occupation. Addressing one negro, who was especially lazy, he exclaimed:

"Come on, you. Git to work, dar."

"Shucks, Sergeant," replied the lazy one. "Ah 'listed foh de wah, an' hit's over."

"Yo' 'listed foh de wah. Y-a-ss! An' also foh de duration of de wah. Now, de wah, hit's over, but de duration, hit's jes' done begun."

ONE REASON FOR DECLINE IN FARM PROFITS

ADVANCE census reports, like preliminary election returns, are not infallible, but they can usually give a fair approximation of final results. The U. S. Bureau of Census has just released preliminary figures covering the live stock census for the states of Delaware, New Hampshire, Rhode Island and Vermont. These give the number of horses and mules in 1910 and again in 1920 in both agricultural and non-agricultural service.

The 1910 figures revealed a total of 61,928 horses and mules in non-agricultural service in these four states, while in 1920, the same territory had but 37,417, a decrease of 24,511, or 39.2 percent loss in ten years in the number of horses not on farms.

This is a decrease of almost 40 percent, and if the figures for the other states reveal a corresponding situation as to horses in Pennsylvania, Maryland, Delaware and the eight states east and north, where conditions regarding horse use and production are much the same, it will amount to 382,222 head,—a very sizeable reduction in the last ten years.

The decrease of farm horses in these eleven states is not nearly so great. The four states referred to, for which the preliminary census figures have been issued, show a decrease from 168,180 horses in 1910 to 149,717 in 1920, or a decrease of only 18,463 head, approximately 11 percent reduction in the past ten years. On this basis the entire eleven states will probably show a reduction of 204,308. The total loss in horses of both farms and cities in this area will probably run to 586,530 head.

If any real good came from the reduction of the number of horses in use in these states, the matter might be viewed with tolerance, but a very large proportion, probably two-thirds of the horses displaced were in lines of work, such as city short hauls and deliveries, where they rendered more efficient and economical service than the motorized equipment which took their places. The natural result, therefore, is that the business men in the eastern cities, towns and villages, are paying more for such service than they did before, in their outlay for equipment and in the expense of operating and maintaining same, and the farmers of the central west have lost a considerable proportion of their market for horses, hay and coarse grains.

The reduction previously noted indicates that an annual market for 60,000 horses has been destroyed and demands for hay and grain reduced by about $88,000,000, figuring that each horse displaced consumed $150 worth of feed per year, which is approximately correct. Farmers have lost in two markets—in horse sales and in the sale of their hay and coarse grains. Eastern business men have lost by reason of having been diverted to the use of a more expensive type of equipment for short haul transportation and delivery service.

However, the jolt has not been confined entirely to the farmers. Letters from coal dealers, grocers, and other merchants in that territory to the Horse Association of America (Chicago) read as follows: "We are using motors for delivery and find the cost prohibitive." "I find I must either give up auto delivery or go out of business." "After keeping accurate records, the cost of maintaining the trucks was astonishing in comparison with horse drawn equipment, and the service not so reliable. I believe as soon as other concerns now using motor transportation figure their costs, they will return to horses, as we have."—Horse Association of America.

WHERE THE HORSE HAS THE ADVANTAGE

We never saw a horse laugh. But when a horse sees a four-year-old flivver staggering up the street he has a right to laugh.

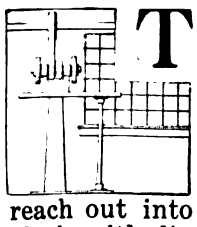
—Cincinnati Enquirer

Some people shake hands as if they thought they were doing you a favor.

Using the Lathe

With a Few Special Attachments This Tool's Uses are Greatly Increased

BY J. N. BAGLEY



THE blacksmith of today is the Automobile man of to-morrow. The many marked changes which have taken place in the last few years in the mode of travel have caused the blacksmith to reach out into other fields than the regular blacksmith line for business. A large per cent of his customers are using automobiles, trucks and tractors, dispensing largely with wagons, buggies, etc. Therefore, it behooves the Smith to adjust himself to the conditions existing.

It is the purpose of this article, which if followed out along the lines suggested, is to place the Smith in position to make some extra money for himself as well as keeping his old customers coming to his place of business. To use the lathe with milling attachments requires no extraordinary ability, neither does the making of the rear axle from stock material.

If the Smith carried in stock all the repair parts for the different cars that come to his place for repair he would have a large amount of money invested and also have a stock that might never be used, to say nothing of the amount of room it would take to store them. In his particular territory there might be a couple of makes of cars, two or three commercial trucks, etc. and to carry just a stock of axles and transmission shafts alone for these would require considerable capital. If the Smith is to expect business he must prepare to give prompt service and he can hardly expect to do it if he tears the car down and lets it stand in the work-shop while he orders repairs from some agent.

The writer has found from years of experience that the better way is to have the necessary equipment for making some of these repair parts at short notice and give the customers service that will be appreciated. For example,, the customer might call up in the morning about 8 or 9 o'clock and ask to be towed in, and after bringing him to the shop it might be found that a new axle or transmission shaft was needed. If the Smith has the required equipment, such as lathe, etc., he can take the raw stock and in the course of three or four hours have a new axle made and the car ready to deliver to the customer and in so doing give service that will be well appreciated. Customers who receive this service are usually so well satisfied that they will stick by the dealer as long as he is in business. On the other hand if you tear the car down and say to him, "Bill, you have a broken axle, and it will take two or three weeks to get one from the factory," the chances are the next time he needs his car repaired he will try some other place where he can get quicker service.

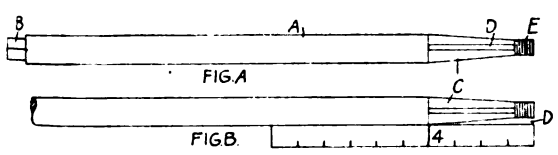


Fig. 1.

The necessary tools for making the repair parts mentioned will require no elaborate outlay of cash, and can be operated by any Smith with ordinary, mechanical ability. When these tools are installed they can be used for many miscellaneous jobs aside from those just mentioned, in fact, you will not be able to tell how you have managed to get along without them before. To do this class of work, a lathe of course will be necessary together with a milling attachment, a few milling cutters, and an arbor for holding the wheels, which can be made in the shop if so desired, all of which will cost possibly $350.00 or $400.00.

At first consideration you will say "I can't afford it, besides it would not pay to have money invested in an equipment of this kind." But before coming to a definite decision, however, let us reason it out from a standpoint of dollars and cents and see just how much money it will earn, as all tools or equipment must be judged by its earning capacity. The writer recalls instances where lathes have been installed and over one hundred axles of various kinds have been made in one shop during a single season. Now the price of these axles range from $4.50 to $10.00 or $12.00 as the case may be. Of course, some of these axles were made for garage owners at the neighboring towns but they were made just the same and should be figured at this time.

To illustrate this more clearly, we will place the value of the equipment at $400.00 complete, figuring the interest in case the money is loaned at 8 per cent, which would make $32.00 interest on the investment for one year. We will make a rough average of the stock from which the axles are made at 1¼ inches in size, costing per axle $1.20. This size of 1¼ inches, however, may be a trifle big, as many axles are of a smaller size but this will strike a fair average. The finished axle will range from $4.50 to $10.00 or $12.00 as above stated and it takes from two to three and a half or four hours to make them, depending somewhat on the style of the axle and the special work necessary to fit it. Figuring the labor of making the axle at $1.00 per hour which is a fair average, we have a total of labor and material at about $3.20 per axle.

For this axle which has cost us $3.20 to produce we will assume we receive $5.00, which would be a fair price, making a profit

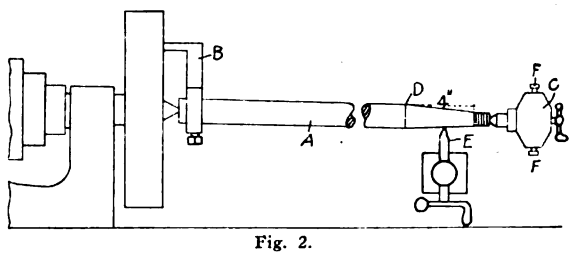


Fig. 2.

of $1.80. Now considering thirty axles during the season, a very low estimate, and we have a $60.00 profit on the axles to say nothing of $75.00 extra hours' labor at $1.00 per hour or $75.00. Now that we have the necessary equipment installed we can make piston rings, piston pins and small bushings almost every day in the year. Besides the interest on the investment which amounts to $32.00 we will very nearly pay for the equipment the first year, and not only that but we have taught the trade that when they come to the shop with a piece of work they will get it on schedule time, which in most cases means a great deal to the customer.

Service these days is what gets the trade and *holds* it, be the town large or small, for the car owner will take his work to the larger place if the man in the small town is not in position to give satisfactory service when he wants it. Regardless of the size of the town or village there is no argument against an equipment of this kind in the garage if properly handled. However, the investment should be made wisely, that is, do not buy a large 24-inch lathe when a 13-inch will answer as well. One should visualize the field and judge the use he has for the lathe and buy accordingly.

In case the Smith or the Garageman, as we will call him, is in a territory where large machinery such as threshing machines, tractors, etc., are used he can expect to get a share of this business and should buy a lathe large enough to handle all of the work.

The question now arises, how long will this machine last which has cost four or five hundred dollars as the case may be. The lathe after a year of use will show practically no wear if it is taken care of and properly oiled. The same power that is used for the air compressor, grinder, or what not, will handle it very nicely and there will be no extra power plant to buy. The lathe is usually equipped with a full set of gears for thread cutting and many threads can be cut with the lathe that cannot be cut with a die, and besides if one were to invest in enough dies to cut all the different size threads that can be cut on a lathe the investment in dies would more than amount to the cost of the lathe equipment described.

Referring to Fig. 1 at A we have a drawing of an axle of a very common type and not at all difficult to make. This axle has a square at one end which slips or fits into the square hole in the differential gear. The other end C is tapered to fit into the tapered hub and is supplied with the key D to key the wheel to the shaft and prevent it from turning inside of the hub. The end at E,

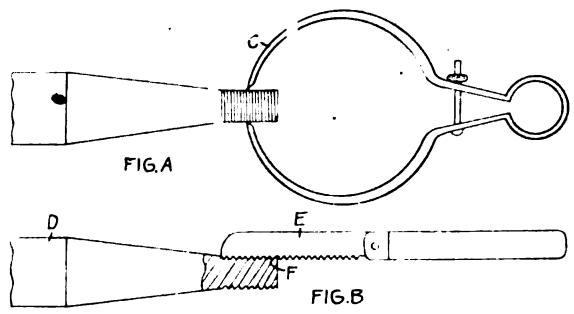


Fig. 3.

is threaded to permit of a nut being placed to prevent the wheel from working off the axle and also prevent the key working out of its place. At first it may seem quite a task to turn the taper on the end of the axle and square up the end as shown. Then again there is the key way to cut, a hard job you will say, at once, if you never cut one on a lathe, but it is very simple after the method is understood thoroughly.

Referring again to Fig. 1 at B we will first take the taper of the broken axle as shown. Laying the straight edge B on the shaft as shown we find the taper is four inches long and the space D is one-quarter of an inch. Now let us see how difficult it will be to find out how far over to set the tail-stock of the lathe to cut this taper correctly.

Referring to Fig. 2 we have measured back from the end where the taper starts four inches as shown at B, we have set the tail-stock over until we can start the cutting tool E at the outer end and in running in four inches have a space of one-quarter of an inch between the shaft A and the point of the cutting tool as shown at E. Setting the tail-stock over to take up this space and tightening the screws in the tail-stock block F to prevent it slipping, we are ready to begin the operation.

The moveable center in tail-stock C should be adjusted just tight enough so that there is no play of the shaft between the centers when it is revolved. Place the lathe dog B on the shaft letting one end project through the face-plate as shown and we are ready to turn the taper as in ordinary turning. The first cut will run but a short way along the shaft while the next will run a trifle farther and so on until the four-inch mark is reached when the shaft will be tapered just right and will be ready for the key way to be cut.

The next thing in order before the shaft is taken from the machine will be to readjust the tail-stock center to its central position. This can be done by loosening the screws end and slipping the tail-stock along up to the live center and watching the two centers very closely until they come in direct line when it should be locked in position. Take the measurements of the outside diameter of the threads on the old axle as shown at A Fig. 3 with a caliper as shown at C. Transfer this measurement to the new axle and turn it to size.

The next operation will be to find the number of threads to the inch in case it is not already known. To accomplish this we use a thread gauge as shown at E Fig. 3 and placed on the thread F of the axle D. Note the number of threads to the inch and change the gears on the lathe to cut the desired thread.

To cut the right-hand thread start the cut at the outer end and when the cutting tool reaches the shoulder reverse the direction of the spindle at the same time drawing the cutting tool away. When the cutting tool has returned to the starting position reverse the direction of the spindle again and at the same time set the cutting tool to the work. Continue this operation until the thread is sharp at the top, try the nut for fit and if you have a diameter correct before starting the thread it will screw on very nicely and the work can be removed from between the centers. One of the most important things to consider is the setting of the threading tool to get a clean even cut. In case the tool is too low the cutting will be heavy and irregular, if too high the cutting edge will be above the work and will crowd the shaft away instead of cutting it. The smaller the work, the faster it can be run and the cleaner will be the cut. In setting the lathe tool care should be exercised to see that it is set square with the work or the thread when cut will lean one way or the other, so to speak, and the nut will not screw on even though the diameter be correct. In Fig. 4 we have at A the shaft suspended between centers B and the end to be threaded at C parallel with shaft A. The thread gauge E comes in very nicely at this time for setting the tool. Back the tool away from the work far enough to permit the gauge being placed against the shaft as shown and the tool forced into the

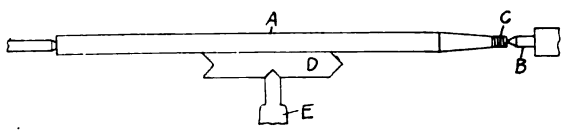


Fig. 4.

B notch in the gauge. When the cutting tool is so adjusted that it fits the notch exactly it indicates two things in particular; the pitch of the cutting gauge is correct and the tool is set correct for cutting. This little tool is inexpensive and should be added to the equipment, for it is invaluable for getting the correct pitch for grinding the lathe tools both for inside and outside work. It can be used also for setting the tool for either inside or outside threading.

Now that we have reduced the operation of cutting the thread and turning the taper, the next step is the cutting of the key-way and squaring the end as it should be squared to fit the opening in the differential gear. To do this it will be necessary to remove the compound rest from the carriage and bolt

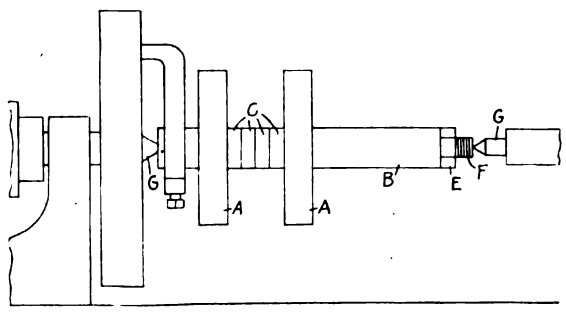


Fig. 5.

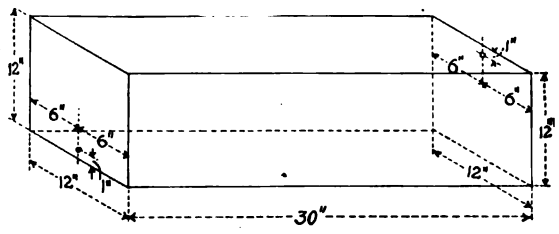
the milling attachment in place. Place the milling wheel arbor shown at B, Fig. 5, between the centers and space the wheels A with the ring C, adjusted to the exact distance apart for cutting two sides of the square at the same time. Tighten the nut E while holding the ring in position and suspend the entire assembly between the centers G as shown in sketch 5. Place the shaft in the vise of the milling attachment and adjust it to cutting position. Arrange the speed of the cutter so that it will cut clean and smooth and not heat the tool. This can be done by adjusting the belt on the cone pulley or using the back gear of the lathe. As soon as the cut has been made with the shaft in this position, turn the shaft one-quarter turn over and make the second cut thus completing the square.

While the milling attachment is attached to the lathe carriage a key-way can be cut in the same manner, using the milling cutter on the arbor or it can be cut with a small cutter for the purpose. Place the work in the vise of the milling attachment so that the cut will be the same depth at either end. In cutting a key-way the entire depth should be made in one cut because the cutter will work much better than it will in making two or three shallow or light cuts. There are two grades of cutting wheels on the market; high speed wheels and carbon wheels. The carbon steel answers very well for the low-price cutters. The making of the axles is a very simple operation as has been shown. Nothing complicated about it whatever. After you have made a few axles and have become familiar with the workings of the machine, it will surprise you how quickly you will be able to turn out a finished axle or a transmission shaft, whichever the case may be. In fact you can make an axle as soon as the car can be taken down in nearly every instance, if the necessary stock material is in the house.

A very good plan is to take the measurement of all broken axles that come to the shop and file them away for reference and when you know you are going to have an axle to make for a certain make of car you can put a man at the work before the car is taken down, thus saving considerable time and getting the job back to the customer on schedule. And then again by having the necessary data, should a neighboring garageman telephone for an axle, you can make it and send it to him without having the old axle for measurement. What can be accomplished along this line depends entirely upon the operator. It behooves every Smith engaged in the business today who is not doing some sort of automobile repairing to get the shop equipment lined up for spring trade and put out his sign and be ready.

A Challenge
To Mr. Nichols

One of our Arkansas subscribers, Mr. W. H. Nichols, in a spirit of loyalty to his home State, has written to say that he has two problems for us to consider. From the statement of the problems, we infer that Mr. Nichols has great faith in the Arkansas blacksmiths and little or no idea that the



The Editor's Problem.

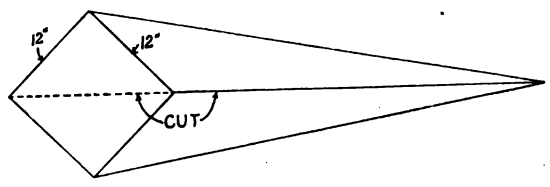
New Yorkers are on the same plane with the natives of his State.

We take this opportunity of telling Mr. Nichols that, as a general rule, blacksmiths, whether in New York or in Arkansas, have a big bump of originality and ingenuity. We feel sure that our New York readers are, in many respects, just as intelligent as the Arkansas men.

Not only have we suggested an answer to each of Mr. Nichols problems, but we have issued a challenge to this gentleman in the shape of a little problem of our own. We New Yorkers will wait with great interest a reply, or perhaps many replies, from our Arkansas brothers, who are so able in solving practical problems.

We challenge our Arkansas brothers to solve, as easily as we New Yorkers do, the following problem:—

A New York blacksmith was given a solid

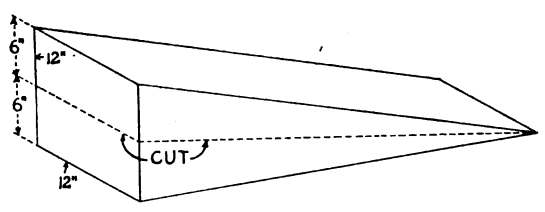


One Solution of Mr. Nichols' Problem.

block of chrome-nickel steel 12 inches square at the ends and 30 inches long. In other words the four sides of the block measured 12 by 30 inches each and the ends 12 by 12 inches. Now this block was so hard that it could not be cut or bored, or dented with any tool ever made. On one end, just one inch from the bottom and exactly half way between the two sides there was a tiny punch mark, a mere dot on the surface. On the opposite end, just one inch from the top and also half way between the sides was a second punch mark. The New York smith was asked to give the exact surface distance between these two punch marks and he replied by cutting off a steel wire just 40 inches in length.

In other words the distance between the two punch marks is exactly 40 inches when surface measurements are made. Can our Arkansas, or in fact any of our readers, show just how this line runs on the surface.

The two problems submitted by Mr. Nich-



Another Possible Solution

ols were as follows. We know that our New Yorkers will be able to solve them at a glance.

Mr. Nichols has a piece of valuable timber 12 feet long. One end of the timber is 12 inches square while it tapers off, like a pyramid, to a point at the other end. He wishes to cut this timber into two equal pieces. How can he do it?

Mr. Nichols claims, in his second problem, that an Arkansas and a New York smith, were each given some chain links to be welded into one long chain. The links were in groups of three each and there were five groups. The New York smith was obliged to make four welds to complete the job, but the Arkansas smith made only three welds. How did he do it?

We wrote Mr. Nichols that time was too valuable in New York to spend in making four welds when three were all that was necessary. We showed him the New York method.

WANT ADVERTISEMENTS

ADVERTISEMENTS of SHOPS FOR SALE or TO RENT, SHOPS WANTED or SITUATIONS or HELP WANTED,

will be inserted under this head at 3 cents a word, including the address, for each insertion, payable in advance; but no advertisement will be accepted for less than 60 cents, however small.

Remittances may be made in postage stamps where the amount to be sent is less than $1.00. Address

M. T. RICHARDSON CO., Advertising Department,
71-73 Murray St., New York. Publishers of the Blacksmith and Wheelwright

Patents

PATENTS FOR INVENTIONS.

H. W. T. JENNER, patent attorney and mechanical expert, 622 F Street, Washington, D. C. Established 1883. I make an examination and report if a patent can be had and the exact cost. Send for full information. Inventors assisted in developing ideas and inventions. Trademarks registered.

For Blacksmiths

BLACKSMITHS, LISTEN!

Any handy man can make more money doing hard jobs easily. Forging and solid welding with Toy's modern methods of blacksmithing, hardening and tempering to a standard with collard tempering charts. All for one dollar. Samples free. 52 years a machine blacksmith. W. M. Toy, Sidney, Ohio.

You have confidence in a weld made with Uniflux the Universal Flux Welding Compound. Users know it to be superior. Makes stronger welds more easily and quickly and at less cost. If you are not using it you should. Request Circular or send 10c for sample. Goruse Company, Elmira, N. Y.

For Rent

FOR RENT

Blacksmith shop, brick building 32 x 60, lot 107 x 132, electric power and light. Will sell stock and tools. Only shop in town with consolidated school. Good farming country. N. C. Brandt, Boxholm, Iowa.

FOR SALE

Well equipped blacksmith shop. For particulars address J. F. Hisey, Bronaugh, Mo.

For Sale

FOR SALE

My blacksmith shop and bicycle repairing in Fine climate. Only oxy-acetylene welding shop, and only bicycle shop in the whole district. High prices for work. Stock at invoice price. Reason for selling poor health. City of 2500. B. C. Canada. Plenty of work all year around. Write for particulars address M care of Blacksmith and Wheelwright. P. O. Box 654 City Hall Station N. Y. C.

FOR SALE

White oak wagon poles in the rough, 3" x 6" butt, 3" x 3" point, 12 foot lengths. F. F. Bown Mfg. House, Box 500. Pittsburgh, Pa.

FOR SALE

General power blacksmith shop, stock and tools. Gasoline power. All tools necessary for running a general shop. My former customers want a shop and blacksmith, and 25 per cent of the value of the shop and tools paid cash down will handle this deal. Price of shop and tools $1,200 and I will invoice the stock below cost. Stock will invoice about $150. Good school up to 12th grade, and located on state highway. Write A. E. Green, Box 286, Buffalo, Okla.

FOR SALE

Extraordinary Bargain: 140 kegs No. 2, 3 and 4 front and hind Perkins Goodenough horse shoes, in lots to suit as long as they last, at five dollars a keg, f. o. b. Baltimore, Md.; also a quantity of No. 8 and 9 regular head horse nails at a very low price. Address Thomas J. Huggins, 119 S. Hanover St., Baltimore, Md.

FOR SALE

A blacksmith and wheelwright shop, well equipped with electric drill and circular saw. Horse shoeing and country work, auto repairing. A good stand. Two rooms upstairs rent for $10.00 per month. Proprietor 75 years old, time to quit. Maskell Ewing, Box 13, Penns Grove, N. J.

For Sale

FOR SALE

Outright or one-half interest, blacksmith, general repair and manufacturing equipment shop located in town of Dermott, Ark. Address P. O. Box 313, Dermott, Ark.

FOR SALE

One new No. 1 Alligator Shear; cut 4½" x ½" and 1¼" round, $175.00. 1 25-lb Vulcan Generator with torch; only $175.00. Have been in use six months. John Paulsen, Humboldt, Iowa.

FOR SALE

Blacksmith shop and garage combined; two sets of tools and machinery complete and the only shop in town. Enough work for two or three men all year around. Will sell cheap, terms to suit buyer. Call or write John W. Kesler, Orrin, North Dakota.

The man who does not advertise simply because his grandfather did not, should wear knee breeches, silk stockings and a wig.

Prices from West Virginia

From Austin Smith, West Virginia: My prices on shoeing are as follows:

No. 1 Shoes	$2.00	No. 5 Shoes	$2.50
No. 2 "	2.15	No. 6 "	2.75
No. 3 "	2.20	No. 7 "	2.85
No. 4 "	2.25	No. 8 "	3.00

Resetting shoes each $.25

I do all my own work. I have no helper. I do all kinds of wagon work and horse shoeing and make horse shoeing my specialty. I am always glad to hear from brothers in the trade. My prices for wagon work are as follows:

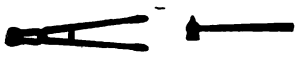
I charge $1.00 per hour for labor and the material is extra.

New wagon tongues	$7.00
New hounds front	4.00
New hounds hind	3.75
Cutting down wagon wheels, per wheel	7.00
Spokes, each	.50
Wagon rims, each	.50
New wagon axle	7.00
New Bolster pin	1.25

Some Pennsylvania Prices

From R. B. Wible, Pennsylvania: I give below some of the prices that we get in this part of the country:

Shoeing No. 1 and 2 burden	$2.10
Shoeing No. 3 and 4 burden	2.30
Shoeing No. 5 and 6 burden	2.60
Shoeing No. 1 and 2 Neverslip	2.50
Shoeing No. 3 and 4 Neverslip	2.80
Shoeing No. 5 and 6 Neverslip	3.10
Buggy tires new	8.00
Resetting	3.00
Tire Rims	3.00
Tongues	4.00
Axle	5.00 and 6.00
Hounds	5.00



Iowa Prices

From T. E. Sheridan, Iowa: In one of the back issues of the BLACKSMITH & WHEELWRIGHT, you requested the smiths to send prices. My prices are as follows:

SHOEING

New shoes each	$1.00
Resetting old shoes	.50
New neverslip each	1.25
Resetting neverslips	.50
Calks each	.10

PLOW WORK

Sharpening lays	$1.00
Sharpening and pointing	2.00
New lays 14 in. or smaller	6.00
New lays 16 in. or over	7.00

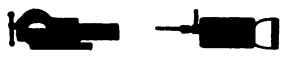
TIRES

Setting 1½ in. tires	1.00
Setting 3 in. tires	1.50
Buggy tire each	1.25

An Old Man

From Willis Philbrick, Maine: I am sixty-four years old and have worked on shop work, mill work and farming all my life. I have worked at shop work ever since I was a boy and have built wagons and carriages and ironed them. I have done machine work, have worked on both iron and wood and have done some auto work.

I have a small farm of one hundred acres which I work on and have a shop for both wood and iron, and do all sorts of wood and iron work. I have machinery for the work run by a gasoline engine. In the last few issues of the BLACKSMITH & WHEELWRIGHT, I did not see much that I do not know how to do, and I have noticed lots of times that articles which are written are by some young fellows who think they know it all, and as a general rule those that know enough to do all kinds of jobs know enough to keep their mouths shut.



A Unique Shoe

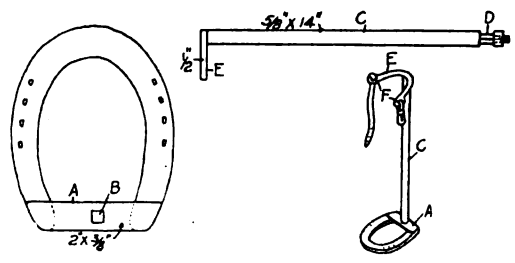
From Charles Chism, Ohio: I am sending you a sketch showing a patent of my own which I made for a veterinary, for a horse which had a small cannon bone broken. He nailed the shoe on and did not have to swing the horse up. The horse was cured and the veterinary said that it was the best case he had ever doctored. The horse could balance himself very nicely with this kind of a shoe. Perhaps it will be a help to some brother blacksmiths.

I took a common shoe and welded a two by three-eighth-inch iron, as shown at A, across the heels of the shoe so that it would extend two inches back of the horse's heel. I punched a square hole, as shown at B and then took a five-eighths-inch rod, fourteen inches long as shown at C, squared one end, as at D, and cut threads for a nut. I then took a piece of half-inch round iron, made it half-moon shaped as at E and made places as at F for straps to go around the leg.

* * *

I did not notice an answer in the November issue to the question of Brother Hanson. I think he is very fortunate in having an old blacksmith as a competitor charging high prices. In my neighborhood there are some old blacksmiths that do not believe in getting fair prices. As a rule most of the older smiths still believe that a dollar is enough for shoeing a horse and that fifty cents is enough for setting a tire. Brother Hanson says that his competitor does poor work. I do not think this is true, because if he did he would not get the work at his high prices.

I think that it is the public propaganda that troubles most blacksmiths. You will find that that is the reason he does not speak to you. Find out if this old man reads a trade paper. If he does not urge him to take



Mr. Chism's Idea.

the BLACKSMITH & WHEELWRIGHT. I had a brother blacksmith work seven miles from where I live out in the country. His prices were very low. I knew that he was hardly making a living from the way he spoke to me and from what I heard from others. He often called on me but would never take my advice and would not take a trade paper. I had the BLACKSMITH & WHEELWRIGHT sent to him at my expense.

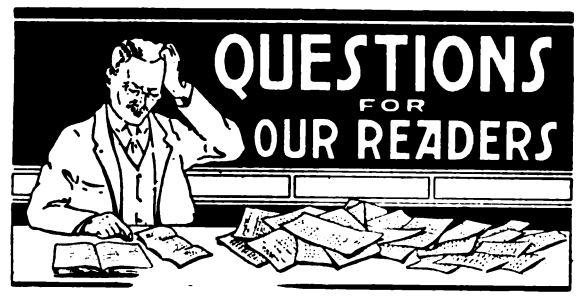
He received the March issue and his wife read it to him and showed him his mistake in working the whole year and having a big book account. He closed his shop and went to work in a mine that was close by (as a mine blacksmith), and now he is making seven dollars and eighty cents a day and at that he works but eight hours a day.

He was in my shop about three months ago and I asked him why he closed up his shop. He told me that he and his wife figured out that it did not pay him to go on and he thought it was time to close up.

He said that he was making more clear money now than he ever made in his life and he does not have to beg for it like he did when he was in the blacksmith business.

I should like to see an answer to the suggestion that Brother Volmer of Wisconsin made in the October issue, in which he stated that he thought it would be a great help to blacksmiths if every smith who ran a shop were compelled to take out a license in the same way as a veterinary or a medical doctor. His plan was to have smiths pass an examination to show what they know and what they can do. Brother Volmer stated that he felt that if a smith could not stand the test he could not run a shop.

What if a woman is entitled to a man's wages? She gets them anyway.



TIRE PULLER

From John Meade, Wisconsin: Have any of the brother smiths a tool to pull off tires (large ones). I made one but it does not suit me. Some brother may have a better idea and if he has, I wish he would describe it and send it to the BLACKSMITH & WHEELWRIGHT.

I would also like to get a second-hand milling tool, or as some call them "keyseat-cutters." I find that new tools are extremely high, notwithstanding the fact that the war is over, so that I cannot afford to buy any.

FILES

THE file is such a simple tool that all men think they know how to use it. Such is far from the truth. There is a right and a wrong way to handle the file, so much so that where one man will spoil a good thirty-center in two minutes, another will make it last for months. Everyone has one or more files in his own garage that are used indiscriminately on parts ranging from breaker points to exhaust valves.

File teeth have one straight side and one slanting side. Cutting is only possible when the straight side is facing in the direction of the stroke—in other words, *the forward* stroke is the cutting one. The inexorable law of file usage is "Bear down on the forward stroke, but put no weight at all on the return stroke." Bearing down hard on just two return, or back, strokes will wear out a file more than a whole day's proper usage.

File teeth are made glass hard to give them longer life. For this reason, they are very easily broken or chipped off. To throw files around among metal parts or pitch them into a drawer with other tools or to try to jar the cuttings out by knocking the file against a vice—all these abuses chip off the tops of the teeth and spoil the file before it has had a chance to wear out. The file maker takes unusual care to protect his product as long as *he* has it and wraps the files before they are put in boxes in such a way that there are no metal-to-metal contacts.

Most files in the hands of the average person are ruined by using on hard or scaly parts. The outside surface of cast iron, parts of the exhaust line that have been heated to the point of pitting and scaling, sharp corners and ragged edges, and the various pieces that have been heat-treated are a few of the spots that should never be touched by a good file. Then, because of the nature of the metals, there is a certain order to follow in the life of a file from the time of its purchase; this is, cast iron, bronze, brass, white metals, steel, and finally the harder substances named above.

SOME MIX-UP

Pat—"Mike, 'tis drunk yez be."

Mike—"A lie, a lie you're spaking. Yez would not dare to spake thus if Oi was sober."

Pat—"If yez was sober, ye'd have the common since to know yez was drunk."

Steel Wheels

The Electric Wheel Co. Box N, Quincy, Ill. manufacture steel wheels to fit any axle for plain or grooved tires. They also carry a full line of wood and steel farm trucks with steel or wood wheels. Blacksmiths who desire to investigate this reliable line should write for their catalogue and prices to the manufacturers.

Phoenix Horse Shoes

There is a constant demand for Phoenix Horse Shoes, manufactured by the Phoenix Horse Shoe Co., Chicago, Ill., and this demand has probably proved the fact that the shoes are reliable. The manufacturers in designing these shoes had in mind the desirability of making a practical shoe and they have always held to this idea. This concern also manufactures Bull Dog Calks which are said to hold firmly to the shoe, never to jump out when set and easy to drive in the shoe.

Northwestern Horse Nails

The blacksmith will find that his customers are becoming more critical than ever before, that they insist on careful workmanship. It is almost impossible to turn out a good job without the requisite tools and materials. The smith knows that it is important to use reliable nails in shoeing horses and the Northwestern Horse Nails, which are manufactured by the Fowler & Union Horse Nail Co., Union Division, Chicago, Ill., should come under this head for they are said to be made of the best quality material.

The feature of this nail is its reinforced point which makes it easy to drive and safe to use. The manufacturers will be glad to furnish readers of the BLACKSMITH & WHEELWRIGHT with particulars upon request.

Rochester Helve Hammer

A very sturdy efficient tool is being manufactured by the West Tire Setter Co. of Rochester, N. Y., called the Rochester Helve Hammer. This tool is made in six sizes, two styles of frames. It is very popular because it has been proved by experience that it does the work well.

The manufacturers specialize in tire setters and helve hammers and they have been very successful in manufacturing and marketing products which will bear the closest inspection. This company publishes an interesting book on the Rochester Helve Hammer and the readers of the BLACKSMITH & WHEELWRIGHT may obtain it by writing to the Company.

Arm & Hammer Anvils

The Columbus Anvil & Forging Co., 115-129 W. Frankfort Street, Columbus, Ohio, manufacture the Arm and Hammer Wrought Iron Anvils, which are well known to the trade. They are made of wrought iron which being fibrous is very tough, thus enabling an anvil made from it to withstand the hard usage which is given to such a tool.

The highest grade crucible steel is used for the anvil face. Full details regarding the various styles may be obtained by writing to the manufacturers.

Columbia Calipers

The well known line of Columbia Calipers which was formerly sold by E. G. Smith, of Tampa, Fla., may now be purchased from the Columbia Caliper Co., Marietta, Pa. This information will be of interest to all those who have recognized the accuracy of these measuring instruments.

New Manufacturing Company

The Bertschy Engineering Company of Cedar Rapids, Iowa, organized in May, 1920 has just completed the installation of a large machine tool equipment. This company which actually started business in July 1920 purchased the buildings, property, equipment and supplies of the Peerless V Belt Company of Cedar Rapids, Iowa, and the buildings were immediately remodeled and additions made. Following their organization in July they purchased from the Mattison Machine Works of Rockford, Illinois, the metal working shaper business which had been conducted by the Rockford Company for several years. In addition to the purchase of this well known machine tool manufacturing business, they also purchased the Bermo Welding Apparatus business from the Bertschy Manufacturing & Engineering Company of Omaha, Nebraska.

The new Iowa Company began its production activities in October 1920, and has on hand now castings, parts and material which are in process of manufacture for 16, 20 and 24 inch heavy duty back geared Shapers. The entire output of the machine tool department is covered by orders, and preparations are being made to extend this department to take care of the increased business. In their Welding Apparatus department they have in process of manufacture upwards of five thousand complete Welding Equipments, and a large number of additional Bermo Welding Torches.

In this department the policy of the former management with regard to installations of Welding Apparatus for beginners and small shops is being carried out. This provides for small cash payments, and monthly installments. It is understood that the President of this Company was enabled to start in business several years ago through the assistance given by a manufacturer who allowed him to purchase machine tool equipment on the installment plan. The President has since that time carried this plan out with reference to the sale of Bermo Welding Apparatus. This has been the means of assisting thousands of beginners throughout the country to establish themselves in a business of their own with a small cash investment.

In the belt department where the Silent Chain V Belt is manufactured the demand far exceeds the company's ability to supply. It is said by competent engineers that among the great advantages of this type of transmission are the following that the drive will operate on centers as short as 24 inches, that it does away entirely with slippage, and the extensive tension such as is required in flat belt drives. It eliminates the necessity of having sprocket wheels as other types of silent chain drives require, as the belt operates in V Grooves which very frequently can be cut into a fly wheel of machine, thereby eliminating the purchase of sheaves and requiring only the small driving sheave for motor or other power medium. A saving of practically 10% in power over flat belt drive is said to be possible. A very important feature of this belt is that it will operate under any atmospheric conditions, and temperatures have no effect upon it. A large eastern manufacturer recently requested repair parts for one of these belts which had been in service for eight years according to the Company's own statement.

The Bertschy Engineering Company at the present time employs a large force of men; they are working full time and all the overtime that is possible. They have a very strong organization. While it is a little out of the ordinary to find a machine tool manufacturer west of the Mississippi River especially in Iowa, which is not claimed to be a manufacturing State, there is no reason why this Company with its three popular products all usable in any industry where metals or machinery are handled, or used in any way, should not make a success. They are unaffected by the varying labor conditions which prevail in the large manufacturing centers. They are close enough to the raw material market to avoid any unusual delay from this source. The State of Iowa is said to be one of, if not *the* richest State in the Union, and will possibly not be as much affected by financial conditions elsewhere as those States where industries are more numerous.

The directors of the Company are:
A. J. P. Bertschy,
Geo. S. Wright, Council Bluffs, Iowa.
Glenn M. Averill,
Cedar Rapids, Iowa.
Arthur T. Averill,
Cedar Rapids, Iowa.
E. B. Poff.

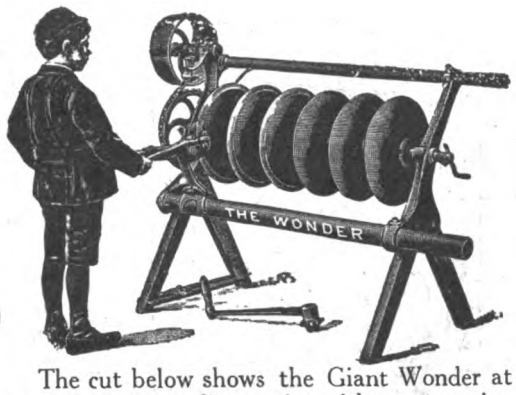
The Bertschy Engineering Company of Cedar Rapids, Iowa, must not be confused with the Company bearing similar name whose office is at Omaha, Nebraska. While some of the officers and directors of the Iowa Company are interested in the Omaha Company there is no other connection.

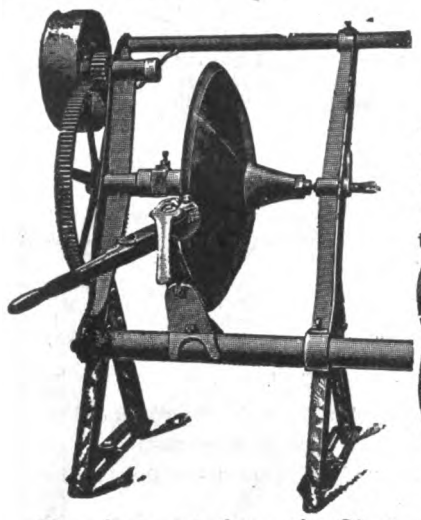
This announcement of the activities of the Cedar Rapids Company coming at a time when business depression seems to prevail throughout the country especially in manufacturing lines is like a ray of sunshine on a dark day. The officers of the new Company are confident of the outcome of the present general policy of slowing down in business, and look forward to a very healthy business during 1921.

THE WONDER DISC SHARPENERS

BUILT LIKE A LATHE

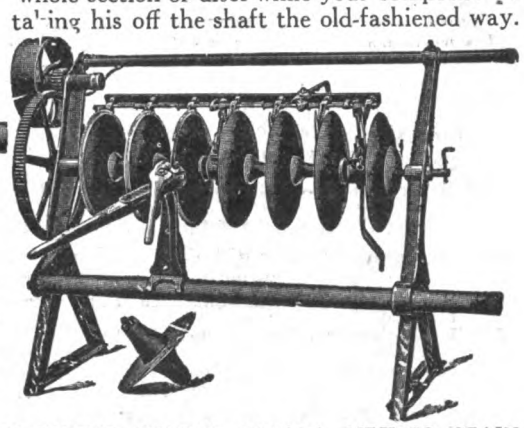
This cut shows the Little Wonder at work on a whole section of discs. This machine is especially adapted for sharpening disc harrows. While the Little Wonder is being successfully used to sharpen plow discs of 22 inches or less, we would recommend the Giant Wonder where disc plows are used extensively.





The above cut shows the Giant Wonder at work on disc plows. Will sharpen any size from 12 to 32 inches in diameter.

The cut below shows the Giant Wonder at work on a seven-disc section without removing discs, thereby saving one-half the time and labor, as in many cases you can sharpen a whole section of discs while your competitor is taking his off the shaft the old-fashioned way.



FOR SALE BY LEADING JOBBERS IN UNITED STATES, CANADA, MEXICO, SPAIN, AUSTRALIA, ARGENTINE REPUBLIC, SOUTH AFRICA AND FIJI ISLANDS

A. E. DURNER, Manufacturer, EVANSVILLE, WIS., and BRANDON, MAN., CAN.

ADDRESS ALL INQUIRIES TO

A. E. DURNER, Head Office, Evansville, Wis.

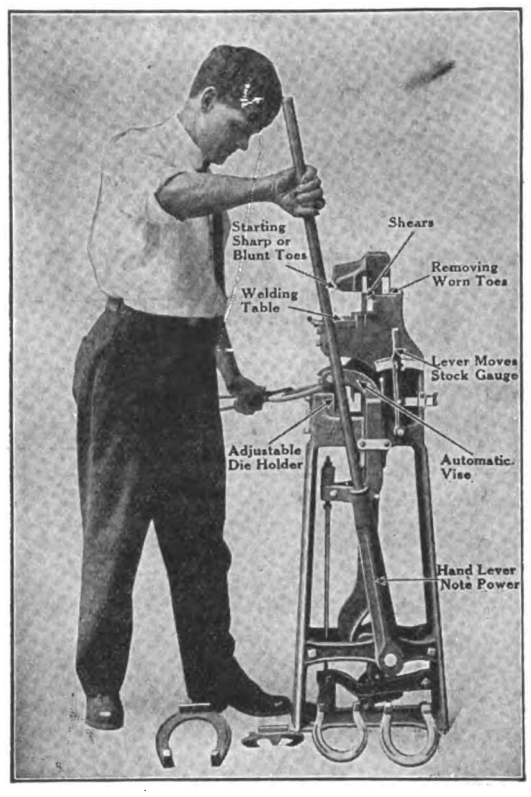
Both size machines are equipped regular, long enough to take in 8 disc section. Special length furnished for 10 and 12 disc section at small cost.

I hold the original patent on this style sharpener. I could build them cheaper, but I won't. I would build them better, but I can't. Write for testimonials from your neighbor. Did you ever buy a cheap machine that gave satisfaction?

THINK ABOUT IT, THEN BUY A WONDER

1921 MODEL
THE L. S. P. CALKING MACHINE

The Greatest Time and Labor Saving Machine On Earth



1921 MODEL—Fully covered with Patents

OUR 1921 Model is the same as our 1920 and we agree with the users and so would you, that it cannot be improved.

Do not mistake this for a machine which makes toe calks or a foot vise. This machine is for turning heel calks, both Blunt and Sharp, sticking and welding toe calks, clipping and trimming ends of shoes. IT CALKS SHOES, doing the work just the same as you do by hand with the hammer, only it is done much better and easier, and in a fraction of the time.

In turning heels, you can turn up just as much stock as you wish, upset or stoveup to make as heavy as you like and square up the calks without use of hammer. There is no losing of toes when you weld on the L. S. P.

It is a strong, handsome, well made machine and will last, as you might say, a life time, fully warranted for one year. It is in use in the best shops in the United States, users claiming more for it than we do.

Write at once for full information and prices.

L. S. P. CALKING MACHINE CO.

P. O. Box 225 **WYALUSING, PA., U. S. A.**

NATIONAL MACHINE CO., Brighton, Ontario, Canada

Value Not Measured in Words

The James D. Darney Company of Philadelphia use a Parks Wagon Shop Special in their shop for repair work. They say they wouldn't be without it, because of the amount of time it saves and the work it does.

"Its value cannot be measured in words," says the Darney Company.

That's the way many blacksmiths and wheelwrights feel about Parks Machines. They are light, easy to handle and cost next to nothing to run. They out perform heavier machines, and cost much less.

Write today for a catalog and see how well Parks Woodworkers are built and how adaptable they are to your work.

The Parks Ball Bearing Machine Co.
Northside Station,
Cincinnati, Ohio

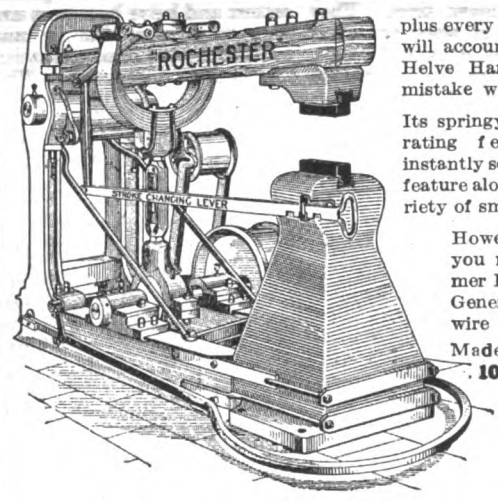
Chicago Offices and Show Room,
615 Machinery Hall
Canadian Factory:
200-210 Notre Dame East, Montreal
Western Office and Warehouse:
1113 Farnam Street, Omaha, Neb.

Wagon Shop Special

This machine is a combination of Circular Rip and Crosscut saws; 22 Inch Jointer, Rim Rounder; Felloe Borer; Spoke Tenoner. All ready for instant use—no changing. One size—power 3-5 h. p.

PARKS
Wood Working Machines

PERFECT ACTION AND THOROUGH WORKMANSHIP



plus every resource and an earned reputation. This will account for the popularity of the Rochester Helve Hammer. They're Eye-Openers and no mistake when it comes to Helve Hammer results.

Its springy forging blow is one of the important operating features—any length, weight, or force instantly secured, while the machine is running. This feature alone saves a lot of time when there is a variety of small work to be forged, swaged, or welded.

However, there are so many distinctive features you must ask for the Rochester Helve Hammer Book, Remembering, that for Welding and General Forging, the "Rochester" is "under the wire first."

Made in six sizes, two styles of frames; 25 to 100 lb. heads

The West Tire Setter Co.
ROCHESTER, NEW YORK
(Manufacturers of the WEST Hydraulic Tire Setter.)

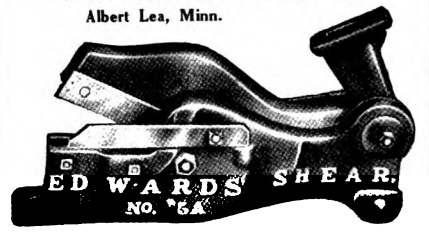
IF DEAF OR hearing is impaired, do not delay sending for our FREE Booklet on NATURE'S REMEDY for deafness. A safe, easy and efficient HOME TREATMENT. Do not deprive yourself of the success and pleasure shut out of life by deafness, when good hearing can be restored so easily and with little expense. The Lisen Co. Denver, Colo.

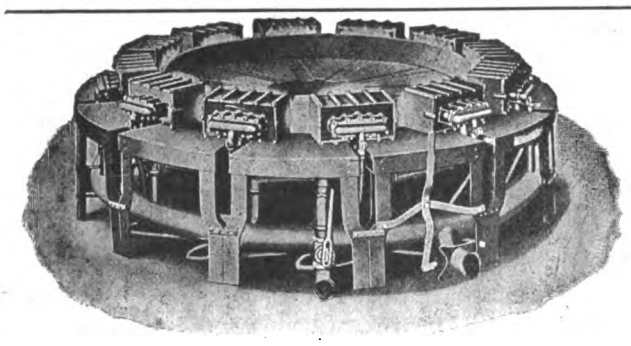
Edwards Shears

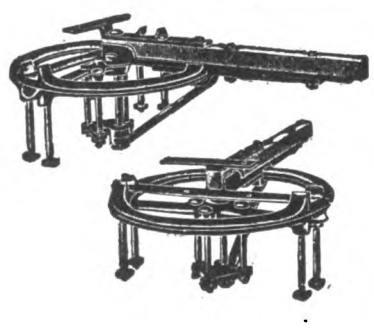
For twenty-four years the Two Leading Low Priced Shears in the U. S., representing the Greatest Value for the Least Money.
No. 5, Weight 200 lbs. cuts 4x1-2 inch soft steel
No. 10, weight 430 lbs. cuts 4x¾ inch soft steel
At the price you should have had one long ago. **Order one** from the first iron man that calls on you. **They All Sell Them.**

Write for descriptive circulars and prices.

C. D. EDWARDS MFG. CO.
Albert Lea, Minn.







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Economy Wire Buffing Wheels

The Chas. E. Miller Anderson Rubber Works, of Anderson, Indiana, are manufacturing a line of buffing wheels under the trade name of "Economy." These wheels are of special interest for the reason that they are built up in sections and the sections may be replaced at a comparatively low cost. The buffing wheel when complete consists of a hub, together with lock washers, brush sections and retaining bolts. By removing the lock washer sections, the wire brushes may be taken off.

The hub is a permanent fixture and new sections may be put on in a very few minutes. The construction of the brush admits the use of various widths and sizes. The wire sections are made from a special formula steel, which the manufacturers claim will not crystallize or break off. They claim that the wire is exceedingly tough and will give long service. The sections wear smoothly and evenly right down to the hub. The buffing wheels may be used for tire work as well as for buffing metallic parts.

Gilmer Products

The L. H. Gilmer Co. is putting out Gilmer Woven Endless Fan Belts for passenger cars in new cartons, packed ten belts to the carton. The line of belts now covers every car that calls for a flat typefan belt and consists of 29 groups which includes 68 makes of cars and 327 models.

A new feature is an individual wrapping which not only protects the belt from shopwear but also makes it attractive for counter and window display. Each wrapper contains the group number of the belt, the makes and models of cars which the belt will fit and also gives instructions for the installation of the belt.

Gilmer Fan Belts for trucks have been issued in 70 sizes. These belts are wrapped individually but are not cartonized. A line of Tractor Fan Belts has also been issued. These belts are mounted on sticks, wrapped individually and packed in individual cartons. They are issued in 23 sizes.

In addition to Fan Belts, the Gilmer line now consists of Gilmer "46" Transmission Lining, Gilmer Tire Straps, Gilmer Rebound Straps, Gilmer Radiator Lace, Gilmer Anti-Squeak Frame and Body Lining and Gilmer Solid Woven Asbestos Brake Lining.

A striking feature of the new Gilmer line is the issuance of a complete line of power belting for use in garages and repair shops.

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CLASSIFIED BUYERS' GUIDE

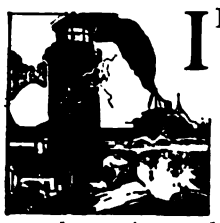
BLACKSMITH AND WHEELWRIGHT

and TRACTOR REPAIR JOURNAL

Vol. LXXXII. No. 2 FEBRUARY, 1921 TERMS ONE DOLLAR A YEAR

Practical Horse Shoeing

Different Methods of Treating Various Kinds of Cracks



IF THE wall of the hoof becomes dry, this condition is favorable to cracking. Sometimes, if the shoe does not fit properly, cracks may be facilitated. And a number of other things tend to assist in producing cracks. A crack may start from the bottom upwards in cases where the horse goes barefoot, in such a manner that the hoofs have not been rounded off. Or, if the tread is uneven, the barefoot horse may develop cracks that begin at the bottom.

Such cracks are understood to be favored when the countersinking for the nail heads permits the nails to penetrate too far into the hoof or when the nails themselves are too long. It will be well for the horse-shoer to remember the possible causes of cracking; so that, when he has a case before him, he may know what things to change in an effort to arrest the progress of the cracks.

Perhaps the cracks which give the most troubles are those which result from severe strains on the coronary margin. These strains may themselves be the result of an uneven distribution of the animal's weight. Such cracks, starting from above require time for complete recovery. This is due largely to the fact that even after the tendency to crack at the coronary band is stopped and uncracked horn begins to form, there will still be the cracked places below.

These will probably not disappear until the down-growing hoof has been growing long enough for the hoof wall below to have worn away a little at a time. Cracks due to dry horn, bad shoeing and cracks down at the bearing surface are not to be regarded as necessarily important. If the hoofs themselves are sound and possess a standard form, such cracks are frequently of little importance.

In seeking to deal with cracks, one point to consider is how to hold the sides of the crack and thus keep it from pulling the new horn apart at the upper ends of the cracks. But this point is not so important as the matter of preventing unequal distribution of weight and of getting the *form* of the hoof into better shape.

Preventing Widening of Cracks

There are several ways of going about the matter of preventing the horny wall from opening up more at the cracks. One of these method uses *clips*. These may be bought ready-made or they may be fashioned out of thin iron rod. The clip will need starting points in the hoof wall, one to either side of the crack. These may be formed by using a tool of special form with its edges heated to redness. The clip is a kind of staple and the special tool has the duty of forming depressions for the entrance of the ends of the clip.

The legs of the "staple" must not be long, as otherwise there might be excessive penetration. These legs may be originally directed somewhat towards each other; so that when placed in initial position, and a pair of special pincers applied, the clip will tend to force the side of the crack together, or at least resist the widening action. The illustration shows the tool which is to be heated at one end for the purpose of burning in the two depressions; the special pincers; and several of the clips.

The work of putting in the clip is to be done while the horse stands on the foot and immediately after the depressions are formed. The idea is to act while the horn is soft. The crack may require but one clip; but it may require two or more. The only cases where this method is to be used are those where the hoof is good and strong and where the cracks are in the toe region.

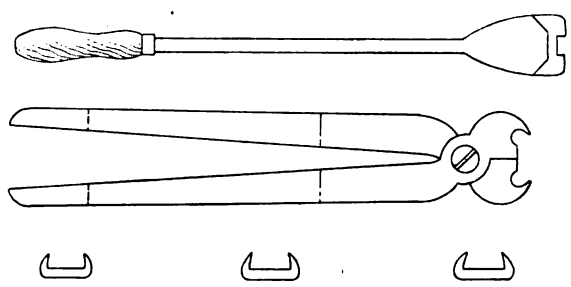
Another method uses a short strap of metal. The idea is to bridge the crack with the strap and secure the latter by means of small screws of wood. These must, naturally, be no longer than the thickness of the horny wall; otherwise trouble of another kind might be initiated. The strap may be long enough to accommodate two screws at each end. In putting the plate or strap in place, it is first to be heated to a dull red and then made to burn a slight depression. It is then cooled; after which it may be set in place and the screws inserted.

The length of the screws must, of course, take account of the fact of the depression. This method has the advantage of being applicable to cracks located nearly anywhere on the hoof. About the only exception occurs in the case of cracks at the extremities of the heel regions. Of such straps or plates, a prominent authority says, "They appear to have given satisfaction."

Another Method

There is another method which is applicable to cracks at the toe or at the quarters. It requires a degree of skill. Horse-shoe nails are employed as rivets. This is really the way they are ordinarily used. The nails are gotten ready and then driven so as to pierce both borders of the crack. They are then clinched in the ordinary way. Less skill is perhaps required if holes for the nails are burnt or bored prior to putting them in place.

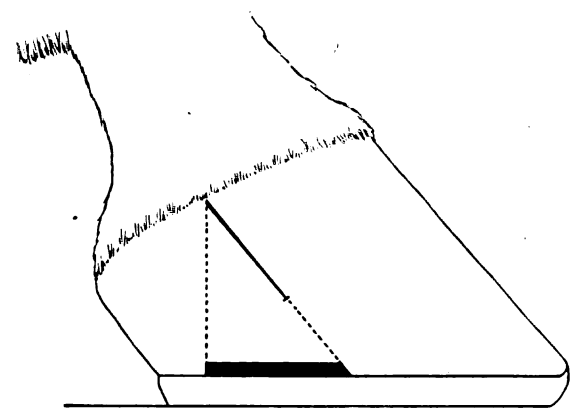
Yet another method is one which employs a broad linen tape. A mass of tow,



Above: Tools for Burning the Clip Recess in the Hoof. Below: Clips for Repairing the Cracked Hoof.

which has been moistened with tar, fat or oil, is applied to the coronet. Then the tape is wound round the upper part of the hoof for the purpose of holding the tow firmly in place. The ends of the tape, the winding having been completed, are secured, by tying, lacing or sewing them together. The whole may now be smeared with a coating of tar. The dressing is left in place until the horse is shod again. Of course, this procedure can hardly have in view the holding of the sides of the crack together. It serves to keep the coronary region in good condition and perhaps facilitate the growth of new horn.

Finally, a shoe provided with "bar clips" is said to have been successful. The function performed is the checking of the repeated openings and closings of the crack. "A shoe with 'bar clips,' fitted closely to the bar of the foot on either side" is what has been used. "By diminishing expansion



Hoof shod with bar shoe for quarter crack. The part of the wall which has been "eased" is shown by dotted lines.

at the heels, this shoe lessens movement in all other parts and prevents the sensitive tissues from being nipped between the margin of the crack."

It will be understood, perhaps, without my saying it, that those of the foregoing methods which make use of metal pieces to hold the sides of the crack together are useful only where the cracks follow the natural fiber of the horny material. They "are of no value where the margins are irregular, zig-zag, wavy or overlapping. In the latter case, the parts should be thoroughly thinned with a rasp or a fine searcher, but bleeding should be avoided." The horse may then be shod and the linen tape applied.

A method employed many years ago by Grosswendt may be repeated under similar conditions. The crack was open and was in fact filled with granulations from the sensitive interior. If metal pieces—clips, horse-shoe nails employed as rivets, plates or straps held by wooden screws, etc.—had been used, good results were scarcely to be expected because of the granulations filling the crack. Instead of using some means of holding the sides of the crack together, Grosswendt inserted a wooden wedge and by its means held the edges apart. Local treatment was used and a cure was ultimately effected.

The most usual form of sand crack appears to be the type which originates at the coronary margin. "In seeking the best method of shoeing, it should be borne in mind that everything which renders the hoof broad and strong, improves its form, and relieves the diseased portion of the wall of pressure, favors recovery. Accordingly, tips, dilating shoes, bar shoes, and stoppings which cause counter-pressure on the sole, assist recovery."

In shoeing, one should make sure that the tread is flat and even, so that the horse may put his foot down firmly. Two toe-clips are useful, as they prevent movement of the hoof on the shoe, in certain directions. It is advised to locate the nail holes a little further back than is usual. Clips, metal straps with wooden screws, horse-shoe nails or some similar holding device may be put on. Which kind of device to use will depend partly upon the place where the crack is located and partly perhaps upon what the horse-shoer knows of the various methods. "Bar shoes are only resorted to when the

bearing surface of the wall is defective."

If the cracks are in the quarters or the heels, then bar shoes are indicated as the thing. The bearing edge is to be cut away a short distance for the purpose of relieving it from the duty of carrying weight. This cut-away section is to be located with extreme care, as failure here might result in excess weight coming on a part of the hoof that would injuriously affect the crack. Suppose the crack is in the quarter, and that it extends down from the coronary band along the fiber. If the shoer notes the point where this crack would strike the bottom of the hoof if it were sufficiently prolonged, he will have the location of one end of the cut he is to make. Let him next note where a plumb line let fall from the upper end of the crack would indicate on the bottom of the hoof. This point will be the other end of the cut. He now has the two ends of the cut; and so may readily cut away horn from the tread from the one to the other. The object is to provide a situation such that when the shoe is on and the weight of the horse comes upon it, the region of the crack will not be involved in strain.

There is another way of getting this same result. As it does not depend upon cutting away horn, it may often seem preferable to the horse-shoer. Instead of cutting away horn between the two points previously described, the corresponding points on the top surface of the shoe may be marked. The metal may be reduced in thickness from the one point to the other. This reduction is made only on the top surface of the shoe—that is, the surface that comes next the hoof.

Heel cracks may be treated just as quarter cracks, it being understood that we are now considering only cracks running down from the coronet.

Sandcrack

Sandcrack sometimes appears in the bars. Here it is usually brought on by high heels. Ordinarily, sandcrack of the bars is confined to fore-feet. Corns are a frequent accompaniment. If the bars open up sufficiently to expose sensitive parts that lie back of them, a certain amount of inflammation may result. And the horse may develop a degree of lameness. While the horse stands at rest, the leg will perhaps be knuckled over at the fetlock. Attention should promptly be given, as otherwise the inflammation may go deeper and even penetrate to the plantar cushion. The bulb of the heel on the side concerned may be affected. In fact, the lameness may go on and become quite severe.

The normal action of the bars involves a bending back and forth. Undoubtedly, when there is sandcrack here it will generally mean that the cracks are being opened and closed continually. Naturally, this tends to an aggravation of the trouble. When the shoe is taken off and the under part of the hoof pared, the sandcrack will appear as a dark line. Gray matter may ooze from it; sometimes, blood. The object to be sought in treating the trouble is to get sound horn to grow. With this end in view, the farrier removes the margins of the crack and the horn on the sides is thinned.

It is inadvisable that weight be supported by the horny wall in this region. The way to relieve it of any such necessity is to cut away horn on the bearing edges, next to the shoe; or to depress the hoof side of the shoe in this region.

A bar shoe is to be used, together with a leather sole and suitable stopping. When the margins of the crack are cut away, it may develop that the crack is really quite deep or perhaps has been made so by the cutting away. If the hoof is "upright," a deep cut may rather be expected. In case the bottom of the cut seems moist, a little wad of tow, which has been moistened with some tincture of myrrh or aloes, is fitted in and the remaining space filled in with wax. This may, if done right, result in a gradual closing of the crack as new horn takes the place of the old.

Platform Gears

Instructions for Making Platform Gears of Iron

IN previous papers we have confined ourselves to platform gears that are largely composed of wood, but so many platform gears are made in which iron is an equal factor with wood in shaping outlines that to omit noticing those gears of this character would leave our work half done. There was a time when the platforms that were largely of iron were used only on the finest of pleasure carriages, but that time has passed, and business wagons and medium-priced pleasure carriages are now fitted up with them in great numbers. As a rule repairs on these gears are more likely to require the attention of the blacksmith than the woodworker, and we will, therefore, take up all parts, and thus do what we can to aid the craft in both departments.

This class of gears more often get out of shape by the bending of the ironwork that is not backed up by wood than at any other part; this bending serves to throw a spring out of place or operates to cause the fifth-wheel plates to bear unevenly, besides causing greatly increased friction, also in other

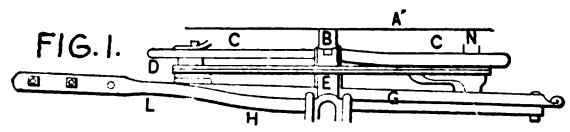


Fig. 1. Side Elevation, Showing Iron and Wood Framework.

ways weakening the framework, and when least expected causes a complete collapse; and, in addition, damages the woodwork to an extent that demands new woods.

The gear shown herewith is designed for a medium weight, cut-under delivery wagon. It is made strong, and there is no sacrifice of strength from a desire to give a light appearance. The woodwork is comparatively heavy and is well plated. Fig. 1 gives a side view of the elevation, showing all the pieces in full or in part and their correct positions. A represents the sill of the body at the point where the gear is attached; B, the top bed, the lower edge of which, being plated, rests upon the top of the top circle of the fifth wheel. The total depth of this bed in 4¾

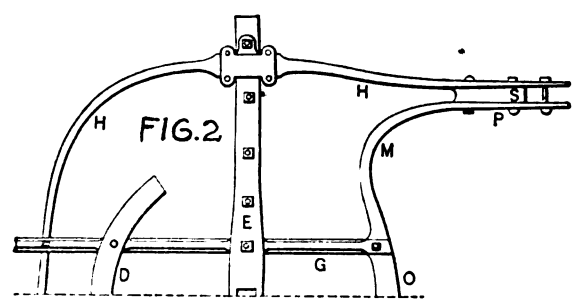


Fig. 2. Ground Plan, Showing One-half of the Frame.

inches, but is cut down to 3½ inches at the fifth-wheel bearing, and 2¾ inches in the center; the width is 2½ inches at the center and 2 inches at the ends. There is one nutter bar, which is plated. The total depth of the wood for this bar is 1⅜ inches. That portion which passes through the bed, B, and extends 4 inches beyond the front edge of the fifth-wheel plates, is cut down to seven-eighths of an inch, the cutting being from the underside. The portion back of the bed, B, is 1⅛ inches deep, and is cut to that depth from the upper side, causing a short curve at the back of the bed, B. The fifth-wheel plates, D, are ⅜ inch thick. A block must be placed between the nutter bar and the upper plate of the fifth wheel, to act as a bearing and to level up the front end of the nutter bars. This block must be cut to a segment of a circle and of a length to extend outside of the nutter bar. The lower bed, E, is 3¾ inches deep in the aggregate, but is cut away to 2¾ inches at the center, thus making the wood of the lower bed lighter than that of the upper, but this difference is equalized by using a much heavier bottom plate in order to secure the requisite strength without giving the appearance of excessive weight. The bed is 2½ inches thick at the center and 2 inches at the ends. The straight futchels, G, are mortised through the bed, E. These are 1¼ inches square. The mortising of these futchels through the bed re-

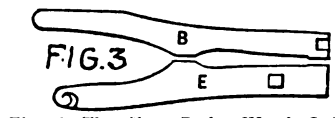


Fig. 3. The Two Beds, Wood Only.

quires care in order to give them the correct pitch, as the bed must rest absolutely level when ironed up. The segment of the circle, which supports the bottom plate of the fifth wheel, H and K, must be of sufficient depth to support the wheel plates at a perfect level, and it is this leveling of the center gear that tests the mechanical skill of the workman. The woodworker may make his part all right, and the blacksmith draw it entirely out of place with his irons. Or the wood may be imperfect and the blacksmith compelled to draw it in place with his irons; in either case the gear is damaged and its wear reduced.

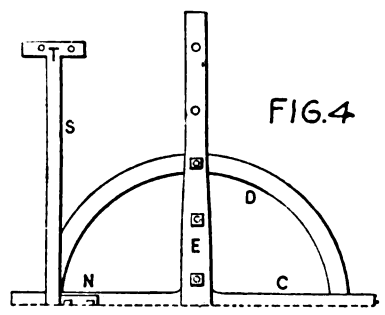


Fig. 4. Half of the Top Portion.

The iron futchel is the part that will test the skill of the smith, as the two are made up together, the rear portion passing entirely around from spring bearings and is bolted to both of the straight futchels. This is made of ¾-inch oval iron back of the spring bearings and of ⅞-inch oval forward of these bearings, the forward ends being swaged to a taper to the point, L, Fig. 46, the point where the jaws begin, the jaws being shaped as shown in Figs. 1 and 2. The front plate, which forms a portion of the fifth wheel and the brace between the wheel and the inside jaws is of ⅞-inch oval, swaged and drawn to the required shape.

Fig. 2 shows the ground plan of one-half of the under gear; E, the bed; G, the straight futchel; D, the fifth-wheel plate block, which shows the segment of the circle without the fifth-wheel plate; H, the outside or main futchel; O, the fifth-wheel bearing plate, which is a part of the inside brace, the ends of which form the inside section of the jaws, S being a block which holds the jaws apart; M, the inside branch to which the section O and the inside portion of the jaw, P, are attached. The straight futchel, G, is plated its full length, as is also bed E, thus making a powerful but simple frame of iron for the support of the wood. Fig. 3 shows one-half of the upper and lower beds and their respective bearings, B, the upper, and E, the lower bed. The ends of these beds may be finished a plain round, as per bed E, or may be scrolled as per bed B.

Fig. 4 shows the upper half of the upper section; E, the bed; C, the nutter bar; D, the fifth-wheel circle, and S, the supporting brace, the ends of which, T, are bolted to the sills of the body, the center N to the nutter bar at N. Fig. 1. The bed, E, is heavily plated, while a plate of medium weight strengthens the nutter bar. The timber for

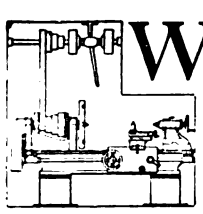
the wood portion should be good white oak; there is nothing better; hard maple or prime red oak may be used if it is impossible to procure the white oak.

No man should undertake the making of a new gear of this character who has not had some experience with gears, but a good general mechanic in either department should be able to make good repairs.

Welding Tractor Castings

How a Cast-Steel Tractor Casting Was Repaired Very Satisfactorily

BY DAVID BAXTER



WHEN making tractor repairs with an oxy-acetylene torch the blacksmith is sometimes required to weld several different kinds of metal during one job. At least he is required to know how to weld these different metals if he makes a practice of repairing all types of tractors. He is not often called upon to weld them all in one tractor job but he should be able to handle them in order to repair all tractor parts. For the modern tractor includes most of the common metals, such as brass, bronze, aluminum, cast iron, mild steel, special steels and cast steel, all in one machine.

The theory of oxy-acetylene welding is practically the same for all of these metals but each different metal embodies some little characteristic all its own, some peculiarity that requires a little different treatment as regards the way the welding flame is regulated or manipulated, or some item in preparing and handling the job. Or there may be a slight difference in the supplies or equipment used. In fact it might be said that each metal is a problem in itself. Where one operator finds a metal easy

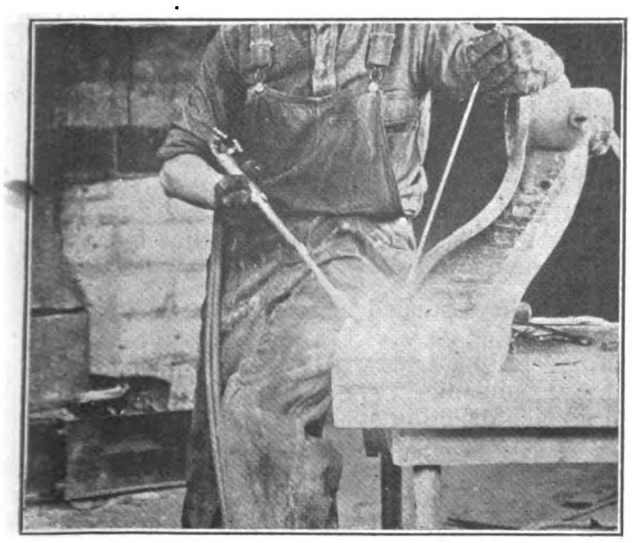


Fig. 1. Forming the V Groove with the Cutting Torch.

another will have considerable difficulty in mastering the same metal.

Now as it is manifestly impossible to attempt the discussion of all, or even two or three, of the different metals in one short article such as this, let us select a kind that is liable to come to any tractor shop to be welded. Let us at this time discuss the welding of cast steel as it applies to a tractor part made of that metal. Let us consider the job illustrated in the accompanying photographs and follow it through the entire repair process from the time it entered the shop to the finished weld.

We will look at it from an angle of how the work was done rather than how to do the work. This will permit the individual welder to make such minor changes in the process as his equipment demands.

First, a brief description of the job: This casting was made of cast steel approximately half an inch thick in the part through which the crack ran. The crack was about a foot in length; situated in the flat part and extending from side to side, including the lower brace rib, and to complicate matters the crack was located in a corner formed by a larger strengthening brace. An examination of one of the pictures will show the location of the crack.

Composition of Corners

When steel castings are made, nearly all sharp or right angled corners are more or less spongy or porous in the thicker parts. It is this defect that causes such cracks to be harder to weld. The porous metal often contains considerable dross or slag which will not fuse and tends to prevent the steel from flowing. In fact the welder will find it necessary to work his slag out of the metal in one way or another. He must either melt the surrounding metal and float the slag out, or melt it and scrape it out with the filler rod. Sometimes the shape of the casting will permit the welder to cut the defective portion out with no weakening of the casting. This was the case in the job under discussion.

This porous metal in one corner of the casting is the probable cause of the crack so that the weld no doubt made the casting stronger than it was in the first place. Knowing about the probable presence of the dross in the vicinity of the crack the welder proceeded to get rid of it right at the start. This was the first step in the repair process.

To cut the steel out with a hammer and chisel would have required considerable time and hard labor, so the operator cut the entire corner out with the oxy-acetylene cutting torch. This procedure was quickly and easily accomplished, consuming far less time than would have been required by chipping. A V-shaped groove, or rather, slot, was cut the full length of the crack clear through the steel. Fig. 1 shows the cutting operation in progress. The cut out portion of

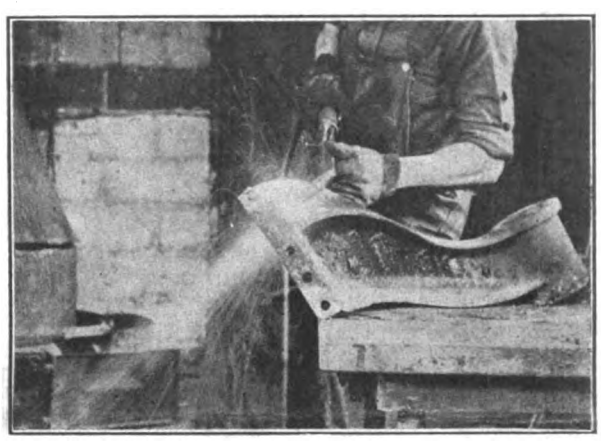


Fig. 2. The Welding Position of the Casting; the Torch in Operation.

the steel is clearly shown in the form of sparks blown entirely through the casting.

Before applying the cutting flame the cracked corner of the casting was heated with the welding flame to loosen the sand and rust that adhered to it. Then the line of cutting was scraped and hammered to get it as clean as possible. This was done to prevent any foreign matter from interfering with the cutting.

After cutting the groove the next step in the repair was preparing the job for welding by removing all roughness and cindery deposits caused by the cutting action of the flame. The flame literally burned its way through the steel, leaving a small amount of oxidized metal along the edges of the cut. This substance was all cleaned off before applying the welding flame, since to leave it might cause trouble, on account of the oxide becoming entangled in the weld to prevent fusion or cause a porous weld.

After cleaning and grooving a job the next step usually is to arrange for preheating. But was not needed on this job. Preheating was of no avail on this job because there was no danger of contraction of cracks or of expansion strains. Therefore heating previous to welding was eliminated and the casting placed in the first welding position.

It is scarcely ever necessary to preheat steel castings to overcome the effects of expansion and contraction because the metal is elastic so that it easily adjusts itself to the changes of temperature. This fact forms the main difference between cast steel and cast iron in the welding. It is scarcely ever necessary to heat cast steel jobs previous to welding if they are no heavier than this one. Large cast steel jobs should be heated, however, in order to facilitate the fusing. Red hot steel will melt faster and flow together easier because then it is al-

ready a long way toward the fusing state. The lighter class of work doesn't require such long periods of welding and therefore needs no heating.

Another difference between steel castings and others such as cast iron, is the action of the molten metal under the welding flame. If the white flame is allowed to touch the metal after it commences to melt, the oxygen in the flame is rapidly absorbed and causes the metal to become spongy. Should this be continued the metal will literally be burned up, the same as though it were being cut. Then too, steel does not flow readily, so the novice is liable to think he is securing complete fusion when in reality he has only melted a thin skin of the surface.

The flame should be held farther from the surface and the heat be allowed to "soak" into it. Jobs as heavy or heavier than the one described should be melted deep in order to obtain a good bond. If the filler metal is piled on top of the weld which is not melted deep enough the result will be no better than a mere adhesion. This is true of other metals too, but not so likely to happen since a deeper melting is more readily achieved. The operator must be careful about this deep melting on steel, however, and not try to force it by holding a high-power torch too close, or too long motionless.

The Next Step

But, to revert to the welding process as it was applied to this particular job, let us see what was the next step. This is clearly indicated in Fig. 2, which also shows the actual welding operation. After cleaning and grooving the crack the casting was placed upon the welding table in the position indicated in the picture. In other words, it was placed upright upon the table so that the groove would be nearly horizontal, and so the casting would not be liable to rock at a critical stage of the welding.

Then, after lighting and regulating the flame to the neutral condition, the operator

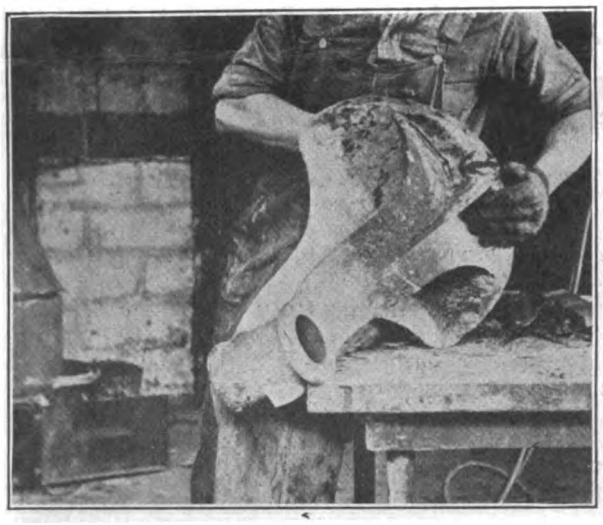


Fig. 3. The Groove Partially cut out with the Torch.

took up a filler rod of mild steel and applied both the flame and the rod to one end of the groove. Which end is chosen is immaterial, but it happened to be an end near the edge of the casting. The flame was held close at first and revolved in circles a couple of inches in diameter; crossing the filler now and then to heat it.

As the spot heated and change color the circles were decreased in size until the flame played upon the groove only, and as this portion of the groove reddened and commenced to melt the red hot end of the filler was introduced in such a way that it would melt into the flowing groove. Particular care was taken to see that both sides of the cut were melted down fluid before adding filler metal. In this way the tip of the flame was swung back and forth across the groove, changing the circular motion to a sort of criss-cross movement. When necessary to keep the groove fusing, the flame was played along the groove instead of across it. Much of this torch movement depends upon the condition of the weld and upon the welder's ability. He should study the weld and be ever watchful of it, ready to change tactics with the whims of the melting, so to speak. That is why it is so difficult to tell all welders how to do the work; there are so many little things that influence the melting and mixing of two metals, some intentional and some involuntary.

After the first portion of the groove was filled, in fact while it was being filled, the flame was gradually shifted to another portion where the operator repeated the operation, except that the flame was no longer revolved but was zig-zagged along the sloping sides of the cut. However, the flame was sometimes swung along the metal outside of the groove to furnish heat for conduction purposes. That is, the metal adjoining the groove was heated to prevent the weld heat from being drawn away too rapidly by the cold sections of the casting; in this way the revolving movement was utilized.

One Cause of Failure

It might be well to insert here that this is probably the cause of more failures in steel welding than any one thing; the operator doesn't realize how rapidly the heat is drawn away from the weld. In fact he doesn't notice that it is being conducted away and therefore he completes a poorly knitted weld without knowing it. The flame should be large enough and he should manipulate it in such way that it supplies excess heat sufficient to replace what is lost by conduction.

When the second portion of the groove was welded the flame was once more shifted to another portion where the procedure was repeated. Thus the whole groove was filled in a succession of heatings and fillings. Each filling, however, was but a continuation of the previous ones. Barring pauses to test the adjustment of the welding flame or to scrape bits of slag out of the molten metal, the entire length of the crack was welded without stopping, thus making the welding a continuous stream of filler.

Whenever bits of slag became apparent the flame was concentrated on them and given a quick dipping motion in an effort to dislodge the offender. If the slag did not melt loose and float to the surface the filler rod was dipped into the weld and given a quick twist which usually cleaned out the spot. When the slag floated to the surface it was either blown aside by the flame pressure or scraped away with the filler rod. The torch was tipped a little to one side or the other so that the flame would blow across the surface of the molten metal to carry the slag to the edge of the weld.

Dressing Down the High Spots

After the entire length of the crack was welded the operator worked the flame back over it to dress down the high spots and refill the sunken places; to better the appearance of the weld in general. In doing this the flame was concentrated upon the rough places until they melted again. The filler and force of the flame were then utilized to level them out. The low spots were "doctored" by re-melting and filling with new metal.

When this had been accomplished the casting was immediately turned over to enable the welder to doctor the under side of the weld. In portions where the melting had been too ardent, and those where the melting had not reached clear through, it was worked over. The roughness caused by the former were heated by revolving the flame over them until they became fluid, when they were blown and scraped level. The poorly connected portions were opened up by re-melting, and new filler was melted in, in about the same manner as prescribed above. Thus the weld was made stronger and given a more pleasing appearance on both sides of the casting. The welder will find that appearances count for more than he thinks with most of his customers, so it pays to give some attention to the looks of the finished job. A satisfied customer will talk the way he feels.

No arrangements were made in regards to cooling this job since that is another thing that is not needed on cast steel, ordinarily. There was no danger of contraction cracks so the welded casting was merely placed to one side and allowed to cool at will. No covering or banking, was resorted to to promote the slow cooling which is so essential on other metals. When the casting was cold enough to handle it was ready for service again.

Therefore, we see that in the common run of work the welding is a much simpler process, if the melting is properly executed and is deep enough to hold, on cast steel than it is on many other metals.

Some Prices from Nebraska

From Louis Mergl, Nebraska: About three years ago, I took a notion to go into the blacksmith business for myself. I started with little capital, and I have a pretty good business now. Here are some prices that I charge in the middle part of Nebraska:

Plow lay sharpened and hardened 14 inches	$ .90
Plow lay sharpened and hardened 16 inches	1.00
Plow lay sharpened and hardened 18 inches	1.25
Horse shoes neverslip to size No. 4	1.25
Horse shoes neverslip larger sizes	1.50
Resetting	.70
Calks each	.05
Common shoes	1.00
Wagon poles	8.00 to 12.00
Tire setting four wheels	6.00
Tongue put in old iron	8.00

What do the brother smiths think about the farmer who comes to the shop, buys a pair of new shoes, or has the old shoes fixed, and buys some nails and puts the shoes on the horse himself? I do not feel like doing such business, but on the other hand I charge enough to make a little profit on it. There are just a few farmers like that around here. I am planning to buy a "Just-rite Blade Sharpener" for all the sharpening to be done. Can some brother smith give me some advice on this machine, whether it works satisfactorily or not?

How Shall I Charge?

From Harry Hutchism, Iowa: I am a reader of the good old BLACKSMITH & WHEELWRIGHT, and I have obtained some information through its columns.

I would like to learn from some brother smith what to charge for work. For instance, a wagon spoke costs twenty-five cents wholesale, what should I charge my customer for it? Or a bolster costs two dollars wholesale, what should I charge my customer for this? If I use a piece of iron that weighs six pounds at five and a half cents a pound, and it takes me two hours to do the work what should I charge for that?

I have a draft horse and when I shoe him with sharp shoes he forges. I have tried different ways, but still he kicks. How can I cure him?

Here are some of the prices that I charge for shoeing and plow work:

8 new shoes steeled	$11.00
8 reset	8.00
8 neverslip	12.00
Plow pointing	3.00
Plow sharpening	2.00
Tire setting wagon	6.00
Tire setting wagon 3 inch	8.00
I charge for labor, per hour	1.25

Not a Politician

"What is the shape of the earth?" asked the teacher.

"Round."

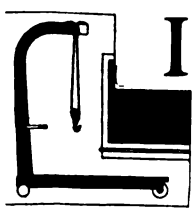
"How do you know it's round?"

"All right, it's square, then; I don't want to start any argument."

Small Florida Shops

Third Installment of Article; This One Concerns a Few Side Lines

BY J. F. HOBART



I ALWAYS like to watch a colored blacksmith at work for he does his work easily and as a matter of course. He never makes smithing the hard work that some white smiths do. In fact, the colored man must make play of anything he does in order to stick thereto and to do the work at all! There are some very good smiths among the colored ones and to me, watching a colored smith at work is as good as a vaudeville show and as full of surprises too!

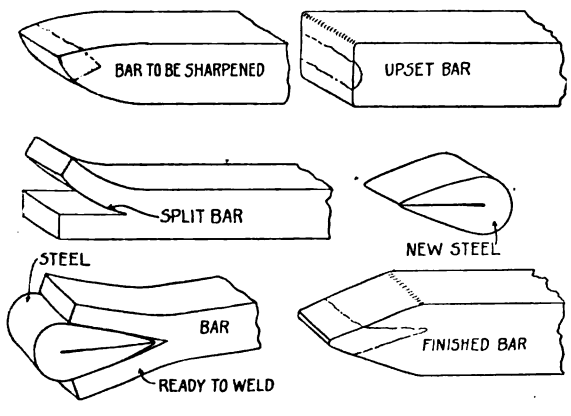
In a story a couple of years ago, the writer told how the colored smiths along the Mississippi River work up old bolts and other steel wreckage into pretty good horse-shoes but they don't do much of that in Florida, for save at Tampa, Jacksonville and a few other sea-coast cities, there is not enough steel junk to be found to shoe a dozen horses! Old steel, like mud, is mighty scarce in Florida.

Another thing the smith doesn't do in Florida is new-laying steel plows. Reason? There are few plows to need new-laying. They don't really plow land in Florida—just scratch the surface two or three inches deep. Do some real plowing to Florida land and turn furrows six inches deep and you have spoiled the land for several years! Florida is the newest land in the Union and soil has not formed upon its surface as yet.

The geologists declare that Florida was settled 5,000 years before it was fit to support a population—from the soil—and as the stock men burn over the land each spring to get rid of the weeds and "make the grass grow," they burn up everything which could enrich the sand. They thereby hold back human development another, 5,000 years or so! The colored smith is not troubled much in Florida with plow work.

Making a "Butcher" Knife

I sat for an hour on a horse-shoe keg and watched a colored smith make a big knife from an old bush scythe and the stub of an old cold chisel. Both as shown by the engraving—"Knife Made From Scrap"—were hard looking bits of stock. First, the smith heated the old scythe, straightened the thick shank or heel, then he heated the scythe in the middle and bent it double. Then he bent it again, midway of its length, making



Crow Bars and Vehicle Springs.

four thicknesses which he welded into a rectangular strip which was afterward bend double and the ends brought together as shown by one of the sketches.

The stubby cold chisel was hammered out into a long thin strip of steel with one thick and one thin edge and the strip was made as long as the doubled bar of old scythe, and the thin edge of the steel placed inside the doubled scythe-strip as shown, the thick edge of tool steel projecting about an eighth of an inch. While in this position, the whole thing was welded together, forming a welded strip with all steel along one edge and all old scythe stock along its other edge. Old scythes make splendid knife material for there is very good stock in them and the thin strip of tool steel in the scythe adds to the stiffness of the back of the knife to a remarkable degree.

The "laid" knife has the advantage that should it "spring" during the hardening operation, it may be easily straightened again by hammering or by prying between the vise-jaws, without the least danger of breaking, as is the case when straightening an all tool steel knife. The combination material makes the knife a bit heavier than the all steel one and where intended as was this knife, for cutting cane and underbrush in something the style of the Spanish Machette, the weight was desirable rather than objectionable.

But how that big knife would cut! To test it, the colored smith wrapped a rag around the tang in place of the not yet applied handle, and used the new knife upon a chopping-block as one would use a hatchet. Bamboo canes, palmetto leaf stalks and similar trash wood were cut readily as with a light axe and the big knife never showed even a sign of distress from the whacking it received over the corner of a big long-leaved pine block!

Sharpening Picks and Crowbars

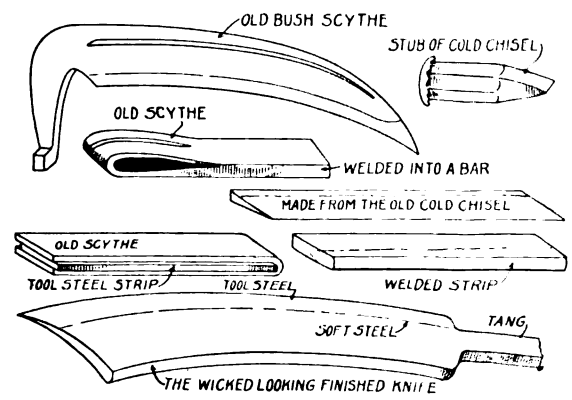
In certain portions of Florida there are deposits of phosphate rock which are picked up and shipped by the thousand train-loads. Picks and crowbars are used in handling some of the rock deposits and in other portions of the state, soft limestone deposits are very plentiful. This rock is quarried out, crushed and shipped all over the state where it is spread upon the sand roads. The rock and sand together will "pack," something which neither alone will do, with the result that a pretty good roadbed is formed. And how the Bermuda and the St. Augustine grass will grow between the rock and sand particles upon an abandoned or little used road of the above named material!

But the phosphate and the lime rock picks and bars require sharpening and new-laying occasionally and the manner in which this was done, and the steel which was used, brought a smile which comes back every time I think of the matter! The colored smith—he owned the shop too—was actually new-pointing picks and drills with bits of old automobile and wagon springs! The engraving "Crow Bars and Vehicle Springs" shows how the work was done, and well done it was too.

The bars to be sharpened were certainly "tough looking customers" as may be seen in the engraving. The first thing done was to take a good heat on the end of the bar which was then *churned* upon the face of the anvil until the bar had been upset as shown by the sketch. The end of the upset bar was then split open, care being taken to cut exactly in the middle so that the two jaws would be of the same thickness. The smith took considerable care in making the cut and when I remarked the fact, the colored smith naively replied: "Boss I done can't make a good job nohow if I split dat bar like a alligator mouth!" meaning of course if one side was thicker than the other.

A vehicle spring was tapered flat at one end, a short piece cut off and the other end flattened also, then the piece was bent in the middle and hammered into a wedge as shown by the sketch—"New Steel"—which was driven into the ends of the split bar as shown by "Ready to Weld"—and a good heat was then taken, the steel well softened clear through, the three surfaces were stuck together and the end of the bar finished at a single heat.

The smith when asked if the comparatively soft spring steel did not wear out quickly, replied with a chuckle:—"Boss, dose bars do come back sooner dan when I fixed dem with old-file steel but I'se done got no mo' ol' files and dem folks up on de phosphate am mighty glad to get dis



Knife Made From Scrap

steel fo' it am a whole lot better dan nothin' an' if dem bars done come back pretty often for more point, I'se done can stan' it somehow!"

A Shovel Smith Shop

In a little smith shop not more than a thousand miles from Tampa, Florida, I found the owner busily engaged in repairing an old shovel. He had removed the good handle from a shovel with a broken and worn out blade and was fitting the handle into a good blade which had lost a portion of its original wooden handle. After getting acquainted a bit it developed that this smith was a regular "Shovel Hound" and made it his business to acquire each and every broken shovel he could get hold of.

He had a standing offer to every "kid" in the place of a few cents for each broken shovel brought in and the piccanimies surely fetched a whole lot, some with nothing "but a strap and two rivets" while others were perfect save for a broken wooden handle. The Smith repaired these old shovels, shuffled the handles and made a good many of them into as good as new which he found a ready sale for at a price slightly below that of new shovels.

As I sat watching the smith juggle a handle into a particularly obsterperous pair of straps, the though came as to how a smith who was located in the right environment might add considerably to his income and tide over the loss of shoeing, by starting

"A SHOVEL HOSPITAL"

But very few tools aside from those found in the ordinary blacksmith shop would be required. In fact, as the Florida colored smith did, only the common shop tools would be absolutely necessary. But, put in a small oxy-acteylene welding and cutting outfit and the business of shovel repair has infinite possibilities. The cut —"A Few Shovels"—shows partly what can be done with shovel wrecks; one or more of which can be found in almost every shed, barn or shop and hundreds of which would be brought to the smith should he advertise the fact that he wanted derelict shovels. A sign could be placed on the corner of the shop—

"CASH PAID FOR OLD AND BROKEN SHOVELS"

That sign would bring in an old shovel with each customer and a dozen by each boy within miles of the shop. A regular system should be started to handle and care for the old shovels which could be sorted and graded as soon as possible, being placed in

(*Continued on Page* 15)

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Our Editor's Letter

IT is a peculiar thing, perhaps, but I never think of February without thinking of George Washington and Abraham Lincoln. When I went to school, about the only thing that pleased me about these days was the fact that they were holidays, and that the day before we had a long "assembly" which was a recreation from "lessons."

I felt a great deal like the little fellow, who, being told that the next day was Washington's birthday, said, "Gee whiz! Can I go to his party?" When I was a kid, we all got together at the beginning of each month and counted the number of school days in the month. April was a bugbear, but February—February was a red letter month. Only twenty-eight days, and then Saturdays, Sundays and *two*, count 'em, *two* holidays.

We never cared much what the holidays were for, we only knew that it meant no school. Alas for the poor teachers who carefully filled our heads with long recitations which we babbled off, sighing with relief when the ordeal was over.

It's almost needless to say that all this has changed. Somehow, whenever I think of these men, something inside of me says, "Gosh! It's great to be an American." George Washington, the dignified, democratic commander, Abraham Lincoln, the great-souled, clear-headed leader. Don't you feel that it's something to be proud of,—that we Americans have a wonderful heritage? I do.

We all of us think of New Year's day as a day of resolutions. Sometimes I think we ought to feel that the birthdays of these men are days for new resolutions—for turning over leaves. Surely we can have no better examples.

Are you thinking of these men? Are you trying to pattern yourself according to them? Do their ideals of progress coincide with yours?

The thing I want to write about particularly is the fact that these men were progressive, active, *alive*. The thing that I want to drive home more than anything else is the fact that you blacksmiths are *not* progressive. You do not keep up with the times. You stay in the same old groove. You lay plow points in the same way that your grandfather did. You shoe horses in the same way that the smith before you did. You read about some *live* smith's ideas about this repair or that repair in the B & W and say to yourself, "That's a good idea; I must do it that way sometime,"—and then,—promptly forget about it. Back again in the same old rut, same old work, same old prices, no further ahead than when you started.

Now, that's kind of hard talking, isn't it? Of course when I say "you" I don't mean everyone. But, do you feel guilty of any of these little vices? If you do, or if you feel yourself slipping, take my advice, and buck up. Remember George Washington, and Honest Abe and *change*.

A Forecast of the Industry

AS we read our morning papers and as we talk with our friends, we are impressed with the fact that a spirit of depression seems to be stalking through the land. The more we read and the more we talk, the worse we feel. And yet, is not all of this the result of a sudden transition to normal?

For many months we have lived in a period of inflation; our view point has been altered; our ideas of conditions magnified. The dollar bill has been viewed through the wrong end of a telescope and assumed the appearance of a postage stamp. We ceased to be interested in any figure less than five unless it had two zeros after it. Now that these zeros have been removed, we feel depressed. And yet, to continue our simile, nothing has been removed except a few zeros; the real tangible things of life still remain. An acre of land; a ton of coal and a pound of meat have exactly the same dimensions and weights that they did in 1914 when business was going up like a rocket.

We are suffering nothing more or less than a descent from the heights of the abnormal to the normal and, because we cannot always live in an exalted condition, we feel depressed. Until the effect of our sudden drop wears away, our condition will remain. It is our duty to forget the past and make the most of the present.

The present business depression which seems to exist in sections, throughout the land, is merely temporary and is exaggerated by the season. Winter in the mechanical industry is, and always has been, a rest period. We will find, with the coming of Spring, the same signs of life that we have in the past.

Conditions are what we make them. Think you are sick and you will soon have your friends solicitious concerning your evident infirmity. Rush into a bank and shriek for money at the top of your lungs, act frantic, and within a few minutes the long line of depositors will melt from the receiving teller's window and mass in front of the paying teller. Cry about business depression and your friends will take up the cry and there will be a depression. Just try a little optimism for a while and see the results.

UP-TO-DATE

"Do you try to make home life pleasant for your son?" "Yes," replied Farmer Corntossel, "but it's mighty hard to live up to the refined ways he insists upon. I'm annoyin' him turrible because when I'm workin' round the barn I keep forgettin' to refer to the hayloft as the mezzanine floor!"

Here Is Your Chance

A Prize of Over $1000.00 is offered through The American Humane Association for the most satisfactory horseshoe or Device which will prevent horses from slipping on roadways and wherever in service.

Why This Prize is Offered

All over the northern part of the United States, each winter, thousands of horses slip and strain themselves. Sometimes they fall; sometimes legs are broken and the horses are shot. The inhumanity of present conditions is very great. The loss in valuable horseflesh is appalling.

Snow and ice increase the slipperiness of the pavement. Horseshoes must be kept sharp much of the time. Even this does not prevent the animal from slipping. Many of the state roads, while smooth and of good grade, offer a very uncertain footing for beasts of burden. These conditions must be met. Trade and agriculture must go on as usual. Not alone do slippery or smooth pavements threaten the horse; they also offer an embargo on the transaction of business of every kind. Millions of dollars of loss accrue each year from the uncertainty of the footing of the horses, mules and donkeys, which bear the burdens of civilization.

To relieve these existing obstacles to traffic and stop the frightful suffering connected therewith The American Humane Association invites the cooperation of all inventors and lovers of man's faithful friends in harness.

Conditions of Competition

1. The Competition is open to all without restriction.

2. The Association reserves the right to reject any or all designs submitted and to make final decision on award.

3. A Committee of three, appointed by the President of The American Humane Association, composed of one prominent veterinarian and two practical horsemen, of large experience, will examine the designs submitted and report on the same with recommendations to the association.

4. The design may be submitted by means of drawings, or a model, or both. A description should accompany each design submitted, stating, in detail, the merits claimed for the invention, the material used, or proposed to be used, in its construction, and its estimated cost. State whether or not the invention is in actual use or has been tested, and the results as to wearing record, non-slipping qualities, and other advantages. Such descriptive matter should be typewritten.

5. Each sheet of drawing and each model and all descriptive matter shall be unsigned, but shall bear a device, number or motto for identification; and the same device, number or motto shall be placed on a sealed envelope containing the competitor's name and address. This will not be opened until the award has been made. In making the award, the cost of the device, its wearing qualities, and all other points of merit, will be taken into consideration, in addition to its non-slipping qualities.

6. Drawings and models, with the accompanying envelopes, must be securely packed or wrapped and delivered at the office of The American Society for the Prevention of Cruelty to Animals, Madison Avenue and Twenty-sixth Street, New York, before 6 o'clock p. m., July 1, 1921.

All inquiries regarding this competition should be addressed to Dr. William O. Stillman, President, The American Humane Association, 287 State Street, Albany, New York.

List of Donors of Prize

Pennsylvania S. P. C. A.	$200.00
American S. P. C. A.	200.00
Massachusetts S. P. C. A.	200.00
New York Women's League for Animals	200.00
Women's Pennsylvania S. P. C. A.	200.00
Western Pennsylvania Humane Society	100.00
American Humane Association	25.00
Red Acre Farm	5.00

SMALL FLORIDA SHOPS

(*Continued from Page* 13)

groups according to the work required by each. Those requiring only new wooden handles should be placed in one bin, those with good handles but poor blade in another, close by the handleless blades.

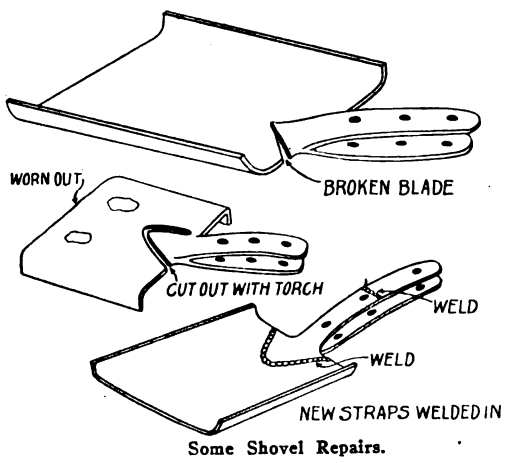
The blades requiring welding could be segregated and those requiring new straps put in a place by themselves so that when the workman gets at a bunch of shovels he has those that require about the same operations to put them in condition again. It will not pay to try to fix up a bunch of shovels as they come along, welding a blade to one and putting a new strap on another with a handle to the third.

The Welding Torch

The welding torch will enable many a broken shovel to be saved by a very few minutes' work. As shown by one of the sketches—A Broken Blade—the fracture which completely ruins many an otherwise good shovel may be quickly repaired by simply welding the break and that too without removing the wooden handle or even preheating the blade.

Just begin at the inner end of the break, after same has been hammered or bent into alignment, and weld toward the outer end of the crack. Five minutes with the welding torch will make the shovel fully as good as new and even stronger than it was before being abused and broken, for no shovel is ever thus damaged by legitimate use. Using a shovel for and as a crowbar, breaks many a blade close to the straps as shown by the sketch.

When a worn out blade is found, especially with good straps and a fine handle,



Some Shovel Repairs.

the straps may be transferred bodily—and without removing the handle—from the wornout blade to a better blade which may have lost its straps. Just use the cutting torch as shown by the sketch—"Cut Out With Torch"—and do the same with the broken-strap blade, then the good straps may be welded into the good blade in a few minutes and another good shovel will be ready for sale or exchange for half a dozen broken ones!

Welding in New Straps

The engraving—Some Shovel Repairs—shows how the new straps look after having been welded into place. There is a string of little weld-spots in a heart-shaped row around the top of shovel blade and if thought necessary, the smith may grind out all these weld-marks on the emery wheel. But they do no harm if left as shown, save that they do not look as pretty as when ground smooth.

But if to be ground, the weld should be given more metal so that the joint may be reinforced a little more than it will be reduced by the grinding process. It is thus that oxy-acetylene welds may be made stronger than the original metal. Just build up reinforcing upon either side of the weld and there you may have all the extra strength desired.

When a reinforced seam or weld is to be ground, a little care and skill with the grinding wheel will enable the workman to leave a slightly swelled ridge along and over the welded place which, without being unsightly or even hardly noticeable, will still add greatly to the strength of the weld and to that of the original metal plate.

Welding Straps

The sketch—"New Straps Welded In"—also shows how one of the straps has been given a new end. The old strap, evidently broken off, was fitted to another old strap in such a manner that the rivet holes came at a level with each other, then the strap was welded fast, ground smooth outside and as much reinforcing as desired, left inside where it would be imbedded in the wooden handle.

Shovels have slightly turned-up edges or sides along the blade and sometimes these edges split a few inches up from the business end of the blade. A few minutes' torch work and the break may be mended stronger than when new.

Hoe and Rake Repairs

Shovels are not the only tools which may be reclaimed by the oxy-acetylene torch. Hoes and broken garden rakes yield easily to the welding treatment. In the south, a great deal of hoe-work is done upon lawns—or what are called lawns, and the weeds and other growths are cut down with a sharpened hoe used as a scythe. But the hoe is soon worn out by constantly filling or grinding its edge to great sharpness. With the welding torch, the hoe is quickly renewed by simply welding on an inch-wide strip of another old hoe-blade or a strip of broken saw-blade either from a buck-saw blade or from a carpenter's broken handsaw. It will only be necessary to place the hoe blade and the strip in position, flat upon a bit of asbestos paper resting upon a solid, preferably metal surface. Then clamp the pieces in position, or hold them until one corner of the seam has been "stuck" by the welding flame. The rest of the weld can be put together quickly and at very slight cost for the reason that sheet steel is one of the easiest things to weld, thereby making the operation a cheap one, both for gas and for labor.

The above is only a little of the work which an enterprising smith may hunt up in Florida—and in any other locality as well—and such work should prove very profitable indeed and take the place of the vanishing shoeing in a manner which will leave no regrets when shoeing will have almost entirely disappeared. The blacksmith has no business to sit down and bewail the days and the methods and work which have gone or are fast going. If one kind of business disappears it is up to the smith to find something to take its place and to find same "P. D. Q." so as not to lose out by the change in work.

Evolution and progression fall to the lot of the smith as well as to every other tradesman and he who cannot evolute or progress is bunted into the discard by those who can progress. So, when shoeing or any other branch of your income begins to vanish, don't sit around on the anvil regretting the "good old times" when the shop was full of horses! Don't do that. Just "get a move on" and go after business and you can keep busy. If you can't get one kind of smith work, take another kind. Create a demand for your work and keep busy.

The above shows how a smith may open one good source of revenue for himself and I might fill a column with other ways of "raising the wind" which is dying out of horse-shoeing. I can show you one small Florida smith shop in which toy wagons are repaired and ironed in a manner which makes them very durable. Another Florida shop has a cobbler's bench in one corner where the smith shoes the man if he can't shoe the horses any more!

Muleological

On mules we find two legs behind
And two we find before;
We stand behind before we find
What the two behind be for!

—*Lafayette Lyre*

An Excellent Suggestion

From N. R. Swope, Missouri: In the December issue, I note several interesting letters. Brother J. W. Pruyn, writes lists of prices in his locality. He gives his prices in a very intelligent way, specifying wood only in speaking of sand boards, bolsters, wagon tongues, poles, etc. This is the way to give prices. Simply saying "sand boards," "wagon tongues," etc., leaves one in doubt whether the complete article is spoken of, or just the wood. Usually this is all that is broken or worn out.

Brother Fagg's letter was interesting; as often the customers feel they are being charged too high for work, therefore just show them the prices charged elsewhere. In regard to tire pullers, I will just say a word, do not be afraid of getting your tire hot. then you can easily get it on with the aid of ordinary tongs and hand hammer, that is for ordinary sized buggy and wagon tires.

When a tire is so cold that it has to be forced on, it is too cold to set well. Regarding the plow bolts, will say there is a regular head, and a repair head on the market. The repair head is just a little smaller than the regular head. Did you ever have a customer who complained he could not get some special style plow bolts for his plow shares? Here is my cure. Heat the share at each bolt hole and drive a square punch in the hole, then use the common square shank plow bolt.

An Old Blacksmith

From W. C. Swayze, Illinois: More than forty years have passed since I decided to be a blacksmith. In my younger days I did not enjoy health. My profession as a teacher did not agree with me physically. In my choosing I decided to be a blacksmith. It was the right move in my case. In a few years my weight increased from one hundred and forty-eight pounds to one hundred and ninety-two pounds, and today at sixty-five years, I am like a steam engine, never tired. I am equally handy in wood, but handle the iron department exclusively.

We are prepared to build new work, but our time is taken on repairs. In my forty years' experience I have noted a great change. A few years ago it was generally understood that a blacksmith must obey orders. I have been called at midnight to do work and I stepped into the harness without question. It is different today. They now come during the day and in place of giving orders they ask politely "Will you?"

Our rising generation seems to be interested in sports. Our city has had no blacksmith apprentice for more than twenty-five years, and it seems the business is coming where it belongs among professionals. Why should lawyers, doctors and other professionals rank above ours? I imagine I could handle their business better than they could handle the blacksmith business. Say boys, arise, show your dignity, you are needed and always will be.

Replying to Mr. Tichenor, I must object to his criticism of Mr. H. H. Lyons' article on plow bolt heads. It is sometimes hard to get new shares for older makes of plows. Frequently I have to make new shares and to countersink for the large heads would be entirely wrong. A reasonable countersink and grinding the heads to a surface is the only way and it does not necessitate a large head. Mr. Lyons has the right idea to point a share, and I claim it is the only best way.

I cannot do my work as fast as the two who pointed and sharpened twenty shares in two and a half hours, and I use a power hammer too. Two heats on a point may be sufficient, but I take three and sometimes four. It takes thirty minutes for me to sharpen a fourteen inch share and according to his article it takes but fifteen minutes to point and sharpen a tractor share. That is too fast. I fear it would bear inspection in my territory. My advice is to keep your truck in the Garage. A farmer is easily spoiled. Here are some prices which I am charging:

Sharpening 12-inch gauge	$1.25
Sharpening 14-inch gauge	1.50
Sharpening 16-inch gauge	.90
Pointing 12-inch gauge	2.50
Pointing 14-inch gauge	3.00
Grinding disc	.25
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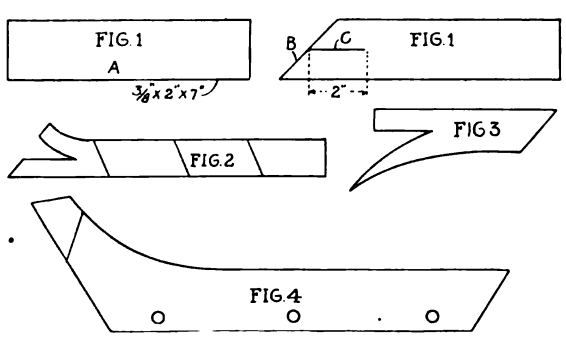

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Bent rims, per wheel	5.00
Sawed felloes, each	.75
Bolster, old irons	6.00
Sand board, each	5.00
Hounds, per pair	6.00
Spokes, single, each	.75
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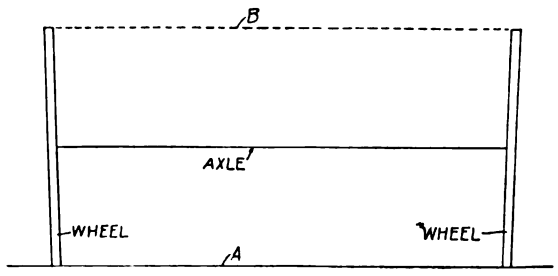

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"Oh, mother, don't go; you always say the wrong thing."

"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 asked.

"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."

—Tit-Bits.

Look things squarely in the face. Find out what is wrong with your store, your service, your advertising, your merchandise, or yourself. If business is poor, some or all of these things are wrong. Get them right.

WANT ADVERTISEMENTS

ADVERTISEMENTS of SHOPS FOR SALE or TO RENT, SHOPS WANTED or SITUATIONS or HELP WANTED,

will be inserted under this head at 3 cents a word, including the address, for each insertion, payable in advance; but no advertisement will be accepted for less than 60 cents, however small.

Remittances may be made in postage stamps where the amount to be sent is less than $1.00. Address

M. T. RICHARDSON CO., Advertising Department,
71-73 Murray St., New York. Publishers of the Blacksmith and Wheelwright

Patents

PATENTS FOR INVENTIONS.

H. W. T. JENNER, patent attorney and mechanical expert, 622 F Street, Washington, D. C. Established 1883. I make an examination and report if a patent can be had and the exact cost. Send for full information. Inventors assisted in developing ideas and inventions. Trademarks registered.

For Blacksmiths

BLACKSMITHS, LISTEN!

Any handy man can make more money doing hard jobs easily. Forging and solid welding with Toy's modern methods of blacksmithing, hardening and tempering to a standard with collard tempering charts. All for one dollar. Samples free. 52 years a machine blacksmith. W. M. Toy, Sidney, Ohio.

"Sample received and it is all you claim for it. For amount enclosed please send me by express 25 lbs. of Uniflax." A Barton of Kosse, Texas writes us the above on Jan. 10th. You also need Uniflax "Master of Service" Welding Compound. Request Circular or send 10c for Sample. Goruse Company, Elmira, N. Y.

Wanted

WANTED

A good location. Will rent, work or buy. Send full descriptions of shop, work and prices. John Printz, Urbana, Ohio.

For Sale

FOR SALE

A blacksmith and wheelwright shop, well equipped with electric drill and circular saw. Horse shoeing and country work, auto repairing. A good stand. Two rooms upstairs rent for $10.00 per month. Proprietor 75 years old, time to quit. Maskell Ewing, Box 13, Penns Grove, N. J.

FOR SALE

Blacksmith Shop and garage in Red River Valley. Fine territory. Shop has power hammer and good set of tools; six living rooms above shop. A good location for a good general smith. Reason for selling poor health. Address Mark & Company, McCanna, N. Dak.

FOR SALE

Only shop in a good town in Northern Iowa. Plenty work, good pay; electric equipmnt throughout, including acetylene welder. Building 30 x 60 nicely arranged, lot 53 x 150. Carry around $1,000 stock. $3,500 buys it, terms on part to right man. For particulars write L. J. Miller, Lakota, Iowa.

FOR SALE

Blacksmith shop in good live town of 1,000, only shop and plenty of work for two men the year round. Frame building 44 x 60, established 45 years; large territory and good prices. Electrically equipped. Wm. I. Scheetz, Hanover, Kansas.

SPARKS AND SHAVINGS

The Mayer Power Hammer

Many smiths believe in investing whatever profits they make in new tools and this is really a wise attitude, because the new tools, if they are good ones, will probably mean more profits in the future.

The Mayer Power Hammer which is manufactured by the Kaukauna Machine Works, 103 Island, Kaukauna, Wis., is a splendid device to invest money in, because it means more money in profits and time saved.

This hammer is said to create extra business for the smith, and is known all over the world. It is made in five sizes so that there should be no difficulty in obtaining the size most appropriate for your shop. Details relative to the capacity, advantages and prices may be obtained by writing to this concern. They will cheerfully answer all inquiries.

Kitowski Eye Turning Device

A machine which for its simplicity alone should appeal to smiths, is manufactured by F. J. Kitowski, St. Cloud, Minnesota. It is called the "Kitowski Eye Turning Device," and is especially adapted for auto spring work. It is said to be the one and only device that will make a complete and perfect eye of any size desired with one turn of the lever. The price is very reasonable.

Full particulars may be obtained by writing to the manufacturers.

Rochester Helve Hammer

The Rochester Helve Hammers manufactured by the West Tire Setter Co. of Rochester, N. Y., are made in six sizes, two styles of frames. The manufacturers specialize in tire setters and helve hammers and their efforts have been confined to produce the best obtainable in this line.

The popularity of their products would seem to indicate that they have been successful. An interesting and instructive book on the Rochester Helve Hammer may be obtained by writing to the manufacturers.

Warner Blowers

There is hardly a well equipped blacksmith's shop which does not number a blower among its equipment. It is a very necessary device when it is of reliable manufacture, but when it is unreliable it is worse than nothing at all.

We should advise our readers to investigate the blower which is manufactured by the Warner Electric Co., of Kalamazoo Michigan, because it is said that this blower is one of the most reliable on the market.

It is said that this blower will stand hard usage (and it certainly gets that in a busy shop) and is simple and durable. It will give any speed desired and is made up for 110 volt current, 25 to 60 cycles only.

If you are in doubt as to the efficiency of this machine, the Warner Electric Co. agrees to sell it on a 30 day trial and in that time you will probably have no difficulty in determining the merits of the device.

It is necessary that you state the voltage and cycles required in order that you get the machine adapted for the current supplied in your shop. This company publishes a folder on forge blowers, which should be in the hands of very blacksmith.

Admiral Welding Equipment

Admiral Welding Equipment, which is manufactured by the Admiral Welding Machine Company, of 1603 Locust Street, Kansas City, Mo., has been on the market for over nine years, and has thoroughly proven its value. It is said to combine efficiency, economical operation and absolute safety, and is obtainable at a reasonable price.

The manufacturers claim that the reason why their equipment has proved so successful, is because it has been thoroughly developed under actual working conditions. A complete catalogue covering the equipment sold by this company will be sent to any blacksmith who writes to them.

Phoenix Horse Shoes

The largest manufacturer of horse shoes in the world is the Phoenix Horse Shoe Co., Chicago, Illinois. This concern also manufactures the Bull Dog toe calks.

The Phoenix horse shoes which this concern makes are known all over the world and they have become so popular because of the careful way in which they are made, and the satisfaction which they give to customers. They are used by horseshoers all over the world.

Miller-Anderson Products

Chas. E. Miller-Anderson Rubber Works, 1420 Meridian Street, Anderson, Indiana, manufacture the Miller-Anderson products which cover vulcanizers, retread outfits and complete equipment for tire and rubber repair shops. This concern also manufactures auto, mortorcycles and bicycle tires, tubes and accessories.

They have recently published a new catalogue which illustrates and describes their products. Blacksmiths who are interested should write to them for a copy of it.

Northwestern Horse Nails

Blacksmiths know that it is necessary that horse nails be made of the best quality material, that they be perfect in form and finish, and have points which make them easy to drive and safe to use.

The Fowler & Union Horse Nail Co., of Chicago, Illinois, claims that the nails that they manufacture contain these qualities. It is said that the reinforced point, which is a feature of the Northwestern nail, makes it easy to drive and safe to use.

"Lisen"

The Lisen Company of Denver, Colorado, have a treatment for deafness which is unique. This treatment contains no new ingredients, but is the special blending and scientific fusion of rare and precious oils and herb extracts with distinctive methods of application.

This treatment has been used in the private practice of an eminent doctor with very fine results for over twenty years. If you have been bothered with ear troubles it will be well for you to write to this company and obtain full information of their remedy.

Sharpening 12-inch gauge	$1.25
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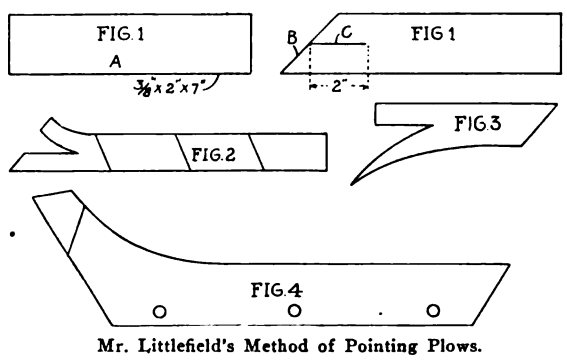

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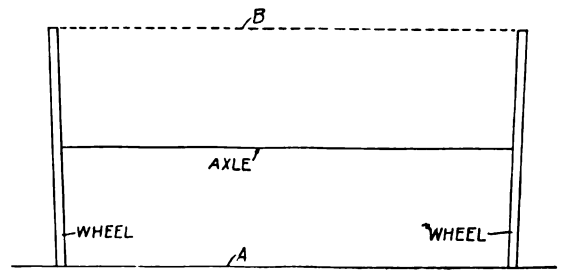

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"I'm going over to comfort Mrs. Brown," said Mrs. Jackson to her daughter, Mary. "Mr. Brown hanged himself in their attic a few weeks ago."

"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 asked.

"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."

—Tit-Bits.

Look things squarely in the face. Find out what is wrong with your store, your service, your advertising, your merchandise, or yourself. If business is poor, some or all of these things are wrong. Get them right.

WANT ADVERTISEMENTS

ADVERTISEMENTS of SHOPS FOR SALE or TO RENT, SHOPS WANTED or SITUATIONS or HELP WANTED,

will be inserted under this head at 3 cents a word, including the address, for each insertion, payable in advance; but no advertisement will be accepted for less than 60 cents, however small.

Remittances may be made in postage stamps where the amount to be sent is less than $1.00. Address

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Patents

PATENTS FOR INVENTIONS.

H. W. T. JENNER, patent attorney and mechanical expert, 622 F Street, Washington, D. C. Established 1883. I make an examination and report if a patent can be had and the exact cost. Send for full information. Inventors assisted in developing ideas and inventions. Trademarks registered.

For Blacksmiths

BLACKSMITHS, LISTEN!

Any handy man can make more money doing hard jobs easily. Forging and solid welding with Toy's modern methods of blacksmithing, hardening and tempering to a standard with collard tempering charts. All for one dollar. Samples free. 52 years a machine blacksmith. W. M. Toy, Sidney, Ohio.

"Sample received and it is all you claim for it. For amount enclosed please send me by express 25 lbs. of Uniflax." A Barton of Kosse, Texas writes us the above on Jan. 10th. You also need Uniflax "Master of Service" Welding Compound. Request Circular or send 10c for Sample. Goruse Company, Elmira, N. Y.

Wanted

WANTED

A good location. Will rent, work or buy. Send full descriptions of shop, work and prices. John Printz, Urbana, Ohio.

For Sale

FOR SALE

A blacksmith and wheelwright shop, well equipped with electric drill and circular saw. Horse shoeing and country work, auto repairing. A good stand. Two rooms upstairs rent for $10.00 per month. Proprietor 75 years old, time to quit. Maskell Ewing, Box 13, Penns Grove, N. J.

FOR SALE

Blacksmith Shop and garage in Red River Valley. Fine territory. Shop has power hammer and good set of tools; six living rooms above shop. A good location for a good general smith. Reason for selling poor health. Address Mark & Company, McCanna, N. Dak.

FOR SALE

Only shop in a good town in Northern Iowa. Plenty work, good pay; electric equipmnt throughout, including acetylene welder. Building 30 x 60 nicely arranged, lot 53 x 150. Carry around $1,000 stock. $3,500 buys it, terms on part to right man. For particulars write L. J. Miller, Lakota, Iowa.

FOR SALE

Blacksmith shop in good live town of 1,000, only shop and plenty of work for two men the year round. Frame building 44 x 60, established 45 years; large territory and good prices. Electrically equipped. Wm. I. Scheetz, Hanover, Kansas.

SPARKS AND SHAVINGS

The Mayer Power Hammer

Many smiths believe in investing whatever profits they make in new tools and this is really a wise attitude, because the new tools, if they are good ones, will probably mean more profits in the future.

The Mayer Power Hammer which is manufactured by the Kaukauna Machine Works, 103 Island, Kaukauna, Wis., is a splendid device to invest money in, because it means more money in profits and time saved.

This hammer is said to create extra business for the smith, and is known all over the world. It is made in five sizes so that there should be no difficulty in obtaining the size most appropriate for your shop. Details relative to the capacity, advantages and prices may be obtained by writing to this concern. They will cheerfully answer all inquiries.

Kitowski Eye Turning Device

A machine which for its simplicity alone should appeal to smiths, is manufactured by F. J. Kitowski, St. Cloud, Minnesota. It is called the "Kitowski Eye Turning Device," and is especially adapted for auto spring work. It is said to be the one and only device that will make a complete and perfect eye of any size desired with one turn of the lever. The price is very reasonable.

Full particulars may be obtained by writing to the manufacturers.

Rochester Helve Hammer

The Rochester Helve Hammers manufactured by the West Tire Setter Co. of Rochester, N. Y., are made in six sizes, two styles of frames. The manufacturers specialize in tire setters and helve hammers and their efforts have been confined to produce the best obtainable in this line.

The popularity of their products would seem to indicate that they have been successful. An interesting and instructive book on the Rochester Helve Hammer may be obtained by writing to the manufacturers.

Warner Blowers

There is hardly a well equipped blacksmith's shop which does not number a blower among its equipment. It is a very necessary device when it is of reliable manufacture, but when it is unreliable it is worse than nothing at all.

We should advise our readers to investigate the blower which is manufactured by the Warner Electric Co., of Kalamazoo Michigan, because it is said that this blower is one of the most reliable on the market.

It is said that this blower will stand hard usage (and it certainly gets that in a busy shop) and is simple and durable. It will give any speed desired and is made up for 110 volt current, 25 to 60 cycles only.

If you are in doubt as to the efficiency of this machine, the Warner Electric Co. agrees to sell it on a 30 day trial and in that time you will probably have no difficulty in determining the merits of the device.

It is necessary that you state the voltage and cycles required in order that you get the machine adapted for the current supplied in your shop. This company publishes a folder on forge blowers, which should be in the hands of very blacksmith.

Admiral Welding Equipment

Admiral Welding Equipment, which is manufactured by the Admiral Welding Machine Company, of 1603 Locust Street, Kansas City, Mo., has been on the market for over nine years, and has thoroughly proven its value. It is said to combine efficiency, economical operation and absolute safety, and is obtainable at a reasonable price.

The manufacturers claim that the reason why their equipment has proved so successful, is because it has been thoroughly developed under actual working conditions. A complete catalogue covering the equipment sold by this company will be sent to any blacksmith who writes to them.

Phoenix Horse Shoes

The largest manufacturer of horse shoes in the world is the Phoenix Horse Shoe Co., Chicago, Illinois. This concern also manufactures the Bull Dog toe calks.

The Phoenix horse shoes which this concern makes are known all over the world and they have become so popular because of the careful way in which they are made, and the satisfaction which they give to customers. They are used by horseshoers all over the world.

Miller-Anderson Products

Chas. E. Miller-Anderson Rubber Works, 1420 Meridian Street, Anderson, Indiana, manufacture the Miller-Anderson products which cover vulcanizers, retread outfits and complete equipment for tire and rubber repair shops. This concern also manufactures auto, mortorcycles and bicycle tires, tubes and accessories.

They have recently published a new catalogue which illustrates and describes their products. Blacksmiths who are interested should write to them for a copy of it.

Northwestern Horse Nails

Blacksmiths know that it is necessary that horse nails be made of the best quality material, that they be perfect in form and finish, and have points which make them easy to drive and safe to use.

The Fowler & Union Horse Nail Co., of Chicago, Illinois, claims that the nails that they manufacture contain these qualities. It is said that the reinforced point, which is a feature of the Northwestern nail, makes it easy to drive and safe to use.

"Lisen"

The Lisen Company of Denver, Colorado, have a treatment for deafness which is unique. This treatment contains no new ingredients, but is the special blending and scientific fusion of rare and precious oils and herb extracts with distinctive methods of application.

This treatment has been used in the private practice of an eminent doctor with very fine results for over twenty years. If you have been bothered with ear troubles it will be well for you to write to this company and obtain full information of their remedy.

Anything you take up with an easy and lazy tolerance isn't going to pay—but if you'll buckle down to business and advertise you're bound to win!

Index to Advertisers

CLASSIFIED BUYERS' GUIDE

Are You Getting Your Share of This?

There are times when trade is not so brisk and many and many a dollar can be added to your profits.

Do you ever notice how many Fords or automobiles need new top covers now and new celluloid in their curtains? You are driving your own customer away by not doing it for him and you are loosing a big share of profitable business that is yours. You maybe busy now, but remember your customer prefers to have one man do all of his work. Your customer's car needs just as much attention (probably more so) than does his horse or farm wagon.

If he takes his car to the factory to have new celluloid put in his rear curtain the factory will charge him at least $2.50 for doing it. You probably have not done this work because you needed a special sewing machine to sew this celluloid in or probably you were afraid to try it. It is the simplest thing in the world. Any body can do this work in a few minutes.

We visited with our old friends the Wheel Top & Hdw. Co. of Cincinnati, Ohio, the other day and were surprised to see the quantities of top covers and rear curtains that they were making and shipping for all kinds of cars and to all parts of the country. These top covers were not only Fords, but were for all kinds of cars. We were informed that many an old time smith was doing this work nearly altogether. They also informed us that they were giving the Blacksmiths the benefit of their wholesale prices.

Ford covers can easily be carried in stock because a cover will fit any Ford Car from 1915 to 1920.

Our suggestion would be for you to get in touch with the Wheel Top & Hdw. Co. of Cincinnati, Ohio and get their number 67 catalog and they will quote you wholesale prices. Don't let this golden opportunity slip by you.

Lane's Unique Tool

The Will B. Lane Unique Tool Co., 180 No. Dearborn St., Chicago, Ill., are the manufacturers of Lane's Unique Tools. They manufacture a very large line, each tool of which is claimed to make good permanently. If it breaks or is defective in any way, the company agrees to replace it free of charge. They manufacture socket wrenches, pocket wrenches, ratchet wrenches, ratchet screw drivers, etc. It will pay readers to write to this company for folders describing their tools.

BLACKSMITH AND WHEELWRIGHT

and TRACTOR REPAIR JOURNAL

Vol. LXXXIII. No. 3 MARCH, 1921 TERMS ONE DOLLAR A YEAR

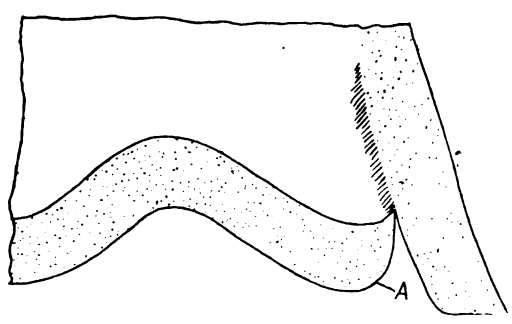
Practical Horse Shoeing

Symptoms of Loose Wall, Seedy Toe, Thrush, Etc., and Treatment Therefor

THE bearing margin of the horny wall sometimes cracks. This is a trouble which more frequently affects barefooted horses. It is due to more than ordinary strain at this part of the hoof. The best cure is to forestall the occurrence. The lower edge of the horny wall is to be rounded with the aid of the rasp. This is to be done when the old shoes are taken off preparatory to turning the animal loose. However, not all cases occur with barefooted horses. Sometimes, the horse-shoer becomes careless and uses nails that are too thick. If the nail holes in the shoe are too near the outer margin, it may facilitate the cracking of the wall by a nail.

The cracks that start at the coronet may, after awhile, reach all the way to the bearing edge. If such an extension of an upper crack is feared in the case of a barefooted horse, the thing to do is to put shoes on him and thus provide a means of holding the horny wall. However, an upper crack may appear in the case of a horse already shod. Thinner nails may help. So also may nail holes in the shoe, if they are placed to the best advantage. The crack may be more or less hindered by burning or cutting a deep transverse groove at its upper end.

We have so far had briefly before us sand-cracks that follow the fiber of the horny material. There are other cracks which cut across the fiber. They may occur just about anywhere; but generally they are to be found at the quarter and at the toe. They may be "a result of treads from sharp or faulty calkins. Pus from suppurating corns, etc., may break through at the coronet, and produce the same result by interrupting, for a time, the connection between the horn and the coronary band. Such cracks are occasionally seen at the heel, the horn fibers having broken across, owing to dryness and contraction of the horn. They are not of much importance, and need only attract attention when they come within the region embraced by the nails. In order to avoid disfiguring the hoof, the horn below the cleft should be preserved as long as possible, the wall at



Vertical Section of a Hoof, Showing at a Loose Wall.

this point being lowered and kept clear of the shoe. If, however, the piece becomes loose, it is better to remove it and fill up the resulting cavity with gutta-percha or some composition."

Loose Wall

The white line marks the region where the sole joins the horny wall. If, at any point in this white line, the junction has ceased and there is no longer a union, the condition is called "loose wall." This is another front-foot trouble; though, as a matter of fact, it does occur also in hind feet. It is more likely to occur on the inner side of the hoof than on the outer. Probably, a goodly proportion of all horses are more or less affected with loose wall. Unless it penetrates to the soft and sensitive parts of the hoof, not much attention is likely to be paid to it.

If, however, it does reach to the softer and sensitive parts and the horse becomes lame, the case will have to be inquired into and help given. Loose wall that extends deeply is likely to be accompanied by lameness and perhaps inflammation and the formation of pus ("matter").

To find out whether the foot is affected with loose wall, the shoe should be removed and the hoof thoroughly examined along the white line. Sometimes, there will be a bulging of the horny wall that can be noted without taking off the shoe. This bulging, if at the lower part of the wall, may be taken as a more or less probable indication that loose wall exists. By taking off the shoe and searching along the white line, certainty may often be attained. If loose wall occasions lameness, it may be viewed as possibly important.

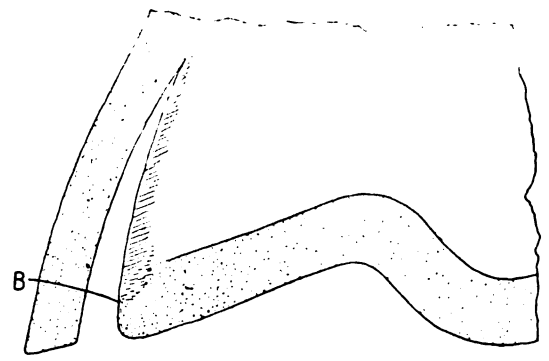
Causes of Loose Wall

As to what causes loose wall—one may note that if the horny wall is vertical or nearly so at the level of the sole, then the mechanical conditions do not favor the development of loose sole. But, if at this level, the horny wall bells outward, then the weight of the horse tends to press horny wall and sole apart. If the hoof is naturally wide and flat, it may be regarded as favoring the occurrence of the trouble. "But laterally distorted and contracted hoofs also exhibit the condition."

It is thought that the softness of the horny material in the white line is apt to favor separation of sole and horny wall, because this softness sets up only a moderate resistance to fluids containing ammonia and because it is rather severely affected by heat when the hot shoe is fitted to the hoof. Water containing urine is by that very fact a carrier of ammonia. The horse is liable to be exposed to the effects of this agent, when he has to stand in a stall that is poorly kept. Walking much over wet manure and standing in wet parts of an ill-kept stable or barn-yard may occasion the same exposure. The contact with manure water and the like is apt to affect the very nature of the material in the white line. Heat dries this same material.

The result of the two things is productive of "cracks and irregular strains in different portions, while the downward progress of the wall, which rather favors tension and cracking of the sole even when sound, contributes to the production of loose wall. Front feet suffer more frequently, because they are kept drier and carry greater weight. Rapid work on hard ground and faulty fitting of the shoe are also frequent causes. Narrowness of the bearing surfaces and an inclination outwards at the heels particularly favor separation. Loose wall can only be cured by the downward growth of healthy horn. In this case, the old advice to remove the cause is especially applicable. Careful preparation of the hoof is of great importance.

The connection between the wall and sole should never be weakened, though all 'seedy' and broken-down horn must be removed, and the bearing surfaces should be made as broad as possible by allowing the shoe to slightly overlap the margin of the sole. This relieves the loose part of the wall of weight without doing any harm. Convex walls should be judiciously rasped so as to bring them toward their normal direction. If the hoof is weak, the bearing surface of the shoe may be very slightly inclined inward. If, however, in addition to loose wall, other disease in the hoof exists, a bar shoe with leather sole should be applied; sometimes quarter clips are useful."



Vertical Section of a Hoof Showing at B Seedy Wall, Wherein the Process has Extended Further.

If there is lameness to be reckoned with, then the part of the horny wall separated from the sole may be relieved of weight by cutting away horn on the under surface of the horny wall at this point or else by depressing the hoof side of the shoe in the region concerned. However, only a short stretch of the surface of either wall or shoe can thus be removed. The space between the leather sole and the sole may be filled in with Venice turpentine or tar, though the tar is not considered quite so good. Tow may be used, if necessary. Wax may be substituted as a filling. Any substitute that will become fairly hard would better not be employed. Sometimes, the pain due to the trouble will be severe. If it seems to be caused by the presence of pus, a small hole may be bored in at the point suited to produce a good drainage by gravity. The cavity may next be treated with an antiseptic. Thus, a 5-per-cent solution of carbolic acid is a suitable wash to use. Instead, one may use a solution of creosote or creolin, though one should avoid using it in a strong form. After using a weakened or diluted antiseptic, the next thing to do is to cover the opening with antiseptic cotton or wool. Sometimes the parts may advantageously be painted with a resinous tincture, such as the tincture of myrrh or the compound tincture of myrrh and aloes.

If the horse is barefoot, loose wall may be treated by cutting away all loose horn that can well be removed, and following this up by putting on a shoe.

In order to force in an antiseptic liquid to clean out a cavity, it may upon occasion seem best to use a small syringe or some similar device capable of driving the liquid in. Things should be managed to create ingoing and outcoming streams flowing at one and the same time.

Seedy Toe

This trouble does not occur so very frequently. It affects the innermost layer of the horny wall and consists in a division or

separation of the structure of this material. If a part of the wall seems to be protuberant or hollow, one may suspect seedy toe. If, upon striking the spot with a solid object, a hollow sound is detected, then one may feel still more sure. The shoe is now taken off. If seedy toe is the trouble, then the white line will be seen to be replaced by a narrow slit. The separation goes deeper than in loose wall, and may in fact extend all the way up to the coronet. In the space will often be found horny material in a degenerated condition. The diseased material may occupy a space anywhere from one-quarter to four inches broad.

Lameness May Result

This is usually a trouble with which there is no pain. But lameness may result by working the animal too rapidly, or by permitting it to throw its weight on the diseased parts. The cause of seedy toe is thought to be "an interruption in the formation of horn." However, "there is considerable diversity of opinion on this point, but tentatively seedy toe may be considered as possibly due to the action of a fungus-like organism which obtains entrance to the inner sheath of the wall and induces change in the horn. A cure requires considerable time."

To shoe a horse which is troubled with seedy toe, the horse-shoer should aim to arrange things so that as little weight as possible shall come upon the diseased part of the horny wall. How to do this has already been explained. The farrier cuts away horn or lowers the bearing surface of the shoe at the proper place. The cavity containing diseased material is to be cleaned out. The cavity is now to be treated with pure carbolic acid, and then filled with an intermingling of tow and tar, turpentine, or wax. If the disease affects a very large part of the hoof, it may seem advisable to apply a bar shoe. Nails are omitted in the diseased region.

A more resolute treatment for seedy toe proceeds by cleaning out and cutting away all the disintegrated horny material; following this up with a thorough disinfection with pure carbolic acid; applying a bar shoe; and finally blistering the coronet. When this complete treatment is employed, the horse should then be given a long rest to permit him to get back to proper condition again.

Thrush

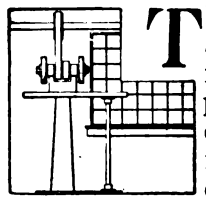
This is a disease which is usually accompanied by the presence of a black or dark colored liquid in the groove of the frog. This liquid will probably smell badly. Thrush often begins in the groove of the frog and later on extends itself. It may even destroy material which it affects. The frog, itself, in a representative case of thrush, may be ragged and dead-like. When thrush spreads, the result of the decomposition of material may be an irritation of sensitive parts accompanied by more or less pain. Even lameness may sometimes occur.

As thrush spreads, one of the first things to expect is the disappearance of the central part of the frog. This may result in the sides of the frog being crowded together. Where the groove was, will now be a smaller fissure. The result will often be that it is difficult to keep this crevice clean. The discharge may affect the horny bulbs, "and may lead to a similar process in the periople. This is followed by the formation of rings in the superficial horny sheath of the wall."

Note here that it is the *superficial* horny sheath—the thin film on the hoof surface—that is affected. "The rings can be distinguished from those of the deeper sheath both by their appearance and course. They usually consist of slight elevations, which approach in front and toward the upper part of the foot, where they may end or may again take an irregular course backward, extending as far as the opposite half of the wall. They always cross the rings of the deeper sheath; indeed, when thrush has existed for a long time, they sometimes cross one another.

Platform Gears

Improved Methods of Building Heavy Wood Platform Gears



THE heavy platform gear is always in demand, and the more simple its construction, providing there is no sacrifice of strength, the better, as it is less likely to get out of order and require repairs. For this reason a heavy framework of wood properly secured is preferable to the lighter ironwork, both as regards durability and the ease with which it can be repaired when a break occurs. The opinion that platform gears are more expensive than perch gears is due in great measure to the general use of the complicated wood and iron gears upon light carriages. That they are is undoubtedly true as relates to these vehicles, but the conditions change when the heavy plain gears are considered. Even if the cost be greater the advantages more than counter-balance the expense. By the use of the platform half springs and a cross spring, or two elliptics, can be used, giving greater supporting strength and more stability because of the springs being placed near the ends of the hubs and attached direct to the axle, instead of a single spring being placed upon a headblock which acts independent of the axles and has but a few inches of bearing space. To this advantage must be added the convenience of turning.

The aim in preparing this series of articles has been to impress upon the minds of the men who run small shops in other than thickly settled parts of this country that the platform gear is sufficiently simple in its construction to be put together by any carriage woodworker who has a right to claim the position of a journeyman. All that is required for such a man is to study the principle governing the construction of the platform gear. In no way can this be learned more quickly than by making a draft and putting up the gear in accordance therewith. Few realize how quickly an error is discovered by a draftsman who is combining drawing and construction, and a less number realize the advantages of making drawings even of the simplest character. If we can induce more study without adding to the labor of construction we will feel that our efforts are tending toward a betterment of the trade and lifting the burden of labor.

The heavy carriage part shown this month serves well to illustrate our position and at the same time adds another to our list of plain practical gears that are needed for the heavier kinds of freight wagons and trucks.

Fig. 1 shows the lower carriage with the under side up, and in addition to the heavy wood the stays and plates are shown which serve to hold the parts in place and to give increased strength to the whole. The hounds A are very heavy, being two inches wide at

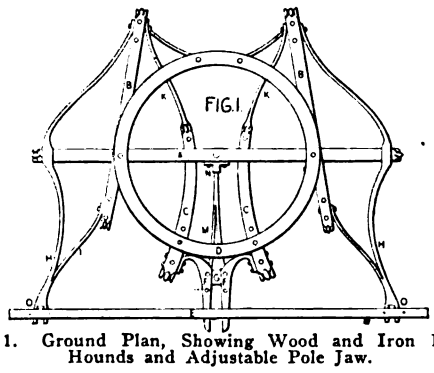


Figure 1. Ground Plan, Showing Wood and Iron Futchels, Hounds and Adjustable Pole Jaw.

the rear ends and two and a half inches thick throughout. They are so heavy that no iron plates are required. The futchels B are two inches square and are plated on the sides the whole length, with a ¼-inch plate extending around the rear ends of the hounds to the spring block bar to which they are bolted. The forward ends of the plates have a turned flange through which a bolt passes to the drawbar, thus binding the various pieces together in a manner that gives the greatest strength. The drawbar C is straight on its sides, but is thrown down enough in the center to pass under the hounds. The ends are of the same thickness as the futchels, the latter being stub-tenoned into the drawbar and strengthened by the plates D. The fifth-wheel plate rests upon wood segments of the required thickness to level the plate when the platform is in its correct position. The spring block E is bolted to the hounds A and the futchels B, being lapped on the same

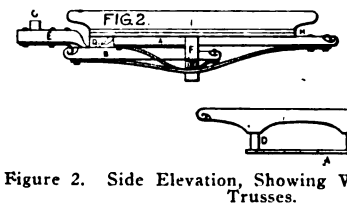


Figure 2. Side Elevation, Showing Woodwork and Iron Trusses.

Figure 3. Front Elevation, Showing One of the Three Crossbars for Body Support and Splindles.

enough to give stability to the frame. If simply bolted on, without supporting shoulders, there would be nothing to prevent the ends moving except the bolts, and these would wear away the holes and the whole would be loosened. The shoulders at the ends G must bear against the sides of the futchel plates H. These plates are very important parts of this platform, as they serve to bind the whole together, lugs being turned at the ends where they meet the drawbar. The rear ends pass around the ends of the futchels and hounds where they are jointed, and are then secured to the spring block by bolts which pass through the lugs. The fifth-wheel plate K rests upon the ends of the main bed D, and upon segments of the requisite depth to maintain its level.

Fig. 2 shows the side elevation of the carriage. It will be seen by this that the futchels are on a level, while the hounds are elevated at the front ends; A, the hounds; B, the futchels, with side plates in place, showing the location of the securing bolts; K, the main bed as per D, Fig. 1; C, the drawbar; D, the spring block; E, the cross bars of the top platform; F, the wood segments that level up the fifth-wheel plate,

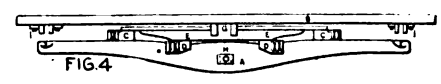


Figure 4. Front Elevation Showing Main Bed, Fifth Wheel, Ends of Wood Futchels and Hounds.

the bearing surfaces of which rest at the front of the wheel upon hounds and at back upon the hounds and futchels. The forms of the two are shown by Figs. 6 and 7.

The front elevation is shown in Fig. 3; A, Fig. A, the hounds; B, the opening or jaw for the pole; C, the main bed as per D, Fig. 1; D, the drawbar; E, the center cross bar of the upper carriage; F, the fifth-wheel plates.

The upper carriage is shown by Fig. 4, bar A is the center or main bar; bars B the front and rear cross bars. These bars are bolted firmly to the sills of the body, and the top fifth-wheel plate C is secured by bolts at each bearing. It is important, therefore, that the utmost care be taken to have all the bearings level. This can be done only by first bolting the bars to the body, then leveling the plate upon its bearings; to do this turn the body bottom up. It is impossible to secure an easy turning vahicle if the fifth-wheel plates do not work true and smooth. The plates may be perfectly true, but in putting them on the tightening of the bolts may draw them down at one point, and as a result there will be a rise at another. It will require but little strain to throw the plate a sixteenth of an inch, which will be sufficient to reduce the wear of the plates twenty-five per cent and increase the friction double that amount.

Fig. 5 shows the form of the center bar A, Fig. 4. The other bars differ in having

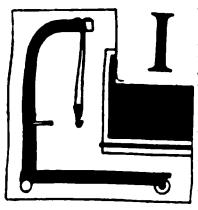
no center depression, they being flat where they rest upon the plate, and having the ends

The weight of timber used depends upon the weight of the body and the purpose to lightened out from outer line of bearing. which it is to be put, as this pattern can be used to advantage on the lightest two-horse trucks and on the heaviest freight wagons. This pattern is very strong, and being simple in construction it can be made by any carriage part maker who has a general knowledge of gear construction.

Small Florida Shops

In Which We See Among Other Things, a Shop Made Tire Puller

BY J. F. HOBART



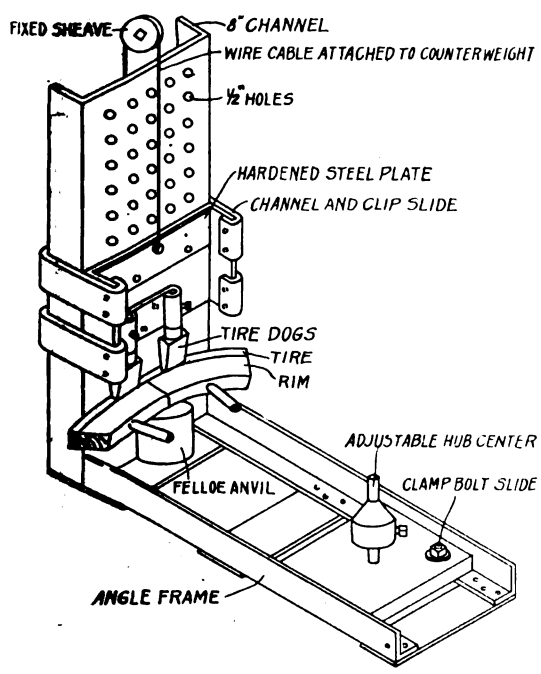
I NOTICED in the January issue on page 20, a query from brother John Meade, Wisconsin, about making a tire-puller. Am sorry the one made by Mr. Meade did not work well and if he will send along a sketch and description of the apparatus, maybe the writer or some one else can tell him how to change his device just a little bit so it will work well. Send along the drawing and description to the editor and we'll do the rest.

Meanwhile, here is how they pulled tires in a little out-in-the-woods Florida Smith shop. That is, they pulled off any tires which had not already dropped off or become so loosened by the hot sun that only the tire bolts held the steel to the rims! They had a long timber rigged up in one end of the shop as a lever with bearing pieces to rest the tire upon and a sort of plunger which was forced by the lever down upon the rim of the wheel between the two tire-bearings. With the weight of a colored man dangling from the end of the eight-foot lever, there was evidently a lot of pressure imposed upon the wheel in a manner to force the tire and rim apart sidewise. With stress thus applied, a few *light* hammer blows upon the rim started the rim and tire apart and by proceeding in like manner around the wheel a couple of times, a pretty tight tire would be knocked off in a very few minutes.

Shop-Made Tire Puller

The writer has elaborated upon the tire-puller apparatus as found in the little Florida shop and he has made the apparatus into a compact tool with which, by the aid of a couple of one-half inch round tool steel rods 30 inches long, a pretty stubborn tire may be started from the felloe and driven off by working two or three times around the wheel as directed below.

This tool may be easily made up in the smith shop, a piece of 8-inch channel steel, two pieces of angle steel and some odd pieces of sheet and bar black steel being mostly the stock required. The backbone of the tool is the piece of 8-inch channel. Another short piece is fastened loosely to the upright piece by means of four clips riveted to the short channel, thus forming a channel and clip slide to which the tire dogs were attached by means of a heavy black steel bar which was turned into a socket at either end and each fitted with a set screw to hold the shank of a tire dog of which two were required. These dogs looked something like an anvil hardie cutter with a round shank instead of a square one and with one face straight, all the bevel being placed on the other side. The setscrews permit the necessary adjustment of the tire dogs to make them then both lie parallel with the rim of either a small or a large wheel.



Tire Pulling Tool.

Across the top of the channel slide, a strip of steel had been turned to hook over the top of the slide. Then the strip was hardened and riveted to the slide. This strip was to prevent the upper end of the slide from being upset by constant prying over it with the two steel bars which give pressure to the tire dogs. To use the device, it is set up as shown with bearing at three points fair upon tire and rim, then one of the steel rods is inserted in a hole which comes fair and the slide pried downward. The other bar is inserted in another fair hole as the slide is forced downward and as the holes in the channel are drilled upon inclined center lines, there will always be found a hole fair to place a bar in.

The Rim Anvil

The rim anvil as shown is placed directly underneath a joint in the felloes, and this location is followed all around the rim unless it be a one or two piece affair, in which case, the rim anvil may be placed anywhere. When a heavy strain has been made upon tire and rim, some hammering is done upon the edge of the tire which speedily drives the tire downward. Thus, no hammering at all is done upon the wooden felloes, all of it being done upon the tire thereby reducing felloe-splitting to a minimum.

A very small wire cable is shown leading from the slide, upward over a sheave located overhead. A counterweight, balancing the slide is attached to the cable, thus balancing the slide so it will stay anywhere it may be left. The wheel to be detired is placed upon a track formed of two pieces of angle steel; a slide which may be clamped in position, carries the hub-center shown, which also is adjustable up and down as well as to and from the channel upright. The hub center is a big conical affair several inches in diameter and intended to enter the hub band rather than the wheel box. It matters not where the hub center finds a bearing provided it is adjusted to the proper height to keep the wheel level and fair between rim anvil and tire dogs and at the proper distance therefrom.

Driving Off a Tire

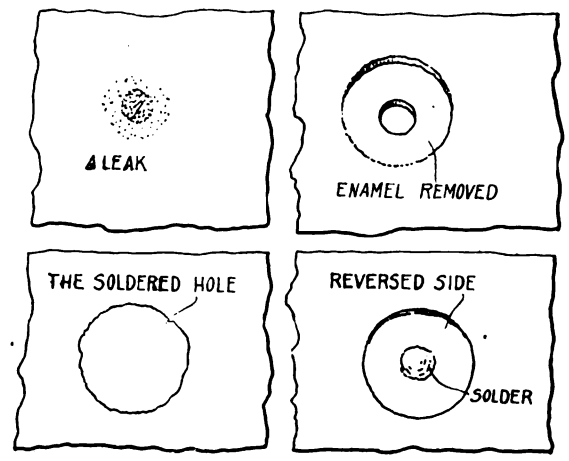
By always placing a felloe joint fair upon the felloe anvil and by doing all the hammering upon the tire and none upon the rim, the tire may be driven off with no injury whatever to the wooden rim of the wheel. By using hand sets and handled ones upon small and large tires respectively, the driving-off is hastened and by using a sledge upon the handled set when a large tire is to be pulled, the combined urging of sledge and pry-rods will start off any tire which can be removed without smashing the wooden rim.

One man can work this tire-pulling apparatus, as by inserting a pry-rod and leaving it there, all the stress gained is held, the slide not being able to slide back against the closely inserted steel rod. The very short leverage of the rod between the steel strip and the hole in the channel, enables great power to be applied by expending 50 to 75 pounds upon the end of the 30-inch pry-rod. Approximately the short arm of the lever will be about ⅜ inch and the long arm about 28 inches. This gives a leverage of 28⅜-74-2/3 and with a pull of 75 pounds upon a pry-bar, a pressure of 74-2/3x75 = 5600 pounds, over 2-½ tons, which will be exerted to push the tire off the rim.

That Unique Shop Again

In the December, 1920 issue of The Blacksmith & Wheelwright, a unique little shop was described in which, in addition to smith work, a large number of journal bearings were babbitted. A short time ago this shop came under new management through a change in superintendents of the manufacturing company to which the shop belonged. One of the first things done was to pull out the large bench which served as a "clearing house" for everything received from the machine shop.

In place of the large and cumbersome bench, a light trestle or "horse" was made up, an anvil-high and placed back of the anvil for the support of long work. Heretofore, all the material received from the machine shop had to be "toted" by the workmen or brought by auto truck to the shop



How Agate Ware Was Mended.

door and then unloaded upon the "clearing table" or bench described before and now done away with. A plankway was constructed from the shop floor, which was about four feet above the ground, down to a foot-high platform in front of the smith shop. There was room to make an easy incline, but it was necessary to make a drawbridge in the incline for the reason that the shop auto truck frequently had to pass through.

Accordingly a section of the incline was made removable and fitted so as to be easily raised and pulled endwise upon the rest of the incline, leaving a 12-foot clearway for passage of the auto truck. A portion of the new plankway, adjacent to the shop, was made level, so the hand-truck loads of material received from the main shop could stand without blocking. Ball bearing platform trucks were used all through the main shop and now these trucks can be run right out to the smith shop and the truck itself is used in place of the "clearing bench" for the handling and distribution of work for the smith shop.

Substitute For Coal

The babbitt-melting furnace in this shop, described in the December 1920 issue was heated with coal. The new manager caused several bushels of little blocks of wood to be sawed from the wood shop waste. These blocks were about 2x2x3 inches and were used under the babbitt-melting furnace the same as coal, the air blast being used with the *wooden coal* same as heretofore. The results obtained were as good as with smithing coal and so well did the blocks fill the bill that they were used on the smithing

forge also. When starting a fire, a row of blocks would be placed around the outside of the fire space and the usual fire kindled inside the ring of wooden blocks.

As the fire burnt out, the blocks would be turned into charcoal and when nearly charred through, they would be pushed into the fire with the other coal and other blocks placed around the outside of the fire, thus making much less coal necessary to maintain a large fire when one was necessary. From the behavior of the little blocks in the fire, it is the writer's belief that were the wood cut into smaller pieces, say one inch square, that the blocks might be mixed "50-50" directly with the coal with result of a 40% saving thereby.

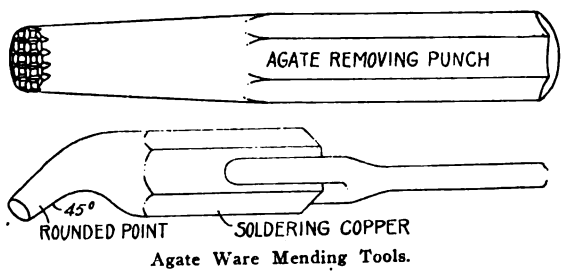
A Blacksmith's Side Line

The automobile has hit the smith pretty hard in Florida as well as elsewhere and those smiths who formerly depended upon shoeing and wagon repairs for a living, and who will not adapt themselves to changed conditions far enough to take up auto and truck repairing—those smiths are hard pushed to make a living and matters will probably be worse as the years pass.

One Florida Blacksmith met the problem fairly and squarely although for some reason —I never could see why—he side-stepped auto and truck work and took on side lines to fill his too-much leisure time. One line in particular interested me very much for that smith had a new bench in his shop, and the bench was piled high with a gasoline soldering copper heater and piles of old agate and granite dishes with a good sprinkling of white enameled ware among them. This smith had actually gone into the granite ware mending business and was doing mighty well at it.

Mending Granite Ware

There are at least three methods in use for mending granite and agate ware— and there may be a dozen other ways of which I know not—but the three methods commonly employed are to screw a flanged clamp-plug into the hole, with a bit of asbestos packing under each flange, a bolt with nut projecting inward serving to tighten the flanges and the asbestos firmly against the agate side or bottom of the vessel.



Agate Ware Mending Tools.

The next method is by the use of a preparation which is a fine, heavy white powder which is mixed with water in the same way as cement and applied to both sides of the ware, in and around the hole. This substance is warranted to stop the leak and to withstand fire and water and it does so—until it comes off! The third way of mending granite ware, as practiced by the "Cracker" blacksmith, was by the good old homely way of soldering, same as tin or copper ware would be soldered.

Soldering Agate Vessels

Yes, granite, agate and white enamel wares can all be soldered as well as tin, provided the hard coating be removed from the steel for a little distance around the hole. Then the surface must be scraped clean, if not already so as it probably will be, under the enamel coating. Then the clean steel surface must be given a thin coating of zinc, after which it can be soldered nearly as readily as tin. The zinc coating may be deposited by wetting the steel with chloride of zinc solution, from which the steel abstracts a coating of metalic zinc. The chloride of zinc solution may be obtained by dissolving sheet or old battery zinc in common muriatic (hydrochloric) acid until the acid will take up no more metal. Pour off the clean liquid and bottle it for use when soldering all iron or steel surfaces.

The Smith's Tools

The smith who had gone into the granite repair side line, had made up a couple of special tools for that business. A one-half inch punch about six inches long had its temper drawn and was annealed, after which the business end of the punch was cross cut with a three-cornered file, somewhat like that shown by the engraving—Agate Ware Mending Tools—herewith presented. The little flat squares between the file cut were left not quite a sixteenth of an inch wide and long. Then the punch was hardened again and drawn to a deep straw color.

This tool was used for removing the agate or granite from around a hole preparatory to soldering the same. Some of the hardest wood the smith could find was sawed into lengths from a quarter of an inch to two inches. A lot of pieces were a half-inch thick and when the punch was used, a bit of the end-wood was slipped under the metal where the punch was to be used.

The smith had found that he could remove the agate coating much more quickly by placing the agate vessel directly upon the anvil and then using the punch and hammer but by so doing, the steel was nearly always stretched and never could be made flat again. By always using the punch and hammer upon sheet metal which rested upon wood, the thin metal was never stretched. It might be bent, but a bend can be hammered flat again, something which can never be done with a stretched spot.

The other tool made up by this smith was just an ordinary soldering copper which had been forged to the shape shown by the engraving. The square, pointed end of the tool had been bent to an angle of about 45 degrees, thereby making the tool very handy for use in either a vertical or a horizontal position. Copper can readily be forged the same as steel or iron, by heating it in the forge and working at a low red heat, taking care not to heat the tool enough to burn or melt any portion thereof.

Preparing for the Mend

The first thing this smith did toward mending a bit of coated ware, was to place the surface flat upon a bit of solidly supported end-wood. Then with the *checker-board* punch, he went all around the hole and crumbled off the coating for at least a quarter of an inch in every direction. Very small holes required only about the punch diameter of clearing off and this was done by tapping the punch lightly and turning it around between blows. When the hole was close to a seam, a bit of scraping was done after the punch-hammering but as the agate or granite coating is applied after the seams have been locked—instead of before—it is possible to remove every particle of the mineral coating. And no soldering can be done until the coating has all been taken off.

As shown by the engraving—How Agate Ware Was Mended—the first sketch shows the appearance often presented by a leak. Just a spot upon the surface. The second sketch shows how the job looks after the enamel has been removed—and all removed clean too—while the third sketch shows how the job looks after the solder has been applied. The round-nose copper is just the thing for rubbing around in the enamel-cleaned hole and by using just the right amount of solder, the smith filled in level with the remaining enameled surface leaving the hole smooth but of course of a different color.

The last sketch shows how the mend looks from the other side of the object. Of course, the agate will be crumbled off both sides of the steel by action of the punch and hammer. The surface may be left bare as shown, or the back or inside may be mended first, then some asbestos paper or cloth placed underneath the hole which should be pressed down hard upon the asbestos to prevent the solder from leaking out. Then the remaining or top side of the hole may be filled with solder as shown by the third sketch and the job is finished.

A Splendid Help

We have received a letter from E. R. Raney who calls himself an "Ex Blacksmith." Mr. Raney is an acetylene welder and lives in Humphreys, Mo. We can do no better than to quote Mr. Raney's letter which will fully explain the picture.

Raney's Twins.

"Raney's twins say 'Dad's the fixer.'

"They don't help me to weld, but they are good avertisers. The cut will show that they have been out helping Dad before this time. The twins are now about eight years old, go to school and are certainly a pair. The picture is a very excellent likeness."

Mr. Baxter Answers

You have all probably found help in the articles that Mr. David Baxter writes for the BLACKSMITH & WHEELWRIGHT on oxy-acetylene welding. We have received a number of letters from readers who stated that they were interested in them. One of our subscribers, Mr. Carl H. Munkelwitz, of New York addressed a letter to Mr. Baxter, in which he stated that he found pleasure in reading his articles and also asked Mr. Baxter if he could give him any information as to whether he could take a course in welding brass and aluminium. He stated that he had been welding and burning for two years. We give below Mr. Baxter's reply, because it may be of help to other brothers who have the same question:

If it is your plan to attend some welding school in order to achieve your ambition, I would recommend the Davis-Bournonville School, since it is one of the best. At least it is close to your city, comparatively. Their general offices are located in Jersey City, N. J. On the other hand if you would rather read in connection with practice in your own shop, there are a number of good books on the subject. Also any of the high class manufacturers of welding equipment will be glad to send a lot of information on the subjects you mention. Many have literature prepared especially for this. Some of the books are:

Oxy-acetylene Welding by R. J. Kehl,
Automobile Welding by M. Keith Dunham,
Autogeneous Welding by R. Granjon and P. Rosenberg.

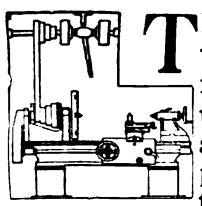
The latter probably is the most complete. Any of the books may be obtained from the Acetylene Journal Publishing Co., Peoples' Gas Building, Chicago, Illinois.

It is not well to place too much confidence in the man who cannot lift his feet from the ground when he walks.

Welding Gear Teeth

Are You Getting Your Share of This Profitable Repair Work?

BY DAVID BAXTER



THE BLACKSMITH who intends to do general tractor repairing should be prepared to weld broken gear teeth of all kinds since a gear is one part of a tractor that is liable to be damaged above all others. Usually the gears are forced to stand more wear and tear than the rest of the machinery, and usually they are subjected to a great deal of abuse. Such carelessness and ignorance can result only in stripped gears, teeth broken entirely out, with the corners broken off, or mashed beyond use. There is little doubt but that the smith will *have plenty* of this class of work if he is prepared to do it because carelessness and neglect will always exist as long as humanity exists.

The blacksmith who operates a gas welding torch is the only one who is really equipped to repair broken gear teeth. Of course the average smith can put on peg-teeth or can dove-tail them in place on some kinds of gears, but to handle all classes he must operate a welding torch. An oxy-acetylene torch is especially adapted to this class of repairing, due to its being under absolute control at all times. The operator can build on teeth from the smallest size to those weighing several pounds.

The procedure is somewhat different from the usual run of torch work, such as cracked cylinders, broken crank cases and shattered housings. In these the broken parts are fused together while on gear teeth work no attempt is made to replace the old tooth; a new tooth is built up in place of the broken one and it is made entirely of new metal. This new tooth is constructed a bit at a time, thoroughly fused with the body of the gear at the root and gradually shaped at the top.

A Typical Gear

An example of this work is illustrated in the photographs that accompany this article. A gear of this style is typical of what the welder can do. Let us take this example and follow it through the details of building on a new tooth. In this way we can no doubt furnish instruction that may be applied to other gears having more or less damage. Lack of space forbids a discussion covering all of the different shapes and sizes of damaged teeth in relation to the little devices that may be employed in overcoming obstacles to the welding.

The gear shown in the pictures was a cast iron bevel gear weighing about ten pounds, and having one tooth almost entirely broken out. As it was not a cut gear this job was not so particular as to accurate size of teeth. That is, the welded tooth could be filed or ground to fit, without machining, as it did not have to mesh closely. This allowed the welder considerable latitude in the shaping of the tooth, which would not have been the case otherwise.

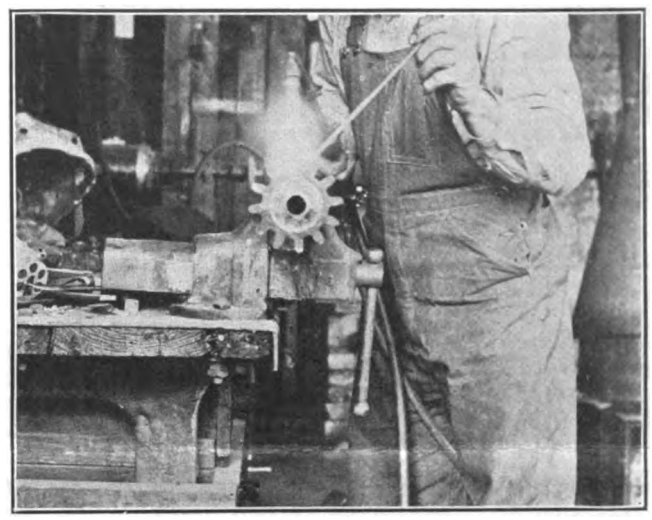
The first step in the process of repairing this tooth was to clean the metal on each side of it and at the same time to be sure that the broken part was not rusty or dirty. The cleaning was done by first heating the vicinity with the welding flame and then brushing it thoroughly with a wire brush. The heat of the flame burned all grease to a sinder and loosened the rust so that it was easily brushed off. Some welders omit this part of the process but it is obviously safer to clean the weld as there can then be no danger of outside impurities working into the melting metal.

The next step in the welding process of repairing most jobs consist of grooving the weld, or cutting metal out of the damaged part, to form a wide V-shaped groove. This was omitted on the gear tooth, although it could have done no harm to file or grind a

Grind the welded tooth before file-finishing. A portable emery wheel handy for this.

groove the full length of the tooth where it was broken from the face. A better root for the new tooth would have been secured; that is the novice would probably find it easier to fasten the tooth metal to the groove than to the rough surface of the broken tooth. At least he could feel more certain that the bond was complete.

After the cleaning, came the question of preheating. This too, was a rather open question; the gear was not heavy enough to absolutely demand heating previous to welding; and yet was compact enough to draw lots of heat away from the weld. In this instance the operator welded without preheating because he understood the fact that he must supply sufficient heat to replace what was lost through conduction and still keep the weld in fusion. This was accomplished by selecting a rather large torch and manipulating it to supply conduction. It would have been a simple matter, however, to heat the gear and would undoubtedly save a beginner considerable trouble.



A vise is a handy flare to weld small castings like this.

The heating would prevent heat from being drawn away from the weld and thus permit him to use a smaller flame with which it is easier to control the new tooth metal since it does not tend to blow the fluid metal about so wildly. The preheating also tends to strengthen the bond as the tooth metal will then shrink with the casting metal; if the tooth is welded cold it will sometimes shrink away from the gear metal on large jobs.

However, this welder built on the new tooth without the use of a preheater, by employing the welding flame to overcome conduction evils. First the gear was fastened in a vise; not rigidly but in such way as would prevent it from slipping at a critical stage in the welding process. The vise was utilized because the broken tooth could be conveniently held in a horizontal position.

This position is very essential in teeth building in order to bring the teeth up accurately. If the wheel leans a trifle the operator is likely to build a crooked tooth without being aware of the fact until the job is finished. This means a lot of extra work filing off the surplus filler metal which must then he added to the scant side of the new tooth. Nor can the operator melt the filler metal as fluid as it should be to join well, because it will run down the sides of the tooth that leans; and it will not build up squarely on the other side, while a weld that is horizontal both endwise and sidewise may be built up almost exactly as desired. Each layer of filler metal can be placed within a fraction of an inch of what is needed to make

(*continued on page* 15)

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Our Editor's Letter

THE other day I walked into a small dry-goods store and as it was crowded I waited to one side until my turn came. As a matter of fact when my turn actually came I did not take advantage of it, so busy was I watching the way this man conducted his business. I knew this store to be a reliable one; complete stocks were kept of all the leading lines and one was assured of courteous treatment. I had never happened to come in when it was so crowded so that I had never had an opportunity to see how efficiently or unefficiently this man kept shop.

There were two men waiting on the customers. This should have been plenty if they worked quickly. They did work quickly——but there was a very narrow space between the counter and the back wall. This space allowed one person to work comfortably, but when it was necessary for one man to pass the other it was more than a tight squeeze. One of the customers asked for five yards of paper lining. The one man—we will call him Mr. Brown—squeezed past the other—whom we will call Mr. Smith—in order to take down the bolt of lining. He then discovered that the yardstick was on the other side of the counter, so Mr. Smith had to stop work again while Mr. Brown pushed past him to get the measure. He started to measure off the material when he found that the pair of scissors was hanging on a nail which was way on the other side of Mr. Smith. Squash again went Mr. Smith, while Mr. Brown went to obtain the shears. Needless to say the customer was none too pleased. The customer whom Mr. Smith was waiting on was upset, Mr. Smith was bewildered, and Mr. Brown himself was more than irritated.

Doesn't it even confuse you to read it? All this motion lost when it was needed so badly. Customers tired of waiting left the store without purchasing. Mr. Smith and Mr. Brown dog weary at the end of the day and little wonder. But, the amount in the cash register hardly compensated for all of this.

You may wonder why I am going at such length to describe the way these people kept shop. I'll tell you. It's because I believe that nine out of ten blacksmiths are afflicted with this same malady; this disease of "lost motion." Through it they are unable to do all the work that they might; they find the work more difficult to do, their customers talk of an old "slow-poke," etc., etc. It's a bad illness too, for once it gets into your bones it's a hard job to be cured. It makes it necessary for you to spend two hours doing a job which the blacksmith in the next town can do in one.

It doesn't resolve down to a question of "being slow," though, for the blacksmith in the next town may actually take his time about doing a job, but his anvil is not half a block away from the fire, nor are the nails at one end of the shop and the horseshoes at the other. He has things so arranged that everything is at his hand, so that the minimum amount of time is wasted in turning from one job to another.

I have a little cousin—a girl of about ten—of whom I am very fond. Not long ago she was seated in the kitchen watching her mother dry the dinner dishes. This one day she didn't help—her mother gave her a vacation. She watched her mother take a dish off the tray, dry it and then walk across the floor to place it on top of some others which were on the table. There were lots of dishes to dry and consequently her mother made any number of trips across the floor. The little one watched this but said nothing. The next day she helped her mother, but here is what the efficient little miss did. She pushed the table over, quite close to the tray where the dishes lay and then stepped between the table and the tray. The dishes were finished in about half the time it took her mother to do them for she simply lifted a dish, dried it and placed it on the table right next to her. She wasn't tired when she finished and her mother generously allowed the youngster's triumph.

Well, brother smith are you willing to learn a lesson from this child? Look about your shop and notice where you can save hundreds of steps a day by re-arranging things somewhat. Smiths who believe that their shops are well planned should send in a sketch of the lay-out so the other smiths may profit.

Who will join in this war on "Lost Motion"?

A Wonderful Record

TEN years ago we published an item regarding the wonderful record of the firm of Phineas Jones & Co. of Newark, N. J. The firm has been in the Jones family for three generations covering a period of sixty-five years. Henry P. Jones, the President, is 74 years "young" as he chooses to term his age.

Doubtless there are many concerns in this land of ours which can point to 65 years of existence but we doubt if there are many who can show such a spirit of friendship between the working men and the management as is shown in the Jones' organization. Seven of the men have been with Mr. Jones for over 40 years; five for over 30 years and two for over 25 years.

The service record of the Phineas Jones Company has nearly 50 names upon it of men who have been connected with it for over 25 years. When we speak of this record we refer to those men who have worked until age or death has taken them away.

The importance of co-operation between the organization and the working men cannot be considered too seriously in these days of labor troubles. The man who does his work cheerfully and works for the interest of his employer, does his work well.

The service record of the Phineas Jones Co., indicates that the men are interested in the company and like to work for it. We feel safe in saying that the products turned out by these good workmen are on a par with the best in the market.

Where Horses Come From

Ninety per cent of the 25 million horses and mules in the United States are on farms, and only about 10 per cent are in cities, towns, villages and other non-agricultural work, according to advance figures of the 1920 census.

It is natural that the ten central states of the great corn belt,—Ohio, Indiana, Illinois, Iowa, Missouri, Kansas, Oklahoma, Nebraska and the two Dakotas, where coarse grains are raised in plenty, should be the great reservoir of horse and mule production, rearing approximately three-fifths of all the horses and mules in the country.

The farmers of this section producing horses and mules, supply their own needs, furnish work stock for adjoining farms where horses and mules are not reared, also the heavy drafters, wagon horses and expressers wanted in cities, towns and villages, and the farm chunks for eastern states where horse and mule production is not so common.

Pennsylvania and the states east and north do not produce one-fourth of the work animals they use and are constantly drawing on the central west for their work stock. Many of these are farm chunks sold directly to eastern farms, while others are horses produced and worked on the farms of the Mississippi valley until five or six years old, then passed to eastern cities, where, after six or eight year of service, they are re-sold as sore-footed, city-worn horses, to dealers who sell them at a very nominal figure to farming sections of New England, to work the balance of their days. Such horses represent a complete cycle from farms to cities and back to farms again. It is more true now than in the past that the good horse or mule pays a profit to the producer, the dealer and ultimate user, while the poor one loses money to all concerned. — *Horse Association of America.*

Two Excellent Suggestions

From W. L. S., Oregon.—When using a boring mill chips of metal must always be cleaned away from the slots of the machine, when work is to be done on metal of a different kind. To save a good deal of time that is lost in this way place small pieces of wood in all of the slots that are are not often used making a fairly tight fit. When one of the plugged slots is needed it only takes a moment to pull out the small stick, and those which remain plugged are left clear of metal.

A leak in the metal float of a carburetor may not be visible to the eye although indications of its presence are quite evident. To test the float heat a vessel of water until it nearly boils and immerse the float in it. The heated air inside will expand, some of the air will force through any leak that may be present, and bubbles will force through at this point and show the position of the leak.

He Had to Fall Back On the Horse

Horses were at a premium in Portland, Ore., during the recent gasoline shortage. Fancy prices were paid for the use of nags which looked as though they had been resurrected from the soap factory. More horses appeared on the streets than were known to exist in the city. One farmer, whose car had run out of fuel, hitched his horse to it and came driving into town.—Goodrich Travel Topics.

When industry goes out of the window, poverty breaks down the door.

WELDING GEAR TEETH

(*Continued from page* 13)

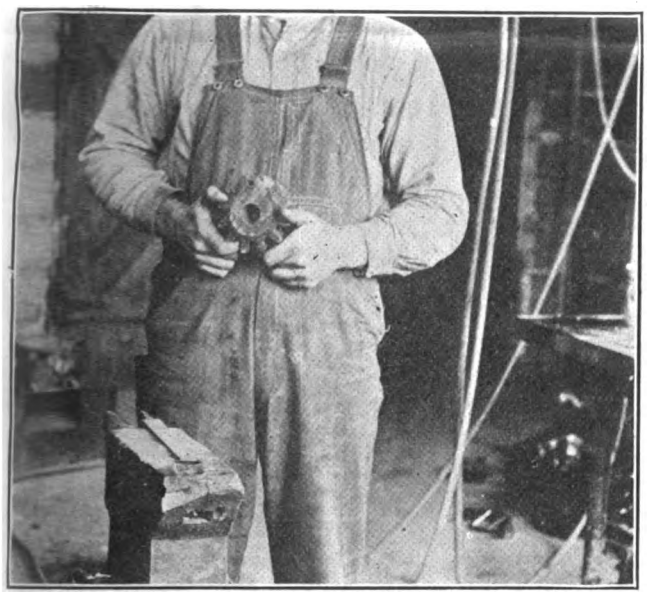
a well shaped tooth. If the welder is fairly experienced he can use the force of the flame and the filler rod to "shape" a tooth that needs very little dressing after welding.

After placing the gear in the vise as shown in the picture the welder lighted the torch and regulated the flame to a strictly neutral condition. This is the proper state for welding cast iron to minimize the danger of hardening the weld or making welds that contain porous spots or pin holes. These defects are usually the result of impurities being trapped in the molten metal, and are caused by an improper regulation of the flame, or a careless manipulation of it. The welder can easily spoil a weld even though the flame is correct. He either attempts to add the new metal in quantities too large, or he burns the metal by holding the flame too long in one position or too close to the molten metal.

Preventing Conduction of Heat

The neutral flame was applied to the gear by playing it back and forth along each side of the broken tooth with the white cone barely licking the metal. A tooth on each side of the broken one was also heated by passing the flame over it. In other words a section of the gear including three teeth was heated. The flame was played over this section until the whole of it was glowing red. This was the method of preventing the bad results that would be caused by conduction in this particular job. A section of the gear was preheated in the vicinity of the broken tooth to prevent the cold casting from drawing too much heat away from the weld. This was preheating as it is applied with the welding flame.

When this section was red hot the flame was concentrated upon one end of the broken tooth and was revolved in small circles over the surface; the flame licked the metal at first but gradually drew back a trifle as the



The completely welded tooth.

iron commenced to show signs of melting. In the meantime the operator took up a quarter inch cast iron filler rod and brought it into the heated zone so it would be red hot before introducing to the weld. As the starting point of the tooth weld commenced to flow the filler rod was moved closer to it in an endeavor to have both the filler metal and the gear metal reach the melting stage at about the same time.

As the heating spot commenced to flow the melting filler was deposited upon it and worked around in a thin layer to cover the broken part of the tooth. In this operation the filler was kept in contact with the weld and pushed around in conjunction with the force of the flame. At the same time the flame was gradually worked along the broken place to deposit another section of the layer.

This also was well knitted to the gear metal. Then the flame and filler were advanced to another portion of the tooth, where the filling process was repeated. Thus the entire length of the tooth was covered with a layer of filler metal; the flame in constant though slight movement, and the rod always in touch with the flowing weld, except when being used to apply the flux powder.

The flux powder, especially mixed for cast iron welding, was applied at frequent intervals during the welding by dipping the heated end of the filler rod in a pot of the powder and quickly returning it to the molten weld. Meanwhile the flame was moved around over the weld to keep it fluid. The heated end of the rod caught just about enough flux for one section of the layer, or for about an inch of the filler rod. The heated rod caused the flux to melt enough so that it would cling to the rod. As soon as placed in the weld, the flux melted and spread over the surface to cleanse and protect it.

When the last section of the first layer was in place the process was doubled back on top of the first layer to place another of the approximately same thickness. In doing this the depth of the first layer was remelted in order to secure a firm bond with the second layer which was allowed to settle into it. This layer was a trifle more carefully formed and had to be shaped better along the edges since it was in reality the foundation of the new tooth. As the height of the tooth increased the work became more tedious. The flame and filler had to be handled more deftly, but the power of the flame became more useful in shaping the tooth. It was given a painting motion along the side of the tooth and at the ends of it, to blow the metal smooth and firm.

The filler rod was also useful in shaping the tooth by scraping and puddling the rough spots.

Tooth Built In Layers

The entire tooth was built thus, in layers. When about half finished the layers were gradually narrowed to conform to the shape of the tooth. Then each succeeding layer required less metal and greater skill in the laying. Care was taken to see that the layer below was fluid before adding another. The layers were thin, probably an eighth to three-sixteenths of an inch deep, because of cleaner weld is made in thin layers. The heavy deposits offer too much opportunity for gas or dross to be trapped in the metal.

The welding was done as rapidly as possible to prevent loss of heat through radiation and conduction. Sometimes between layers the flame was played over the sun rounding gear to bring up the heat.

When the entire tooth was finished the wheel was allowed to cool without covering as there was no danger of contraction cracks, such as is the case with many cast iron jobs.

Some welders advance the theory that it is best to cover all welded jobs whether there is danger of cracking or not. The claim is made that the weld will be softer and more easily machinable. This is questionable, for if the filler metal has been properly applied it will be soft enough to file or machine without the extra trouble of slow cooling, which is sufficient for gear teeth. If the flame has been prevented from oxidizing or carbonizing influences there will be little danger of hard spots, provided of course that the filler metal is soft to start with. If the filler is poor grade it is almost certain to be hard. In this event it will produce a hard weld or at least one with hard spots. These hard spots will be so hard that it is almost impossible to file the new tooth. The tooth will be considerably weakened too.

The portable emery grinder such as shown in one of the illustrations is very convenient for machining new welded teeth. Equipped with a thin wheel it may be used to shape the teeth almost to exact size. If the gear has to mesh closely or run noiselessly the finer finishing will have to be done with a file.

Many tractor gears do not require such particular attention but may be ground quite satisfactorily on the emery wheel, with no filing afterwards to speak of. Therefore all the blacksmith needs for tractor gear-teeth welding besides his welding apparatus is a small emery wheel and some sharp files. The teeth of larger or smaller gears are built up in practically the same manner as the one discussed herein.

RENEWING SHABBY TOPS

IT IS not always necessary to have a new top on a car merely because it looks shabby and worn. Oftentimes the top is perfectly good except in appearance. A small can of a good leather renewer will make such a top look as good as new.

A very satisfactory renewer is made of waterproof pyroxylin compound, containing black coloring matter.

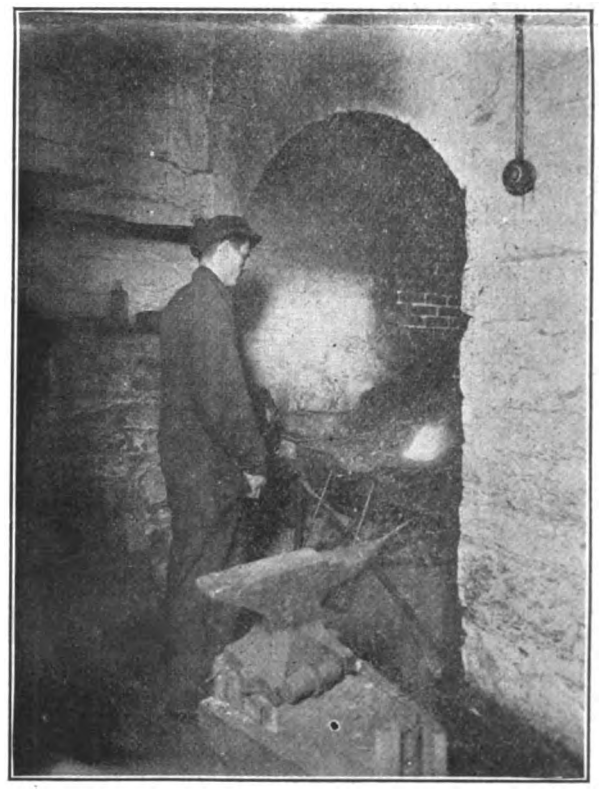
If the surface of the old top is cracked, provided the cracks do not extend all the way through, the leather renewer will fill these cracks and make a smooth uniformly even surface;—when dry the top will be found to have a tough waterproof film that will defy the elements for some months.

One coat of the renewer can be applied in about an hour. The top should be scrubbed or cleaned and then allowed to dry thoroughly before the renewer is applied. The film dries quickly and a second coat is necessary only when deep cracks are to be filled.

THE CAPITOL BLACKSMITH

How would you like this Blacksmith's job? To the building where he works come statesmen, law-makers,—men whose names are on everyone's lips. All this seems to make little difference to him, however, for he works on day after day without seeming to realize the importance of his position.

His shop is located in the basement of the



The Smith at Work (C) Keystone View Co.

United States Capitol and while he did not confide to us just exactly what the nature of his work was, he denied the story that the horses in the frieze around the rotunda of the famous building are reshod every year. We suppose that admistrations may come and administrations may go, but this smith's shop goes on forever.

Don't be afraid to look the figures of your business squarely in the eye. Do it often because if there is any place where ignorance is not bliss it is in the business.

An Answer to Mr. Lyons' Letter

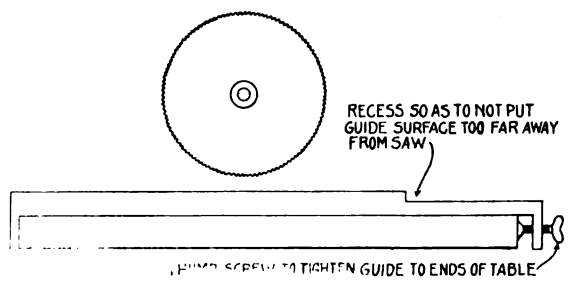
From Mark Petersen, Minnesota: I should like to say a few words in reply to Mr. Lyons' letter in the December issue. I am a blacksmith from the State of Minnesota and have only received a few copies of the BLACKSMITH & WHEELWRIGHT, but have enjoyed them very much. I take several other trade journals, but I do admire the BLACKSMITH & WHEELWRIGHT. I have gotten a good many ideas from reading trade journals and blacksmith books, ideas that perhaps J should never have otherwise thought of, of kinks and wrinkles that have been of real value to me.

In regard to Mr. Lyons' letter on plow work, I do not agree with him, when he says that automobile springs will outlast anything and require no temper. I wish to give you my method of pointing plows. I make it a practice to buy old and worn soft center plow shares from my customers, at fifteen or twenty cents each. I also consider old rasps good. When I cannot get enough of these I buy points from the jobbers, always being sure to get soft center if possible, as the crucible will not stand up among the rocks, being hardened to extreme hardness. These points and the entire length of the plow share, I heat to a full cherry heat.

I then plunge them bottom side down in a bath of clear water or a salt brine. I have also used yellow prussiate of potash, but since this was rather expensive during the war, I have avoided buying it. These shares will come out of the bath so hard that they will wear like a diamond, and cannot be touched with a file.

Auto springs will not be able to live up to this grief among the rocks. Of course, crucible shares cannot be hardened in this way, as they are sure to break very often before they leave the shop. My method is very much similar to Mr. Lyons' when it comes to welding the point on with but one exception. I weld the point on the bottom side of the share first, then lap over and weld the top side.

I feel thankful to Mr. Lyons for all the other information he has given us and hope to see his helpful letters in the BLACKSMITH & WHEELWRIGHT, again, I do not want him



Saw Table Guide.

to feel about it as one of my customers did one day, when he entered my shop with an article which he had previously taken to another smith. I mentioned to him that the other smith had done a poor job and then he said "Yes, that is the way with you blacksmiths, you all holler that the other smith is no good. No matter where you go, you have the same cry—the other fellow can't fix anything."

Mr. Lyons' auto spring may be all right on crucible shares, but crucible shares are not the "go" in this section of the country. I was very much interested in the article by Mr. Hobart on belt lacing and found it very useful.

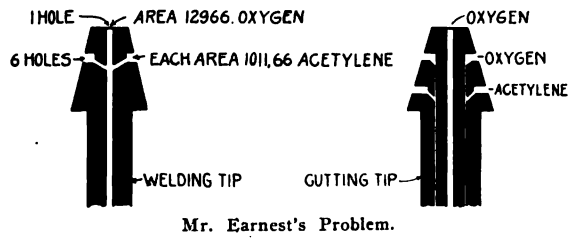
I am sending an illustration of a saw table guide which I have seen a saw miller use and I also use one like it. Cut a small piece of timber one and one-quarter inches thick and two and one-quarter inches wide, the length of your table. Cut narrower on the feed end of the stick about eight inches from the saw as this will avoid some crowding on the saw when ripping crooked pieces with the spring side of the board to the guide. Then bend two pieces of flat iron—an old wagon tire will do—about two inches wide. Bend to a square bend and bolt these on the guide one on each side. Put a thumb screw in one of them to tighten the guide to the table.

This can be set anywhere on the table to cut certain widths of material with very little trouble. I used to fasten my guide to the table with two clamps but I find this far more handy.

I am a young blacksmith and therefore, maybe the old man from Maine will find a lot of fault with this letter. I believe there is more to learn from the good old blacksmith trade than any other profession on earth, and even if we do tell all we know there is no danger of our learning too much. We cannot inherit one another's knowledge when we pass away although I wish we could. We would then have some chance of learning the trade of blacksmithing. I thank the BLACKSMITH & WHEELWRIGHT and all brother smiths for all information which they have given in the past.

Answers Helped Him

From Albert Earnest, West Virginia: I wrote to the BLACKSMITH & WHEELWRIGHT some time ago about brass tubing and also about making a welding and cutting torch and the information that I received was quite a help to me. I now have a splendid torch



Mr. Earnest's Problem.

for cutting and welding both, but there is still one more question that I want to ask.

In drilling the mixing chamber what is the best proportion for oxygen and acetylene? I drill a straight hole for oxygen and three, four and six holes for acetylene. For example, I drill one-eighth of an inch straight through the tip for oxygen and drill six holes cross-wise for acetylene. What area should those six holes have to be properly proportioned for the oxygen area?

Run Shop on Business Basis

From B. H. Brooks, Texas: I give below prices charged in this section of the country:

Shoeing, plain, up to No. 2	per set	$ 2.50
" " over No. 2	" "	3.00
Setting wagon tire 1 5/8 inch	" "	6.00
" " " 3 "	" "	8.00
" " " 4 "	" "	10.00
" buggy "	" "	5.00
Wagon axle, front		10.00
" " rear		8.00
" tongue, old irons		9.00
" reach		3.50
" tongue hounds, old irons, pair		6.00
" bolster, front		7.50
" " rear		6.00
Sharpening plough lays	.35 to	1.00
Pointing " "	1.25 to	2.50
Sharpening grades blade, per inch		1.00
Grinding discs, 26-inch, each		2.00
" harrow discs		.50
Labor, per hour		1.25

I started in business eight years ago without a penny to my name and without credit or friends. I managed to buy a small outfit on credit. I am not boasting, but today I can cash out all of my property for $30,000. I have made all of this at the anvil and have invested in equipment and business property; besides I have sent one boy to college and we live like white folks in a $10,000 home and have an auto to take a little outing in the country occasionally.

I feel truly thankful for my success and wish to say that it is no more than any honest worker deserves. The great trouble with many blacksmiths is that they allow the public and their customers to impose upon them. Why should not a blacksmith shop be run on a business basis instead of a place of accommodation?

That old accommodation stuff does not buy you anything. I will not pay labor and material bills, so, Brother Blacksmiths, take my advice and stop. If you are not making money, start in and play the game strictly on a business basis, and if you cannot get cash on your work just sit down and rest a while or go fishing. I have only lost one account of $40.00 in eight years and that would not have happened if I had been at the shop. The customer just out-talked my smith and got away with it.

A Valuable Letter

From T. K. Hansen, Craigmont, Idaho:

I give below prices which I charge:

Shoeing No. 0, 1. 2, 3, 4 and 5 New each	$1.00
" 6, 7, 8 " "	1.25
Bar shoes	1.50 & 2.00
Resetting pr. Span. no calking	5.00
Tire setting, buggy & narrow wagon tires each	2.00
Tire setting Wide wagon tires each	2.50
New wagon tongues complete	16.00
" " " Hawns each	2.50
Hind Hounds "	3.00
All Narrow felloes and small spokes each	1.00
Wide Felloes and large spokes "	1.50
Wagon bolsters old iron "	7.00
" reaches finished "	6.00

Plow Work

Sharpening lays	each	.75 to 1.00
Pointing lays	"	1.50 to 2.00
New shares 12 and 14 inches	"	6.00
" " 16 "	"	7.00
" " 18 "	"	8.00

Auto Spring Welding

Small spring leaves per weld	1.50 to 2.50
Large spring leaves trucks per weld	2.50 to 5.00
I do not take springs out, nor replace them.	
Road grader blades sharpened each	10.00 to 12.00
Welding gang-plow crank axles each	2.00
Sharpening picks each	.50
" rock drills 1 inch steel (hand) each	.25
Laying steel on picks both ends	1.50

If you are a fast workman, work by the job and not by the hour. In dealing with difficult jobs of different kinds, I always consider three items. First, the actual cost and replacement cost of the article to be repaired or improved, second, the delay in sending and obtaining new repairs and the cost of such delay, third, whether or not any neighboring smith can repair or do the job as well as I.

These factors decide whether or not you can place a heavy charge on your work and

still retain the friendship and good will of your customers. Here are three samples from the above system and how it works out.

Sample number one: One of my customers bought a Bean Threshing Separator which cost $1800.00. When it arrived he refused to accept it, because the weight of the cylinder (eight hundred pounds) had settled the frame of the machine one and one-half inch below the level. The cylinder of a Bean Thresher lies in the centre of the machine. He came to me with his troubles saying that the Company who sold the machine had authorized him to have it fixed, stating that they would stand a good charge if the work were done to everybody's satisfaction.

I fixed it with a pair of trusses using three-quarter inch turnbuckles. It took about nine hours to do this job, and I used about four dollars worth of material. My charge for the job was forty-five dollars. The Company copied these trusses later and is now placing them on the new machines direct from the factories, and everybody is satisfied.

Sample number two: The coupling pin on a railroad engine broke. The job was a trifle heavy for my neighbors, but with a helper, I made a new one in three hours and saved several days' delay. I paid the helper three dollars, the Company furnished the stock and my charge for the job was twenty-five dollars. The boys were well pleased.

Sample number three: A sprocket wheel on a combined Grain Harvester broke in the cutting season. The cost of a new wheel would have been one hundred and fifty dollars. The wheel measured about five feet inside diameter. I fixed it so that it was better than new in less than four hours without a helper. There was very little delay and everybody was pleased. The material for this job cost about one dollar and I charged thirty-five dollars for the entire thing. I could give you many examples of this sort and you will notice that the moral is, under such circumstances, "do not be afraid to charge."

I have worked at the trade for about thirty-four years and learned it fairly well in ten years. However, it took me about thirty years to learn how to do business and in the last four years I have made some real money. Here are a few figures extracted from my books in 1920.

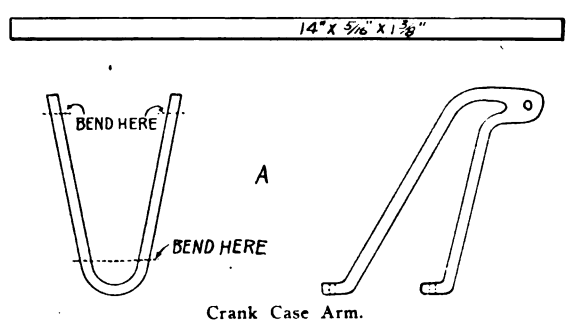
Gross Business		$5521.54
Labor	$325.00	
Material, Light, Power & Phone	1019.63	
	1344.63	4176.91
Balance earnings		4176.91
Deduct 10% on Investment	400.00	
Taxes & Insurance	100.00	
	500.00	500.00
Real Net balance & 10% on investment		$3676.91

My shop, lot, stock and tools I consider worth not less than $4000.00. This is what I have done in 1920, almost single-handed, as I hired very little help and when I did, I paid from seventy-five cents to one dollar an hour. I have electric power and a first class outfit except a trip hammer, and I hope to have this some day.

[EDITOR'S NOTE: In a letter which Mr. Hansen writes to us personally, he states that he has been noticing a great many kicks concerning the hard luck of blacksmiths, therefore he has given his prices and a few points on how to place a strong charge without offending customers. He states that his system has stood the test and has been tried now for five and one-half years. He states that he is sending this, not for the man who knows it all, [and who does?] but for young men, like he used to be, fairly good mechanics who are a trifle too tenderhearted when it comes to charging and collecting. He credits the success which he has now-a-days, in a large measure to brother smiths in other parts of the country who are getting good prices for their work, and sending them to the BLACKSMITH & WHEELWRIGHT for other members of the trade to follow. He does not agree with the brother who said that those who know the most keep their mouths shut. He believes in passing a good idea along, because it will surely help someone. Mr. Hansen is very contented, and states that his wife and he are worth between ten to twelve thousand dollars, that they have a great many fine friends who are "honest to God" good citizens and that all in all he has no kick coming—"and you can tell them so."]

Two Good Ideas

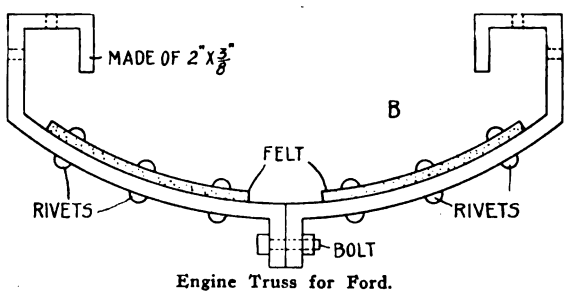
From L. A. Stoddard, Canada: I have not contributed anything to the BLACKSMITH & WHEELWRIGHT for a long while and so I am therefore sending a few sketches. One is of a crank case arm, shown at A, to be used when the original breaks, and the readers



Crank Case Arm.

all know that that is quite often. The other is of an engine truss, shown at B, which is made to go under the crank case, to stop the arm from breaking. I think that the sketches show exactly what I mean.

Now this is only a starter. Let all of you send a trick or two to the old BLACKSMITH & WHEELWRIGHT. I know it is hard to begin sometimes, but loosen up and let others have some of your ideas. Remember you cannot take them with you, so send them in by the



Engine Truss for Ford.

car load. This is rather a hurry-up letter, but some day I am going to write a real long letter.

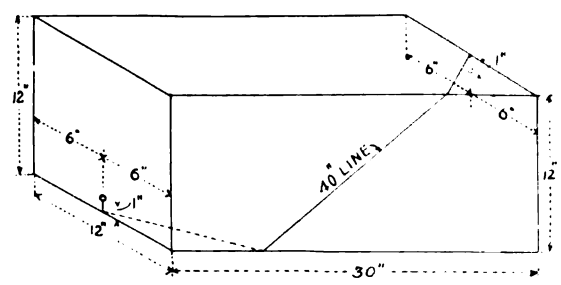
What do the boys think of oxy-acetylene welding? I am doing it, but have a very poor outfit, so if you boys are thinking of starting in, get good tools and you will be started right.

An Answer to the Challenge

From James H. Rhea, Arkansas.—I am an Arkansas Blacksmith, located in the Northwestern part of the State. I will give you a brief description of our shop. It is a building twenty-six by forty feet, in which we have two forges, eight horse power gas engine, full set of cutting off saws, wood turning lathe, grinding wheels of all sizes and one power drill press. We do all kinds of blacksmith work. We also do quite a bit of auto repairing. Our prices appear to be lower than most other States. They are as follows:

Horse shoeing No. 0 to No. 3 with toe calks	$2.00
Horse shoeing No. 4 to No. 5 with toe calks	2.50
Shrink tires wagon per set ...	4.00
" " buggy " " ...	4.50
Laying plain shares	1.00 and up
Gum saws	1.00 to 2.00
Auto work, per hour	1.00

I am also sending a solution of the problem of the chrome nickel steel block which was offered as a challenge to Mr. Nichols of Arkansas in the January issue of the BLACKSMITH & WHEELWRIGHT. This question was



Mr. Rhea's Solution.

in regard to the direction the line takes on the surface of the block.

EDITOR'S NOTE: The solution which our Arkansas friend gives is incorrect, because the line he has drawn is slightly over forty feet in length.

On Working Steel

From H. M. Johnson, Pennsylvania: I happened to pick up one of the BLACKSMITH & WHEELWRIGHTS of June, 1920, and in it I noticed that my old friend Mr. C. Smith has an article on drilling holes straight with a crooked drill and also on shoeing for quarter crack, both of which I think are very good suggestions. The one on welding spring leaves I differ with somewhat, and shall be glad to give the reasons if asked for them.

Looking over the magazine I find a great many good suggestions. One on tempering carbon steel, which Mr. George Stiefvater sent in, in which he describes tempering tools in water. I have found in my thirty or more years of experience, that carbon steel varies so much, that some of it which is made today will not stand cold water for quenching or hardening, because it chills too suddenly and the steel crack which is called "water crack" is caused.

I find that by warming the water or using a grease of some kind I can overcome this difficulty to a certain degree. I have rendered tallow for tempering edge tools such as brick hammers, mill picks, butcher knives, wood chisels, axes, hatchets and all sharp edge tools, also for the springs of gun locks.

I should like to know how Mr. George Stiefvater tempers gun springs or butcher knives without grease. I have worked steel for many years and every day I find out a thing or two which is new. At the place where I work, they use all kinds of steel, carbon, musket, self hardening, high speed, etc., etc.

I shall always be glad to tell anybody whatever I know about blacksmithing, and do all I can to help the brothers in the trade.

An Adjustable Rim Tool

From W. W. Brock, Oklahoma.—Herewith is a sketch of a rim tool which I tried and found to be a handy device. It consists of two side members and two cross members as shown.

The side members are made from a buggy axle, cut in half, flattened at one end and bent to form the elbow as shown in the sketch at A. The other end of the first, side member, at the left of the sketch is bored for a 5/16 inch bolt. A second hole is bored, eleven inches from the bent end, for the same sized bolt.

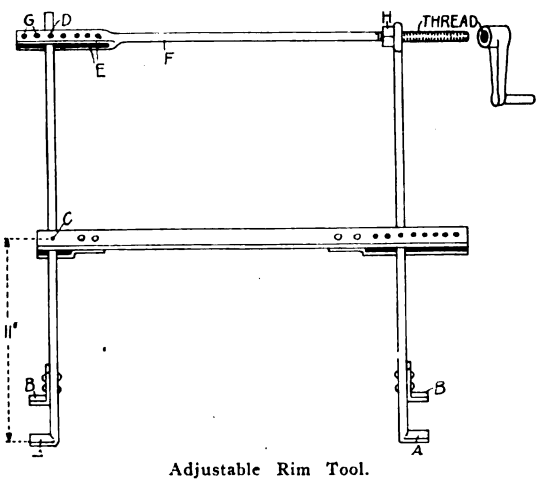
The right hand, side member also carried a 5/16 inch hole, eleven inches from the bent end while the other end of this member is bent to form an eye large enough to take a one inch bar as shown at H.

Upon both of these side members rivet a set of angles as shown at B. The angles can be made from stock ¼ by one inch. The distance between A and B should be

enough to accommodate the rim to be applied.

The lower cross member is made from flat stock ¼ by one inch, 42 inches long. Starting at one end of this member, bore seven or eight holes and tap them for the 5/16 inch screws. Bore one hole at the other end, C, and tap it also. Two angles should be riveted to the ends of this member as shown in the sketch.

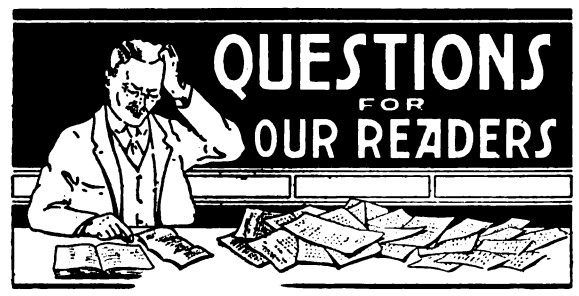
The upper cross member is forked at the end and also carries seven holes for adjustment. This member can be made from one inch stock with the fork welded to it. It measures 48 inches total length and is



Adjustable Rim Tool.

threaded at the right hand end as shown. A threaded crank fits over this end for expanding or contracting the device. The sketch clearly shows how the device is constructed.

(EDITOR'S NOTE. Would it not be practical to bolt the angles shown at B, instead of riveting them? This would admit a number of adjustments for different widths of rims.)



Heating Wagon Tires

From S. Morcombe, Canada.—Can a brother smith give me a description of a furnace for heating wagon tires. Please give dimensions and all particulars.

A Flivver Question

From Simon Ott, Missouri: Can some brother smith help me out? I have a Ford touring car, which was bought in 1916. I always had trouble in starting it and find that it was especially difficult on a cold morning. In the warmer weather I do not have so much trouble. This machine has a Holley carburetor.

The engine is always kept clean of carbon. The valves are in good shape and have sufficient packing in the intake pipe. The compression is good. The machine runs in high easier where other Fords fail. I have the needle valve open for starting one and one-quarter inch round and after the engine is warmed up seven-eighths of an inch round.

Many times when some one drives into my shop on a frosty morning in a Ford, I tell them that I will give them my car if they can start it without hot water, but so far no one has succeeded. I find it necessary to use hot water and I must use the primer whether it is warm or cold whether. I have used dry batteries for starting with same result. If I screw out the spark plugs and squirt gasoline two or three times, put the plugs back, and have the engine start so that it will fire and put on the battery switch it will fire four charges on each cylinder, but sometimes it is very apt to stop after each cylinder has fired once. The valve is not leaky nor is the intake pipe.

Can you tell me why it is that I cannot get the gas into the combustion chamber? Do you think it best to put on a new carburetor?

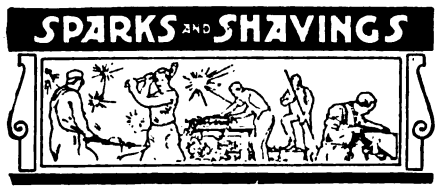
Editor's Note: You speak of some trouble with your Ford car and I only wish that I were a resident of your town for about two hours so that I could come over and accept your gift because I know of one way of starting a balky Ford car which is just as sure as turpentine will start a lazy mare, if properly applied.

The gasoline you are getting in your town must be equal to a poor grade of hard cider and this probably explains all of your trouble. Prime the engine on ether and the thing will start at the first yank of the crank. But there is something the matter with the carburetor. The float level is too low. Experiment with the float and see if you cannot get the level up to within about one-eighth or one-sixteenth of an inch of the needle valve. To do this, bend the float arm upward slightly. If the thing still gives trouble install a new carburetor, Sunderman, Zenith, Stromberg, Schebler, etc.

Still another thing. The engine will start better if you heat the intake manifold. Weld a handle upon a big horse shoe and put the heated shoe against the manifold when you wish to start the car.

Sharpening Twenty-Six Inch Disc

From B. H. Brooks, Texas: Can some brother smith tell me the best process for sharpening twenty-six inch discs? At the present time I grind them, but do not care for this method since it takes too long and uses too much electricity. Some one who has had experience with the cold rolled process will help me by writing about it to the BLACKSMITH & WHEELWRIGHT.



Northwestern Horse Nails.

All blacksmiths know that it is necessary to use a horse nail which is well made, well finished, and which will stand up in hard usage. The nails which are made by the Fowler & Union Horse Nail Co., Union Division, Chicago, Illinois, will bear investigation.

They are said to be the most perfect in form and finish, and the makers claim that their nails will hold a shoe longer than any other nail made. The feature of this nail is the reinforced point which makes it easy to drive and safe to use. complete information may be obtained by writing to the manufacturers.

Giant Grip Products.

Some smiths do not always realize that if they do a particularly good job in horseshoeing, it may bring other jobs of a more remunerative nature. Then to, it is not always their fault when the job they turn out is not what it should be, for often the materials which they use are not good.

However they should have litle trouble if they use the products made by the Giant Grip Mfg. Co. The Giant Grip shoes and calks are very well known, but it will probably pay readers to write to the Giant Grip Mfg. Co. of Oshkosh, Wisconsin, for full information.

Justice Plow Blade Sharpener.

Many smiths are sharpening plow blades in exactly the same way as the smiths of many years ago sharpened them. They seem to forget that there are up-to-date methods and continue to use the old ones. However, the success of Justrite Plow Blade Sharpener seems to indicate that more smiths are coming around to see that a machine which can turn out seventy-five or one hundred pieces a day is worth investigating.

The Justrite Plow Blade Sharpener, which is manufactured by the Strite Governor Pulley Co., 307-309 So. Third Street, Minneapolis, Minn. is claimed to combine speed, accuracy and finish. The Justrite handles plow blades, road scrapers, drag teeth, drill shoes, cultivator shovels, corn knives, in fact anything that need to be drawn down to a fine clean edge.

It will pay you to write to the manufacturers for full particulars.

Warner Blowers.

A blower which is said to give any speed that is required, a hundred if you need it, one that is simple, durable and will stand hard usage is manufactured by the Warner Electric Co., Kalamazoo, Michigan. They sell the blower complete, ready to operate at the Forge, at a very reasonable price.

If you are at all skeptical about what the blower can do, they agree to send it on a thirty day trial, for they feel sure that they can convince you of the merits of their product. It will pay you to write for their folder on forge blowers, and if you are ordering, do not fail to state the voltage and cycles so that they may be able to fill your order correctly.

Rochester Helve Hammer.

The West Tire Setter Company of Rochester, N. Y., manufactures the Rochester Helve Hammer, which is a very well known product. The machines are popular and the springy forging blow is one feature that makes it so well liked.

Any length, weight or force is instantly secured, while the machine is running. There are many other features about this machine which blacksmiths will be interested in and it would be to their advantage to write to the manufacturers for the Rochester Helve Hammer book. The machine is made in six sizes, two styles of frames, twenty-five to one hundred pound heads.

Bryden Horse Shoes.

At the present time there has been quite a demand for snow shoes. In New York the winter had been comparatively mild and then there was a heavy snow storm. Many of the horses were found to be shod with shoes that did not help them any in combating the snow and ice. Thus, blacksmiths who had stocks of shoes which were adapted for the emergency did a rushing business.

Shoes which are manufactured by the Bryden Horse Shoe Works, Catasauqua, Pa., are the Boss Snow Shoes, which are particularly desirable. They are made in two styles, the Boss Light Iron Snow Shoe, and the Boss Extra Light Iron Snow Shoe. Smiths who were caught short this year, will do well to investigate these shoes so that they will be prepared next year.

Arm & Hammer Anvils.

The "Arm and Hammer" Wrought Iron Anvils, which are manufactured by the Columbus Anvil & Forging Co., 115-129 W. Frankfort Street, Columbus, Ohio, are so well known that they scarcely require any introduction to progressive smiths. They are extremely well made, serviceable, strongly built and will stand up under unusually hard usage.

The anvils which are stamped with the Arm and Hammer trade mark are sure to satisfy. They are known all over the world and the manufacturers are constantly in receipt of testimonials which speak of the anvils in no uncertain terms. These letters of commendation state that the Arm and Hammer anvils have proved their worth.

This company also re-dresses, tempers, grinds and polishes your old anvil and thus assures you of many years of service from it. Full particulars may be obtained by writing to the manufacturers.

Goodell-Pratt Tool Book.

Goodell-Pratt Company of Greenfield, Mass. will send to any one interested in tools, gratis on request a copy of their No. 14 tool book which is made in the convenient pocket size. This book illustrates and describes over two thousand sizes and kinds of tools for tool makers, machinists, motorists, carpenters, and householders. It is an extremely valuable book and should be in the hands of all blacksmiths.

Websters' Selected Smithing Coal.

A very attractive little booklet is published by the Pennsylvania Coal & Coke Corp., Whiteall Bldg., New York City, entitled "Forge Fire Facts." Blacksmiths who take pride in their work should see a copy.

All smiths realize that they cannot do good work with poor coal. It is up to them to see if the coal that they are using is the sort that requires constant cleaning, watching and looking over. If they find that they are not able to devote their entire attention to the metal and tools they will realize that the coal that they are using is not the sort that they should use.

Most smiths realize that sulphur in coal is absolutely undesirable, because of its disastrous effects on iron and welding temperatures. Coal which is said to combine all the advantages and virtues that good smithing coal should have and to lack all of these vices is being sold by the Pennsylvania Coal & Coke Corp., and called "Webster Selected Smithing Coal." This coal is said to be free from all impurities. It has extremely high heat value, which is said to give it a heating and coking quality unequaled by any other fuel.

There are six tests which this company suggests that you try with the coal you are now using, so that you may determine whether it is right or not. These tests are contained in the little booklet mentioned before. If you find that your coal does not stand up under these tests it will pay you to consider a change and investigate the product of this concern. It is marketed throughout the United States and Canada and there are large quantities moving to the Western Coast and Western Canada where freight rates are very high.

Northwestern Horse Nails.

Northwestern Horse Nails are manufactured by the Fowler & Union Horse Nail Co., Union Division, Chicago, Ill., and are used very extensively by blacksmiths: the re-inforced point which this nail has is said to make it easy to drive and safe to use.

The line is very complete and includes all desirable sizes.

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Patterns for woodworking machines, power hammers, every grinders, belt sanders, punches and shears, cut for catalogues, good will, list of inquiries, reasonable price. Address B % Blacksmith & Wheelwright, P. O. Box 654, City Hall Station, N. Y. City.

FOR SALE

For Sale: Blacksmith and woodwork shop, 21 x 65; new nine room frame house, three acres land, small orchard, in good farming country, two churches, two stores and schoolhouse. Stock and tools if desired. Reasons for selling, poor health. If interested write, Loyd O. Hann, R. 7, Box 86, Mt. Pleasant, Mich.

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Universal Axle setting machine $2.00. Extra quality hand forged farriers knives 40c while they last; 25 sets 15/16 axle stubs $1.90 per set; Derby circles, perch irons, shaft irons, pole braces, whip sockets, bargain prices. Brickwell Mfg. & Supply Co., Jamesville, Wis.

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Blacksmith Shop and garage in Red River Valley. Fine territory. Shop has power hammer and good set of tools; six living rooms above shop. A good location for a good general smith. Reason for selling poor health. Address Mark & Company, McCanna, N. Dak.

FOR SALE

500 lbs. Felloe plates 1" to 1¼" $5.00 per cwt. Derby fifth wheels, king bolts, and yokes, saddle clips, perch irons, buggy and surrey steps, pole braces and tee irons. Forgings half price, malleable steps and pads 8c per lb. Bicknell Mfg. & Supply Co., Jamesville, Wis.

FOR SALE

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"Sample received and it is all you claim for it. For amount enclosed please send me by express 25 lbs. of Uniflax." A Barton of Kosse, Texas writes us the above on Jan. 10th. You also need Uniflax "Master of Service" Welding Compound. Request Circular or send 10c for Sample. Goruse Company, Elmira, N. Y.

The man who does not advertise simply because his grandfather did not, should wear knee breeches, silk stockings, and a wig.

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Index to Advertisers

CLASSIFIED BUYERS' GUIDE

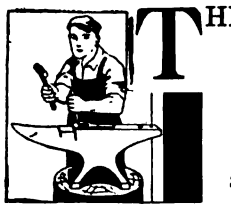
BLACKSMITH AND WHEELWRIGHT

and TRACTOR REPAIR JOURNAL

Vol. LXXXIII. No. 4 APRIL, 1921 TERMS ONE DOLLAR A YEAR

Practical Horse Shoeing

Special Shoes Used For Expanding The Hoof And Methods of Application



THIS peculiar ring formation which is almost pathognomic of thrush, shows that the disease has existed for at least several months."

Thrush may be regarded as a result of lack of cleanliness, lack of sufficient exercise, bad shoeing, etc. Thus, the frog may not get enough exercise because the horse-shoer has cut away too much of the horny frog with the result that when the animal takes a step, the horny frog does not touch the ground. Naturally, this means that the fleshy frog underneath the horn does not get the customary healthy succession of compressions and releases. The same bad result may be caused by the use of shoes that lift the back part of the foot too far from the ground. The horny frog ought to undergo compression when the animal puts his foot down onto the ground and it ought to spring back when the foot is lifted.

If the frog is put out of commission for a long time, either by excessive trimming or by shoes that are too high, it is apt to become dead-like or else to develop thrush. In fact, with no fault traceable to the horseshoer, thrush may occur. Thus, idleness for a long time and of such a character as to leave the frog unexercised may also result in thrush.

"The views held as to the significance of thrush are unusually varied. Some regard it as a very trifling disease, which may continue for years without any particular ill consequence, or even as a benign condition not to be interfered with. If thrush in itself is not of much importance, it often leads, however, to much more serious conditions. It weakens the framework of the hoof, and in flat feet favors the advent of contraction. It may interfere with the animal's use, and even when not actually producing lameness, it causes the stride to be shortened and diminishes freedom of movement. When affecting one side of the frog, it is apt to lead to unilateral contraction and obliquity of the hoof. In addition, it has been held responsible for the production of corns, sand cracks, and even canker."

Thrush is a comparatively easy disease to

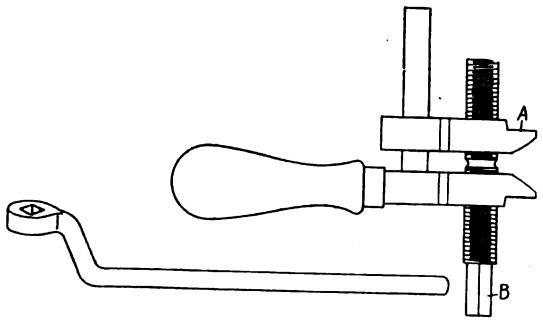


Figure 1. Dilator for Expanding De Fay's Shoe. At A, is Shown the Iron Cheeks, Which Fit Between the Heels of the Shoe. At B the Square Head on the Right and Left Handed-Screw for Taking the Key, is Shown.

treat, unless it has been allowed to run on too long without attention. If the case is of recent origin and there has been no considerable change in form, then exercise is the thing. That is, conditions are to be modified so that at every step the frog will be compressed, and the animal is to be given plenty of movement so as to bring about the proper exercise of the frog. If the trouble is not so simple, then one may proceed by cutting away all loose horny material, by washing the diseased frog two or three times a day, and by the use of some antiseptic or mild astringent, " such as raw pyroligneous acid or a 5-per-cent solution of sulphate of copper." Pyroligneous acid is a name given to commercial acetic acid. It is quite cheap. Sulphate of copper is the same thing as blue vitriol or blue stone. It is sometimes used in the electric batteries of telegraph offices, or at least used to be employed thus. It is also quite cheap.

Notice, however, that a 5-per-cent solution is the thing wanted, and not the blue stone alone. The way to prepare it is to weigh a little of it—say, an ounce. Then dissolve this in 19 times its weight of water. As 1 pint of water is almost exactly 16 ounces, one may simply put 1 ounce of blue stone into a little more than 1 pint of water, and get just about the solution wanted. Or, one may put a little less than 1 ounce of blue stone into 1 pint of water. The ounce here mentioned is the ounce avoirdupois. If the blue stone is bought at a drug store, the druggists' ounce will be a little heavier than the avoirdupois ounce. Three-quarters of a druggists' ounce of blue stone in 1 pint of water will be just about right.

Manure may cause trouble by coming into immediate contact with the frog. To prevent this, the frog may be cleaned and washed and then smeared over with Venice turpentine. This is to be followed by passing a fairly warm iron over the parts. This is done slowly and burning is to be avoided.

De Fay's Shoe

An old case of thrush may call for different treatment. Thus, if the horny material of the frog is already nearly gone and if the hoof has become so contracted that the walls of the heel are pressing on the plantar cushion and the frog, the special shoe known as "De Fay's" may be applied.

This shoe is a flat affair. There are two rear clips on the inner margins of the heels. These clips are to lie "in the lateral furrows of the frog, exactly at the points where the wall is reflected to form the bars. They should fit evenly on the bars, but should not extend to the bottom of the lateral furrow of the frog. The foot surface at the heel must be absolutely horizontal." This shoe is prepared and accurately fitted by a skilled man. The shoe is allowed to cool off and then nailed in place.

An instrument called the *dilator* is then applied. The instrument is used to push the heels of the hoof apart. This operation should be very carefully carried out. The first dilation of the hoof heels will be confined, say, to a widening amounting to 1/12 to 1/8 inch. This is very little. The dilating is not to be repeated for 10 or 14 days, the object being to give opportunity for horny matter to fill in the space that has been gained. The dilator may be made by the blacksmith himself. One form of such an instrument is shown in the accompanying illustration. There are two arms, one arm being provided with a suitable handle. Further, this same arm has a side projection which passes through an end of the other arm. The tips of the arms are provided with side faces suited to come against the horny wall of the hoof. The two arms are to be forced apart, and the side projection of one serves as a guide to keep the two arms in rignt positions—or, at least, to aid in so keeping them.

The forcing apart of the arms is accomplished by the right and left handed screw which is matched with threaded holes in the arms. At one end of the double screw is a shank with a square cross-section. By using a suitable wrench applied on the shank *b*, the arms may be forced apart or else more closely together, after the manner of a turnbuckle. This instrument is useful in other cases of contraction besides those arising from thrush. Consequently, the horse-shoer

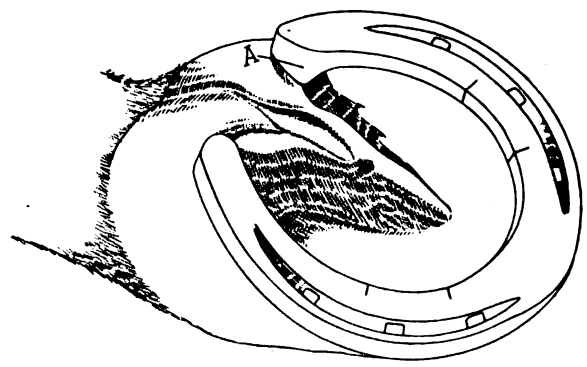


Figure 2. Shoe for Expanding the Hoof. At A is Shown the Point Where the Bar-Clips Should Come.

may have considerable use for it—enough, perhaps, to warrant making it.

De Fay's shoe may be used in conjunction with an expanding apparatus. Both shoe and apparatus have already been described. The apparatus seeks to press the hoof apart in the region of the heels.

De la Broue's slipper shoe is one which tends to expand the entire hoof wall. Its action is judged, however, to be too severe when extended to all parts of the hoof; but is considered a good thing when its expanding action is confined to one or both heels. The expanding action is accomplished *automatically* by the weight of the horse as it presses on the shoe. I do not have available a detailed and accurate description of this shoe; and so have to put two and two together. I describe the shoe and the paring of the hoof with some reserve.

The hoof side of the shoe is to be made to dip towards the outer edge. The hoof underneath is to be surfaced for contact with the shoe in such way that it will bear evenly on the slanting surfaces of the hoof side of the shoe. The metal and the hoof must exactly fit against each other. If this exact fit were not provided, one would have to expect more or less damage to the hoof from the uneven contact. A little thought on the horse-shoer's part will, perhaps, convince him that, when this shoe is in place and the horse puts his weight upon it, the hoof will be spread or expanded.

Experience seems to have taught that it is not well to have this expanding action in the front part of the hoof because of its tendency to damage the white line. However, it is thought to be proper to use it in the heel region. The horseshoer is advised, then, not to put a slanting surface on top of the whole of the shoe, but only to use this slanting surface in the rear part. Judgment will have to be exercised as to the precise places the extent of shoe to involve. Naturally, one will put the dip at just the place where expansion is desired. The top surface of the shoe—that is, the hoof surface of the shoe—is to be formed in the usual way at other points. Of course, the surface of the

hoof that comes next the shoe is to be pared to an exact fit.

Another point to stress is the use of good judgment in deciding on the steepness of the slant or dip. The steeper the slant, the greater the expanding action. If only a gentle expanding action is wanted, then the slant should be gentle as well. If a severe expansion is desired, the dip should be steepened. What may be considered an average slope—neither gentle nor severe—is one that makes a dip of 1/12 or 1/8 inch from the inner edge of the shoe to the outer edge.

It is considered inadvisable to use the slanted top surface further forward on a shoe than the point which corresponds with the point on the hoof where the hoof wall becomes perpendicular to the ground. That is, the shoe is given the slanted top from the rear to the point indicated or to a less forward point. In general, it is not to be extended forward any farther.

It is worth while to remember that the slanted top in the heel regions may be used on bar shoes or other shoes.

Whether the slant is to be put on one or on both heels will depend upon whether the expanding action is desired at one or both locations.

Hartmann's Expanding Shoe

Page 352 (Fig. 335) Hartmann's expanding shoe gets its action in a different way. Apparently, it is based on the idea that there is a natural action of some kind which would expand the contracted hoof, if only it had a proper chance. The stiff horse-shoe tends to hold the hoof severely to one shape, and to resist any tendency to spread or expand. In the Hartmann shoe, the metal is weakened at one or more points with a view to making it easy to expand the shoe. This weakening of the shoe is done with a hack saw or other suitable tool for making a transverse cut. Thus, a single cut with the hack saw may be made in the inner edge of the toe, the cut extending through the metal from the hoof to the ground surface. The cut may be 1/16 or 1/8 inch deep into the metal.

If this cut is placed exactly opposite the very tip of the toe—that is, so as to divide the shoe into two equal halves—then it is in the right position to secure equal expan-

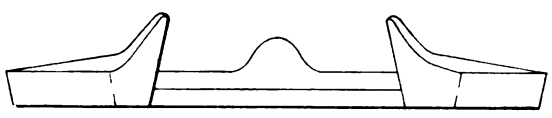


Figure 3.—Einsiedel's Shoe Seen From Behind.

sion of the two halves of the hoof wall. A couple of cuts instead of a single one could be made in the toe and these set at equal distances from the exact center. We should thus secure an equal expansion of the two sides of the hoof. If it is desired to confine the expansion to the heels, the cuts are to be placed further back than the toe region. If it is the purpose to expand only the one heel, the cut or cuts are to be placed on that side.

Page 352 (Fig. 336) Einsiedel's expanding shoe is still another expansion device. It operates automatically. This is a flat shoe of the usual type, except that it is provided with specially formed bar clips. These clips bear against the bars of the hoof and are formed so as to press the bars outward when the horse's weight is on the shoe. That is, the surfaces next the bars are slanted so as to produce this action. Naturally, the severity of the outward thrust will vary with the slope of the bar clip. The steeper the slope, the more energetic the outward pressure.

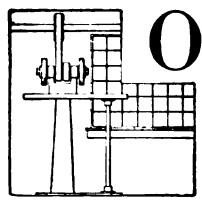
However, after the shoe has been shaped to an exact fit, but before the nailing on has been done, the heels of the hoof may be dilated with the special device already described in connection with De Fay's shoe. This expansion may be continued until a separation of 1/8 inch has been secured. The shoe is then nailed on, when the weight of the animal may be expected to expand the bars. "It produces its effect slowly but surely. In uni-lateral contraction [that is, contraction affecting only one side of the hoof] the bearing surface of the clip only inclines outwards on the affected side. Shoes with bar clips should not be used, when the heels are very low and when the lateral clefts of the frog are correspondingly shallow."

It is very necessary that a certain amount of frog action always take place. When the horse runs barefoot, the wear of the hoof surface that bears on the ground tends to let the frog down to a contact with the earth. Then the widening or expansion of the hoof which naturally takes place when the weight comes on also tends to let the frog down. If the horse is shod, the frog is lifted more or less. Besides, the natural expansion that should take place every time the weight comes on to the hoof is hindered by the stiffness of the metal shoe. Shoeing, in fact, operates against frog action. But shoeing can not ordinarily be avoided; so that we have to consider what may be done with shod horses.

Frequently—perhaps usually—n o t h i n g need be done beyond a permissible paring away of the hoof under surface that comes next to the heels of the shoe and making sure that the shoe itself does not lift the frog too high. But there will be cases where the usual and permissible things are inadequate. The horse does not get the frog action that he should.

Platform Gears

Complete Instructions For Making Half Spring Platform Gears



OWING to the fact that the platform spring gear can be made very cheaply and that it can be fitted to so great a variety of vehicles it has become almost, if not quite, as common as the perch gear, and so far as the wood shop is concerned they cost little if any more than the perch. The extra cost falls upon the smith-shop. In one respect the platform gear is less troublesome than the perch. This is in making one style of gear answer for various lengths of bodies. With the perch gear the distance between the axles is arbitrary, while with the platform it can be easily adjusted to any desired length and the pose of the springs made to accommodate any height of wheels, without in any way interfering with the perfect level of the gear. It is well known that with a perch gear where the perch is straight it is absolutely necessary to so adjust height of wheels or bend of axles as to give a perfect level to the perch; and where the perch is bent to adjust the back and front ends so that they will describe horizontal lines, not necessary on a level with each other, but so that each will have its own level. Neglect in this respect not only mars the appearance of the vehicle but is a source of weakness as well, owing to the fact that increased friction is caused by the fifth wheel plates on a horizontal plane. as they should, and therefore wearing away quickly and at the same time straining the head-block and causing it to wear away quickly.

The adjustment of the fifth wheel plates on a platform gear is one of its most important features, and the mechanic must see to it that a perfect level is secured with the fifth wheel plates on a horizontal plane. Once this is secured all excessive strain is removed and durability is guaranteed to all parts.

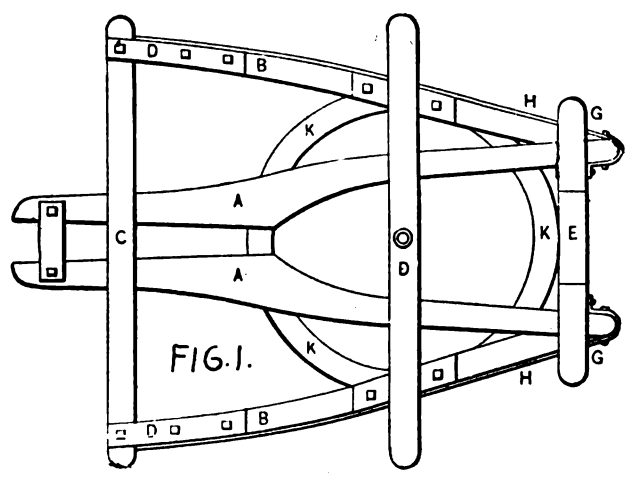


Figure 1. Heavy Wood Platform Gear. Ground Plan of the Lower Gear From the Under Side.

The platform selected for this month is one in which every piece of timber is straight except where lightened out for appearances, and all parts are so put together as to insure a thorough bracing in every direction, and the supports such that there can be little danger of the woodwork getting out of place. Yet too much care cannot be taken to square

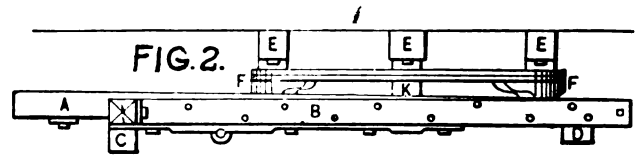


Figure 2. Elevation Plan, Showing Positions of Hounds, Futchels and Fifth Wheel.

up all parts when making up. The king-bolt being the central point, all truing up must radiate from that point. The woodworkman in making a gear of this kind is compelled to depend upon the blacksmith for securing the parts in their proper places, as there is not a rigid mortise or tenon, all parts being set upon each other, and the most the woodworker can do is to niche in an eighth of an inch or so where the parts set upon one another. It is his place to bore all bolt-holes, and it is necessary for him to secure the gear parts in their correct positions before doing his work; but not being secured until after the blacksmith has put on his plates, it devolves upon the latter to see that when in his hands it is trued up and given the exact position which was intended by the woodworkman. To make sure that the frame will hold its place, "T" plates must be used at all controlling points, and when these are

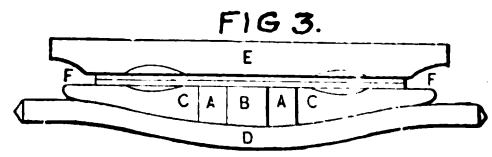


Figure 3. Front Elevation Showing the Principal Pieces Separately.

put on the frame should be placed in a position where it cannot be drawn out of shape through the means of the bolt-holes not being bored true or through carelessness on the part of the workman when fitting the "T" plates or when tightening up the nuts. The platform we show this month is extremely simple in construction; so much so as to bring it within the scope of ordinary intelligence and cheap enough to permit of its use on low-priced wagons. The one expensive part is the fifth wheel plates, but if the plates are purchased ready for use they will cost but a trifle as compared to the cost of making in the ordinary smith shop, where the facilities are few; and in these days the man who makes them on the anvil wastes time and money and fails to produce as perfect a piece of work as he can purchase of

the dealer in carriage and wagon materials. The plates thus furnished are absolutely true, and if ordinary prudence is observed in drilling the bolt-holes they will remain so until the platform is finished. Fig. 1 illustrated the elevation plan. A, the futchels; these are perfectly straight, and for an ordinary one-horse wagon should be about 2 inches deep the entire length. B, the cross-head block of the upper platform, may vary in

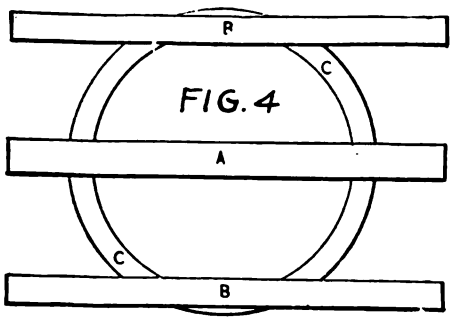


Figure 4. Upper Carriage Part, Fifth-Wheel Plate and Cross Bars.

depth from 2¾ to 4 inches, according to the height of the platform of the body above the fifth wheel and 2¼ inches thick. The king-bolt passes through this head-block, down through the bottom bed and to the arch-truss below. The centers between the heavy ends, C, may be tightened out as shown, leaving the full weight of timber at the ends. The main lower bed is shown at D; the rear cross-bar which supports the rear of the lower fifth wheel plate is shown at E, and the short bar, which adds to support the front of the fifth wheel plate, is shown at F. The cross-bars which act as supports of the body are shown at G. The cross-spring head-block is shown at H and the iron truss at K. All these bars rest di-

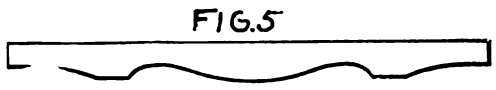


Figure 5. Side View of Center Bar of Upper Carriage.

rectly on their supports instead of being mortised and tenoned. Fig. 2 shows the ground plan, giving the position of all the pieces of wood that compose the frame; also the end half elliptic springs and the half-cross spring at the rear, A, the main bed. This should be not less than 2½ inches thick, 3½ to 4 inches deep in the center and 2 inches deep at the ends. B, the futchels; these should be 2 inches wide for such a wagon as we mentioned in describing the upright illustration, Fig. 1. C is the back cross-bar, its depth being dependent upon the depth of the main bed, A, at the ends. D, the

Figure 6. Form of Front Segment of Fifth-Wheel Bearing.

cross-spring head-block; the depth of this depends upon the arch of the side and cross springs, its width the same as that of the springs at the center and narrowed if necessary to 1¾ inches at the ends. E, the hounds, or, more properly, the braces, which stiffen the frame by being placed at angles from the main bed, A, to the head-bar, G.

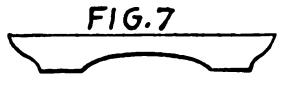


Figure 7. Form of Rear Segment of Fifth Wheel Bearing.

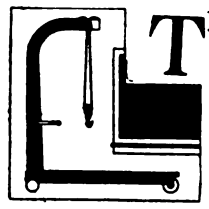
The block, F, Fig. 1, is placed between the lower fifth wheel plate and the braces, E, and cut to a segment of a circle, where it acts as a support to the front edge of the fifth wheel plate. The depth of this bar is entirely dependent upon the distance between the fifth wheel plate and the braces, E, its function being that of a filling between the joints so as to give a solid bearing. The bars, E, should be about 2 inches square, the rear ends being bolted to the underside of the bed, A, and under the center of the drawbar, G. The end half springs are shown at K, the centers being clipped to the tops of the axle, the front ends attached to the drawbar by a sliding eye or a toggle. The rear ends are toggled to the ends of the rear cross spring, M. In making up all bars are secured by bolts, which pass through strap or "T" irons at each point of contact. These irons insure strength and durability, besides serving as supports to the heads and nuts of the securing bolts. Fig. 3 shows the upper section of the gear. In Fig. 1 A is the center of parallel bar (B, Fig. 3) C, the cross-bars, to which the body is bolted, these resting upon the parallel bar and on thimbles on the edges of the upper fifth wheel plate; D, the upper fifth wheel plate.

The timber used should be first-class white oak or ash; it must be well seasoned and very rigid. The small amount of timber used necessitates the best quality obtainable.

Small Florida Shops

An Interesting Side Line of A Southern Blacksmith Shop

BY J. F. HOBART



THE brick-paved county roads of Florida are dotted, almost from one end to the other, with automobiles. While in Clearwater recently (Pinellas County), I kept an eye out for horses and saw just two in two hours' time. One was a fancy saddle horse, high-stepping and prancing along the street, while the other nag, a weather-beaten buckskin, mogged along pulling an American Railway Express wagon. It looks mighty dubious for the smith, the town main street parked with a double line of automobiles and it seems like if the horse-shoeing smith will not get into the game of *shoeing automobiles*, he must hunt other smith work or "shoo" himself off the earth!

In one little smith shop—I am looking all the time for new lines of work for the horse and carriage smith—I found a good line of tools and the smith very busily engaged in making solid welded angle-frames. He did not know for what purpose the frames were to be used but he had a contract to make several hundred of them and at the time I saw him at work, he was making three bends and four welds in each frame. Although the smith had the work "down fine" at the time of my visit, he showed me some of the troubles he had met and overcome while learning the best way of making the frames.

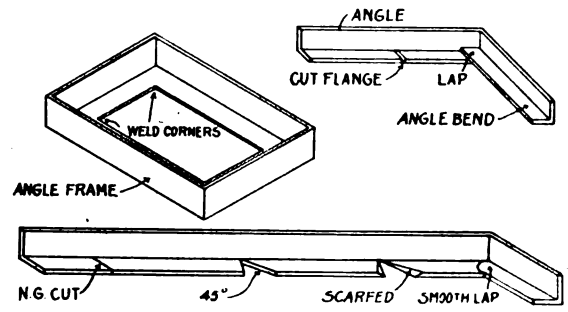
Quite a Job

At first he tried cutting the flange of the angle square across as shown by the sketch. Then he bent the angle around letting the flanges lap each other as shown at "Angle Bend" and "Lap." When all the corners had thus been bent around, the smith welded them where they lapped past each other and he had an awful job getting rid of the extra thickness of metal caused by lapping the two flanges over one another. He tried overheating the steel so that some of the metal would burn away. Sometimes this worked fairly well, but sometimes too much or too little would be burned away, and once or twice, the "burning" took place in the wrong spot and a frame was spoiled until the smith cut out the burned side and welded in a new one.

The third sketch shows the overcoming of the corner business. The square or "N. G." cut was abandoned and a triangular piece cut out as shown where marked "45 degrees." Really, the cut ends were left 45 degrees and a square, 90 degree corner cut right out of the flange at each bend. But when the smith tried to butt-weld the 45 degree cuts, he "fell down" quite often. He could weld the corners all right, but could not make the frames come square. Sometimes a corner would be dented in—"like a cocked hat"—the smith said. Sometimes, he had to weld a flat piece of steel to the flange and plate it down into the metal in order to make the frame stand up square and true.

He gave up butt-welding the 45 degree cuts but did not give up those cuts. Instead, as shown by the sketch, he "scarfed" each of the cut corners so that when the angle was bent around, the corner showed a smooth lap. These laps were then welded and came out fine, being smooth and true, without distorting the frame in the least. The web as well as the flange of the angle had to be welded at one corner and when the angle was cut off, a quarter of an inch extra length was allowed for this weld. The ends of the web as well as the 45 degree cuts in the flange were both scarfed, then brought together, lapped and forged down to bring the frame square and true. Then the flange was welded first.

By welding the flange first, the frame was kept in exact shape, without distortion, and the flange once properly welded, served to hold the frame true while the lapped web was welded also. The smith said that if he



Angle-Bend Cuts.

ever got another order for angle frames, he would surely put in an oxy-acetylene welding outfit. Then he could butt everything together and make better and cheaper work with gas than at present was possible with fire-welding. But he was surely turning out some mighty carefully-welded and accurately made frames. He didn't even use a single special tool, but did all the welding on the corners of his anvil!

Machine Bolts for Carriage Work

How would you like to iron wagons if you had no carriage bolts in your shop and could not have any? Would you like to make each and every bolt you used, cutting off the steel, heading and threading the bolts and then putting them into wagons without any little square section just under the head to prevent the bolt from turning around? That is what one smith was doing in a little backwoods shop. He believed that he had plenty of time and that he could buy nuts and black steel cheaper than carriage bolts, so he used *shop-made* machine bolts for everything. But these bolts did not turn around very much, even without the square section. When this smith placed a bolt in the vise, preparatory to threading the end thereof, he used a hacksaw vigorously for about ten strokes and cut a channel in the end of the bolt as shown by the engraving, which shows three bolts or parts thereof.

The slot in each bolt-end was sawed just deep enough to give a good hold to a screwdriver and when in tightening the nuts, the bolt turned around, a screwdriver was clapped into the slot and that bolt stayed right there until tightened hard and fast. Two special screwdrivers had been made up expressly for bolt tightening. One of these tools is shown by the sketch, and the other one is almost the same except that the bit

which enters the screw-slot was turned the other way, that is, made into a "cross pene" while the screwdriver shown by the sketch is of the "ratchet" type. With one or the other of these screwdrivers, whichever came the most handy, the bolt would be held easily and securely while the wrench quickly made the use of a screwdriver unnecessary.

Home-Made Carriage Bolts

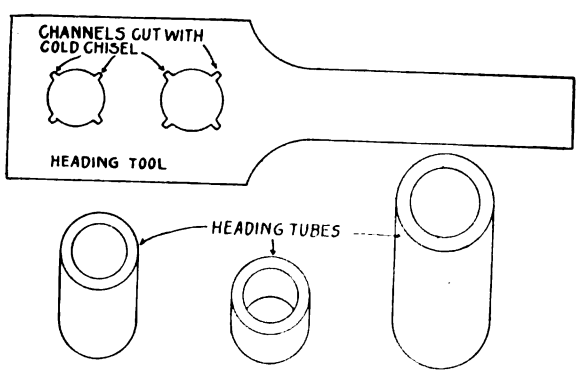
The writer made quite a visit with the bolt-making smith and, one thing leading to another, showed that gentleman a way whereby home-made carriage bolts could be made as quickly and as easily as were the machine bolts he was using. In fact, at the invitation of the smith, who became very much interested in the matter, one of the heading tools was actually changed over to make the combination machine-carriage bolt.

The hand heading tool used is shown by the sketch. This tool was merely a piece of tire steel with one end forged to a handle and two or more holes made of the required sizes. With a three-cornered file, four cuts were made, 90 degrees apart as shown, and each of these cuts was very carefully made so that in no case was the cut-out place wider at bottom than at top. In fact, the cuts were made a bit wider on top of the tool so that the bolt could surely be driven easily out of the heading tool by a tap or two against the top of the anvil.

The smith was advised by all means to case harden the face of the heading tool and thereby prevent the little corners of the cut-in places from wearing away too quickly. The case-hardening could be very easily done by procuring from a drug store some yellow Prussiate of Potash and placing it in a tight tin box where no one would accidentally get hold of the poisonous stuff.

Pound the Potash salt with the hammer until it becomes a mass of thin flakes or scales. A babbitt ladle is a very good thing to do the pounding in and a bit of cloth spread over the top of the ladle and the hammering done through the cloth will prevent any loss of the poison stuff through scattering around under the hammer blows.

To case harden the heading tool, take a good reddish-yellow heat on the part to be hardened, then roll the tool in the potash or place some of the salt on top of the hot metal and spread the salt around with the poker as it melts and runs, something as borax behaves upon hot iron. Repeat the operation two or three times—the soft steel will get harder each time as the film of carbon steel becomes thicker—then heat and quench the tool in same way as for hardening. If the skin of hardened metal does not prove thick or deep enough, more potash treatment may

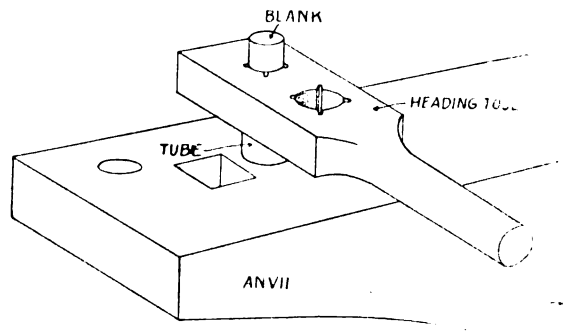


Bolt Heading Tools

be given at any time, no matter how long or how quickly between the treatments.

The same sketch, which shows the little cuts or notches which "put the carriage-shoulder on the machine-bolt," also shows some of the heading tubes which the writer put the smith wise to. And these tubes are the handiest ever in any smith shop where an occasional bolt is headed. These tubes are simple section of steam or water pipe, cut to lengths and well squared up on both ends. It is readily seen that when a bolt is to be made with a length under the head of exactly the thickness of the heading tool, it will only be necessary to lay the tool on the anvil, heat the blank, drop it into the hole in the heading tool, and then hammer away until a head is formed—only, with a very short body, you had better cool the lower end of the blank before dropping it into the heading tool else that end of the blank also becomes headed so much that the finished bolt will not fall readily out of the heading tool. Cooling the lower end of the blank will prevent its upsetting.

When bolts two to four inches long are to be made, then select a tube of proper length, set the tube on the anvil, standing upright, and put the heated blank through the hole in the heading tool. Then slip the cold end of the blank down through the tube, bring the heading tool to rest squarely on top of the tube and head the bolt quickly, holding



Making Anchor-Head Bolts.

the tool squarely against the top of tube all the time.

Bolts with a length of six, eight and even twelve inches may be made in this manner on top of the anvil but when bolts longer than six inches must be headed, it is best to place the tube somewhere else upon a lower level so that the smith's hammer-arm may have more free play. It is hard to hammer an object placed too high, therefore set the long tube upright upon the sow or some other heavy mass of metal which has been placed in a level position nearer the floor than top of the anvil.

A Block for the "Sow"

While speaking of the "sow," I want to tell of a block for one of these handy tools which the smith was using in a small shop recently. The sow was placed upon a yellow pine block about ten by fourteen inches and two feet long. The smith would place the block according to the height desired for the sow. Laid flatwise the sow would be close to the floor. Placed on edge, the sow was raised fourteen inches from the floor. When the sow was wanted as high as the anvil, the block was placed on end and then the top edge of the sow came fair with the top of anvil, a position found very handy when welding long work without a helper.

A Heading-Tube Stand

When the taller heading-tubes are to be used, either on anvil or sow, it was found desirable to use a collar or stand for holding the longer tubes upright. It was also found well to make the tubes from as large pipe as could be used and get a fair bearing for the heading tool. Larger pipe, especially the longer pieces, stood up better than smaller pieces barely large enough to slide over the bolt. Although the first heading-tubes made by the writer were cut from one-inch pipe, it was quickly found better to use inch-and-a-half pipe as the tubes stood upright better and it was not as much work to place the hot blank inside the larger tube.

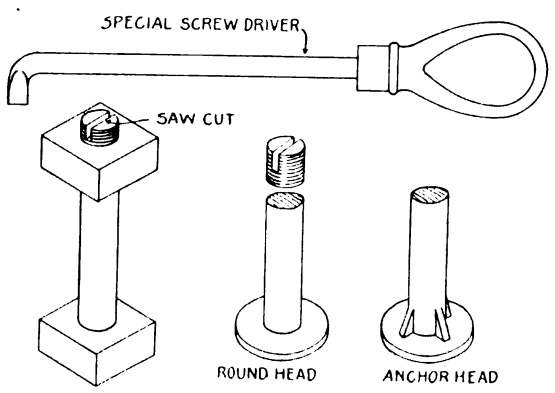
It was also quickly found that some kind of a stand to hold the longer tubes upright was a first class investment. The first stand used was a bit of two-inch plank with a hole bored through in which the pipe could slide easily but snugly. Next, the smith found an old shaft collar which answered well. Later he found in a junk yard, a heavy flange or face coupling which proved the very thing for a heading tube stand.

The smith will quickly learn the easy way of using the hand heading tool and heading tubes and at his leisure it will be well to make up a full set, increasing in length by a sixteenth of an inch for the shorter ones, then by eighths and quarters for the longer tubes. Perhaps you will want to have a complete set, increasing by sixteenths of an inch, from a quarter, up to the limit of bolt length? If you do this, make a rack to keep the tubes in and mark each tube or its stall with the bolt length that tube will make.

If so many lengths of tube are not desired, then make up a larger tube into which the heading tubes will slide easily. Into this larger tube, you can slip two or three of the shorter tubes until the proper length has been made up and in this way, not many heading tubes will be required for any desired length of bolt under twelve inches. Try some heading tubes if you have occasion ever to make bolts or rivets. It is a good stunt.

Blacksmithing a Trailer

In Lakeland, I went into one shop where they were rigging a trailer to be hauled behind either an automobile (when the load was light) or behind a truck when there was much produce to be handled. They made a regular wagon body-box and ironed it in approved farm-wagon style, then they made an axle upon which two pneumatic wheels were to be mounted. In fact, they went to an automobile "Dealer in Parts" and procured an old front axle and a pair of wheels. Then they cut off the steering knuckles, forged them out—or what was left of them—until straight. The axle was treated in the same manner, then the *once-were-knuckles* were welded solid to the axle and with wheels



Holding Bolts From Turning.

in place, placed under the new trailer body.

Just inside the door of the shop where they were making the trailer, I saw a man using a post drill and that machine was a "peach," if such a term may be applied to drilling machines. Big and strong, with both direct and back-geared drive, the tool was capable of drilling a one-inch hole with one man at the crank. The workman was drilling five-eighths inch holes when I saw the machine in operation. He was turning the long-sweep crank with one hand and holding the work with the other. The drill went right along and the workman made easy work of the operation.

Unlike most Florida smith shops, this one was located in a brick block right in the heart of the city and had three fires arranged in a semi-circle, each forge and its hand-blower capable of being easily moved from place to place.

TOO UNUSAL

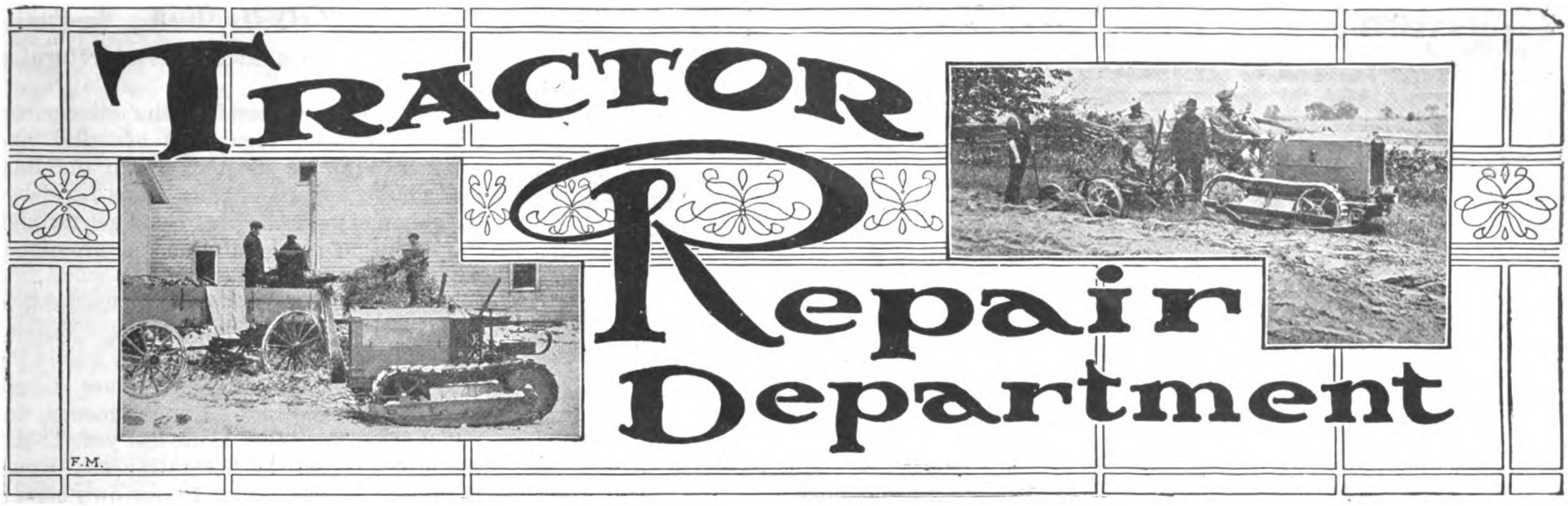
A motorist had been haled into court and when his name was called the judge asked what the charges were.

"Suspicious actions, your honor," answered the policeman who had made the arrest.

"Suspicious actions?" queried his honor. "What was he doing that he seemed suspicious?"

"Well," replied the officer, "he was running within the speed limit, sounding his horn properly and trying to keep on the right side of the street, so I arrested him."

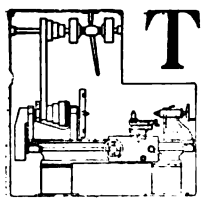
Every man is capable of doing his best—and he should always do it.



Welding a Connecting Rod

Broken or Cracked Connecting Rod Repaired by Oxy-Acetylene Welding

BY DAVID BAXTER



TRACTOR repairing is rapidly becoming an important part of the blacksmith's trade, especially insofar as it concerns the mending of broken parts. Of course the blacksmith is in a better position if he is equipped to do other work, such as valve grinding, cylinder re-boring, timer adjusting, etc., but to successfully handle the mending of broken or worn castings and forgings he must own or operate a gas welding torch. There are many tractor parts that can be repaired only by welding.

Consider for instance a broken or cracked connecting rod. Here is one tractor part that doesn't break very often on account of its heavy metal sections. When it does break it usually needs to be fixed in a hurry and welding is the only way to do it. There are three forms of welding: gas, electric, and forge. The latter is impractical. The electric is not applicable everywhere just yet.

This leaves gas welding as the universal choice, because this method has been developed until it can be obtained everywhere. In this connection, the oxy acetylene form of gas welding is no doubt the simplest and best for all around work. However, as this is not a discussion of the merits of welding in general, nor of any particular form, let us take up the subject of this article and see how one connecting rod was handled. Lack of space forbids dealing with all of the fundamentals of the welding process so we must take it for granted that the reader understands the theory and operation of the welding torch and other apparatus connected with it.

Figure 1. Forming the V-groove with the Cutting Torch.

We will take up the job as it entered the shop, and tell what was done, with the reason for each step in the process. The connecting rod shown in the picture is one of the kind that seldom breaks, but when it does it puts the tractor out of commission. The piston end of the rod was cracked nearly through in the location indicated in the pictures. The origin of this crack was not known; probably caused by working loose until vibration crystallized the metal. Or it may have been a factory defect.

Some welders claim that in event of crystallization the steel should be heated to restore its original strength. If such is the case it would seem that the heat of the weld would be sufficient; or in grooving the crack the crystallized portion of the metal might be cut out. At any rate this weld was made without considering any crystallization of the fracture.

Composition of Connecting Rod

This connecting rod was made of drop forged steel, which established several requirements in the welding process that are not necessary, or are not capable of being executed, in other kinds of metal. We will deal with these factors as we come to them in the different steps in the repairing.

First, it was necessary to bevel out each side of the crack, or in other words cut away enough metal on each side of the crack to form a wide groove in place of the crack. This grooving is very essential on all metals over a quarter of an inch thick, but is particularly essential on steel. For steels as thick as this connecting rod in its fractured part it is scarcely possible to make a good weld without beveling the edges of the fracture. If this metal is not grooved out previous to welding, it must be melted and scraped out during the welding process if the weld is to be homogeneous. Besides being uncertain, the latter method is a crude, tedious method, when compared to grooving.

Enough metal was cut out of the crack to form a groove which would permit the welder to start at the bottom and flow the two parts into one. This would minimize the danger of burning the steel because the welder would not have to force the welding flame to the full thickness into the metal in order to melt deeply enough, thereby fusing the full depth of the weld. Steel turns to oxide quite easily and if a high power flame is forced into it will turn entirely to oxide, literally burned up. Even an exceptionally expert welder cannot make a steel weld as thick as this one without more or less oxidization. He must melt deeply enough and puddle the steel all the time in order to make the sides of the fracture flow together. This always enhances the danger of burning.

In order to simplify the welding and minimize the danger of burning the steel, then, this fracture was grooved out as indicated in the pictures. The connecting rod was placed flat upon the welding table with the cracked end protruding beyond the edge of the table top, to furnish a free exit for the burning steel since the fracture was to be grooved by a high rate of oxidization, viz: the cutting torch. In other words the groove metal was to be removed with the cutting torch, which is in reality only a high rate of oxidization. This burned metal should have a free escape to make the cut clean. Therefore the connecting rod was placed upon the table in such way as would permit the burned steel to be blown directly downward from the cut.

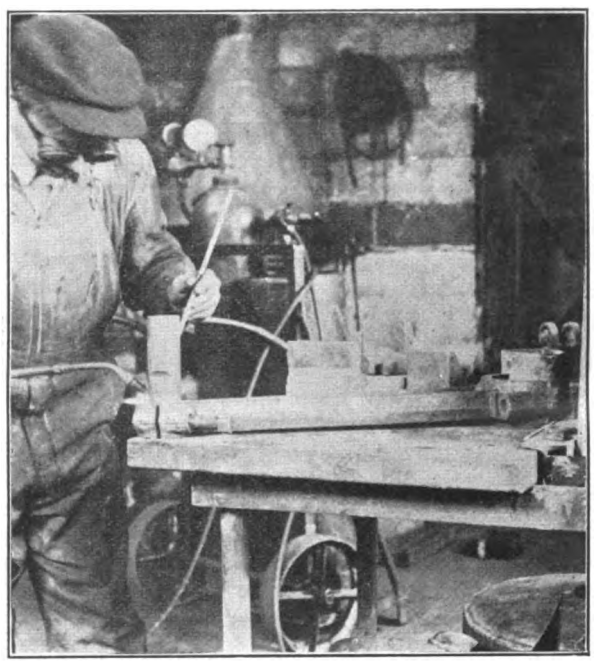


Figure 2. Spot Welding the Severed Part of the Connecting Rod.

Then the cutting torch was lighted and its flame regulated about as for welding. This flame was concentrated upon the outside of the connecting rod at a point opposite from the crack; the crack being on the inside of the bearing. When the steel started to melt the high pressure oxygen was turned on. As soon as this was done the sparks commenced to fly. These increased as the oxidization gained headway until a perfect stream of oxide was blowing floorward. The flame was gradually moved in a diagonal line toward the center.

When almost to the crack the flame was lifted and the high oxygen shut off. Then the neutral flame was once more concentrated upon the outside in a position oppo-

(*continued on page* 15)

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Our Editor's Letter

LONG ago, ever so long ago, in the days when the editor could climb *up* a tree quicker than any boy in the neighborhood, and fall *down* even more quickly, a very important event happened, or rather a collection of events.

I had some sort of a thirty-second cousin who thought, or rather whose parents thought (I declared that she didn't have sense enough to think) that it would be a splendid idea if she came down to our place to spend the summer. That was one event. Nobody ever came to spend the summer in the out-of-the-way place where we lived and the fact that a real, live city girl (she was only eight years old) was going to be around the place for nine weeks was enough to make any real, live country boy excited, although not with pleasure.

I was ready to fight the world when I found that she was coming and didn't conceal my displeasure. I made my plans carefully. I had decided about how many caterpillars I was going to put in the bureau in her room; I had gathered quite a number of lizards to place on the back of her neck when she wasn't looking—well, I had made *some* plans. I knew she was going to be a spoil-sport; all girls were.

At last the awful day came,—she arrived. As she got off the train I said to her, "I'll race you," and I did and—worse luck—she won. She wasn't so bad after all. Very soon I liked her a little bit, and she liked me, and I forgot all about the caterpillars and worms and lizards.

Then I had a birthday. My little cousin presented me with a funny little, knobby package, and I stuttered some sort of a speech of thanks. But the excitement of opening that parcel! My cousin watched me all the while to see just how pleased I would be and I am afraid she was sorely disappointed. Inside the package was some sort of an embroidered affair that was meant to hold brushes and combs—you know the kind—tan linen embroidered in turkey red with little compartments for tooth brushes, hair combs, etc. Can you tell me what any sort of a country boy will do with a thing of that kind? I was mad clean through.

Then I noticed a piece of paper pinned to one corner of this work of art. Printed in queer, awkward capital letters were the words, "I made it *all* myself." Little by little my heart softened. I stopped scowling, and then remembered my manners enough to say "Thank you."

Afterward I got the whole of the story from my mother. This little girl had been so afraid that I might think that someone else had made the holder (little fear of that) that she insisted on attaching the explanatory note to it.

Perhaps you're wondering why I am telling you this story. It's just this. Most smiths do not take sufficient pride in their work. Now I don't mean that it is necessary to go strutting around saying, "Look what *I* did," but I *do* think that every smith ought to take sufficient interest in his work to be proud of it when he's finished. I should imagine that each smith should feel when he is working on a job that it's going to be done in just about the best way he knows how. Each job should be typical of the character of the smith. It should be honest work that you are not afraid to have people pick up and examine, work that will stand the test of time.

There's no shame in not knowing how to do a job, but there *is* shame in knowing how to do it, and do it properly, and then turn out work which is far below standard, as many smiths do. One smith wrote in not long ago and told of the difficult jobs he had been doing. He explained that he got very good prices and that his customers did not complain when he asked a rather high price because they realized that he had done fine work and had used his brains—not only his strength.

Now when you're starting in on another season of hard work, decide that all the work you do is going to be worthy of yourself. Plan that everything you accomplish will be a fitting example of the craft you follow. Let every piece of work be done in just the best way you know how. It pays. It always does. Perhaps not right away, but in the long run it does.

Do you ever think of what others say about your work? We overheard a conversation one time between two farmers. It was somethink like this:

"Say, who pointed that plow of yours?"

"Johnson, the blacksmith."

"Do you know, it's a mighty fine piece of work. I took mine to Greening and it's a miserable job. I believe I'll have Johnson do the rest of mine."

That is the way Johnson's work spoke for him. Can you allow your work to speak for you?

Draft Teams Indispensable to City Hauling

Good draft horses and mules are returning to public esteem.

Men have found they furnish motive power that is reliable, regardless of wind and weather. During the blizzard in the East last winter, horse and mule teams furnished the only motive power that could get through the drifts. Of this situation, a prominent business man in the East writes:

"Business in New York City was almost paralyzed for two or three weeks. Millions of dollars were lost, almost wholly due to the fact that it was impossible to secure enough teams to cart the snow. Enough money was lost in New York City alone last year to pay for and keep all the horses the city would need for years to come. In our own city, if it had not been for the coal wagons drawn by horses, thousands of people would have absolutely frozen to death."

Besides being reliable, horses and mules are long lived and low in cost of maintenance. Leading cartage and teaming companies report that draft animals of good type, sound and mature when put into heavy city work, will last eight years and then sell for one-fifth their original cost, for use in lighter work, where they often continue to give good service for several years.

Naturally a transfer or drayage company, if it finds its patronage partial to auto service, will endeavor to meet their preference. The Brown Transfer Company of St. Joseph puts it squarely up to the customer. They write: "We give the user the choice of motor or horse drawn van, and charge them accordingly.

The president of the Fuel Cartage Company of Chicago says: "If I had $10,000 to invest and put it into teams and wagons, I could make three times as much money as if I put the same amount into motor trucks. We never allow a truck to displace a horse. We will buy a truck for work a horse cannot do, but we never send a truck to do work that can be done by a horse."—Horse Sense.

Have Sold Business

From A. S. Stephens, South Carolina: We have sold our Wagon, Buggy and Auto Repair business and have rented our shops to a man who has been with us for eighteen years and who is a good workman and understands the business.

My father commenced to make buggies and carriages in a small town twenty miles from here in 1855. We moved to Anderson in 1874 and still on the same lot we settled. My father died in 1897 and we continued to run the business in his name up to this time. While we never set the woods on fire, we had three meals nearly every day, but no dividends at all. A few years ago, we changed from the credit basis to the cash basis and things began to look up. In fact we have had chicken pie for Sunday dinner about once every two weeks.

Will Take Greeley's Advice

From W. W. Overton, Virginia: In the December issue I see letters from J. W. Pruyn of Missouri and W. B. Fagg of Ne- eighteen years and am tired of the low prices in their States. I certainly find the prices out West much more fair. It seems as if we in the East do not get enough for our work. I have been in the business for eighteen years and am tired of the low prices being charged in the East. In fact I am thinking of going West. I should like to correspond with some people from the West.

WELDING A CONNECTING ROD

(*Continued from page* 13)

site the crack. In other words the flame was applied far enough around the bearing so that it would cut out a V-shaped piece of metal when it reached the last part of the first diagonal cut. Fig. 1 shows the cutting in operation. Note the shower of oxide.

Grooving the crack separated the connecting rod into two parts, which necessitated tacking or spot welding before starting the main weld. This was for the purpose of securing correct alignment, or to hold the two pieces in accurate position during the welding. To execute this the piston pin was placed in the bearing and fastened with the lock screw. Thus the severed part was fitted exactly to its original position. The table top was utilized as a leveling plate for this purpose.

In spot welding the flame was brought in contact with the upper end of the groove bottom, where a bit of each edge was melted and flowed together with a drop of filler metal. Then the connecting rod was turned over and the other end of the groove was tacked. The first spot welding, with the piston pin in place is shown in Fig. 2. A strictly neutral flame was employed, which is essential on all steel welding. A mild steel filler rod without flux was used to flow the two corners of the groove together. A neutral flame is best for this class of work as there is then less danger of oxidizing. If the flame carries too much oxygen, more than is consumed by the combustion of the flame, part of it is bound to be injected into the molten steel to turn the metal to oxide. At least it is liable to be absorbed by the steel, with the same effect. However, a neutral flame is not an absolute insurance against oxidizing since it must be manipulated rightly, too. If the neutral flame is held too close, or concentrated too long in one spot the melting steel will be oxidized just the same.

After tacking two sides of the groove the next step was the actual welding. The piston pin was no longer necessary, besides being in the way, so it was removed to prevent being damaged by the welding. The set screw was also discarded to permit expansion and contraction of the weld to act freely. Then the connecting rod was arranged for the welding. Fig. 3 shows it with the piston pin removed. This photo also indicates the extent and location of the grooving. The spot welding, too, is indicated here.

The arrangements for welding are shown in Fig. 4, which also shows the welding in

Figure 3. The Spot-Welded Groove.

progress. This arrangement consisted merely of placing the rod in a pair of V-blocks in such way as to bring the grooving approximately horizontal. This, because it is easier to make a horizontal weld. The molten metal has less tendency to flow, and may therefore be built up better. If the weld is not quite level the melting metal tends to flow over an unconnected portion of the groove and thus cause hidden defects. It may flow faster than the groove can be prepared. A horizontal weld can be made in flat even layers that are thoroughly fused with the metal beneath.

No preheating was needed on this job as is the case with so many welds. The expansion and contraction could move in and out without danger of distortion, because the smaller part of the connecting rod was not fastened to the main body of the rod. The reaction of the weld could move the small part of the bearing in and out without

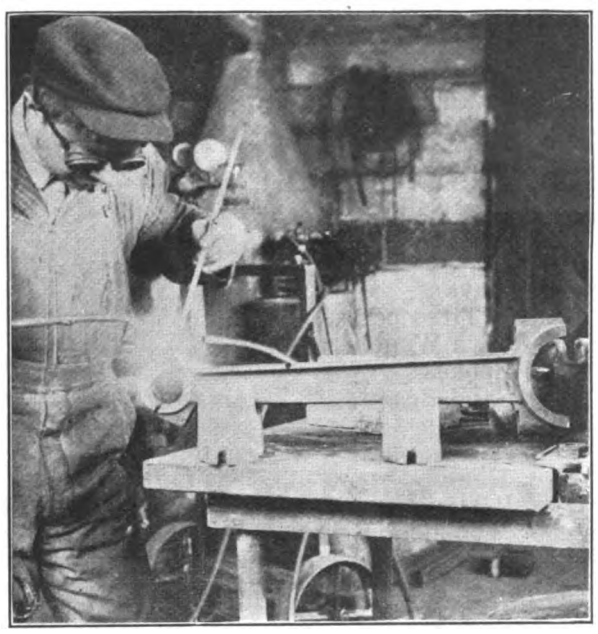


Figure 4. The Welding Process in Operation.

resistance. There was but trifling danger of the small part sagging as it weighed but little; and because the weld was made in layers that would cool fast enough to support the suspended part of the bearing.

This weld was so small that there was no need of preheating to prevent conduction, or rather, to supply heat for conduction purposes. However, a fairly large welding flame was used so that sufficient heat would be supplied to keep the weld melting and at the same time supply conduction and radiation. This was further aided by passing the flame over a portion of the metal surrounding the groove to bring it up to a red stage and thus prevent conduction from stealing the welding heat.

A neutral flame was applied to the groove bottom near one end. It was moved back and forth across the groove in short arcs until the edges of the sloping walls melted and flowed together. Then the flame was gradually moved along the groove bottom in the same short arcs until the whole length of the groove bottom was flowed into one strip of metal. After this the filler rod, mild steel or Norway iron, was introduced. The end of this rod was brought in close proximity to the side of the flame, while the flame revolved in a tiny circle over the end of the groove. As this spot melted the rod heated and when the groove bottom was ready to receive the filler the rod was melting. Then the melting filler rod was brought in contact with the melting groove bottom, and the flame was manipulated at the same time to melt a portion of the sloping sides of the groove.

When this was accomplished the flame and filler were gradually moved to another portion of the groove bottom to repeat the process. Thus the entire groove bottom was filled with a layer of molten metal, in a continuation of pools. The flame and filler were always in motion; the flame swinging where needed and the filler twisting and sawing in the bath. The filler was not allowed to drip but was literally pushed into the melting weld, except when it was utilized to flirt bits of slag or oxide out of the weld.

After the first layer of filler was placed along the groove the process was doubled back over it to melt in another layer. This second layer was carefully fused with the one beneath, and with the sloping sides of the groove, a portion of which was melted down with each succeeding section of the layer. Thus the entire depth of the groove was filled in layers, to the top where a surplus layer was rounded over and carefully soaked with heat along the edges. The force of the flame was used to smooth the rough portions of this surplus metal by blowing across the weld to guide the fluid metal around.

After the groove was filled and rounded the connecting rod was shifted to bring one end of the groove upward. This was remelted by revolving the flame over it. Rough or sunken spots were melted open and filled with new metal until it was certain that the end of the weld was solid. Then the connecting rod was again turned to bring the other end of the weld upward. This was treated like the first. Then the job was turned for the third time to bring the inner side of the weld upward. This also was remelted and puddled with new metal. A surplus was added here too, to furnish machining stock. This was also the purpose of the surplus metal at the ends of the weld.

The Completed Weld

The weld was now complete and ready for machining, except that it was allowed to cool first. This cooling was done in the open without any attempt to slow-cool or bank the job. As there was no danger of cracking, the job was not covered like so many welded articles must be.

The welds were then filed smooth and the connecting rod was ready to go back in the tractor engine. The inner weld, being the most particular, was filed very slowly until the piston pin fitted correctly.

The above is about the procedure for any drop forge connecting rod whether it be broken in the body or either bearing end.

EVEN THINGS UP!

By David Baxter

IT may be your right to kick and growl
When your work has been all balled up;
When the man who did it was careless or lax;
Or may have been taking a sup.
It may be your privilege to put in a knock
To his boss, and to say he's no good;
Such a bum piece of work you never saw;
Why, the nut couldn't even chop wood!

IT may be your right to knock and howl—
But it is also your right to praise,
When the job has been done in a first class way,
Almost perfect in forty-odd ways.
Why not go to the boss and tell it to him;
Say the workman was equalled by few?
Balance up the hard knocks with a boost now and then;
Do justice where justice is due!

CIRCUMSTANTIAL EVIDENCE

The Browne family possessed a whole sheaf of umbrellas, but they were all in sad need of repair. One morning on his way to the office Browne took them all to be mended. At lunch time he went into a restaurant and on leaving absent mindedly walked off with a lady's umbrella; she overtook him; he apologized profusely, and returned it.

In the evening he called for the umbrellas again. He boarded a car, and found himself sitting opposite the lady of the lunch-time episode.

She leaned over and whispered dramatically: "I say, you've had a good day haven't you?"

There is no harm in making a mistake. Every man who amounts to anything at all makes them. But no man who is of much consequence makes the same mistake twice.

Speaking of short-time loans, that provision doesn't apply to the fellow who borrowed a dollar of you until to-morrow.

In Answer to Mr. W. R. E. Hansen

From C. I. Peterson, Minnesota: I want to say a few words in reference to Mr. W. R. E. Hansen of Wisconsin, in answer to your question, "What would you do?" My reply to him would be, "Go join the nearest Blacksmiths' and Wagon Makers' Association. Get their price list and abide by it and if there is no such organization in the immediate neighborhood, I should endeavor to get one started. The writer during his business career has been interested in such enterprises, and while he has always found it rather uphill work, and has met with many discouragements, both from the trade and his patrons especially, he has persisted and believes that he is now ahead of the game, because he has done it.

As an example—our present organization is not very strong, but we are getting from ten per cent to thirty-five per cent more for our work than some who are in this same community, not associated with us. To all such communities not organized, I should emphatically say, *organize.* When the mechanics see their fellow smiths, not as competitors, but as co-partners in business they will reap more profits from their work.

Editor's Note: Because of the fact that some readers may not recall the letter which Mr. W. R. E. Hansen wrote, we are reprinting it below.

"The following letter has been received from W. R. Hansen of Wisconsin. It was addressed to the editor and we think that Mr. Hansen would also like to have the opinion of the other smiths. What do you think of this problem? What would you suggest that Mr. Hansen do? This is a problem with which many young men have to wrestle now-a-days. Write in and tell us what you would do if you were in his position."

"I would like to ask you for some information. I have taken the responsibility of running a shop here for an implement man who knows nothing of blacksmithing, so in reality I am running this shop as my own. I have been in this state but a short time, and know very little about the prices here, or the work. There is an old man running another shop in this place, but I do not consider him a good smith, and people here do not seem to have much use for him.

"Here is the main question: The people tell me that this man charges high prices, but he does poor work. I cannot find out what his prices are, because he won't speak to me, and when I ask the customers one tells me one price and one another, so I cannot tell.

"I want to make this business pay, but am unable to do it for what I get now. The man who owns this shop says that it will come out all right, but I do not know. I believe that if I can make it pay, some day I will be able to get it as my own.

"It is an up-to-date shop, well equipped and I receive thirty-six dollars a week, but I should like to make a show for the work that I do, and the money I get, but am unable to with the prices I receive. What would you do in my place?"

Prices in North Dakoto

From Peter Diederich, North Dakota: I have been located here for the last four years and have a good shop. It is twenty-four by forty feet, and I have the following tools: Little Giant, Trip Hammer, Kerrihard, Emery Stand, Western Chief, Drill, Press, two Anvils, two Forges, Disc Sharpener, Champion Electric Blower, two Gas Engines, a Dempster and an International. I give below some of the prices that we get here.

New Shoes each		$1.00
Old Shoes Reset each		.50
Old Shoe Calks "		.75
Sharpening Plow Lays		.50
Pointing Plow Lays		1.25
New Lays		5.00
Wagon Tires per set from	5.00 to	7.00
Cut Down Wagon		22.00
New Spokes		.40
New Sand Boards		3.50
" Axles	8.00 to	9.00
Bolster		3.50
New Hound		8.00
" Pole except hounds		7.00
" " hound each		1.00

All other work accordingly.

California Prices

From Julius Gattasch, California: I noticed that you are inquiring for the prices that the blacksmiths are charging for work. I give below the prices that we are getting:

Setting Tires

4 inches each	$2.50
3 1/2 " "	2.50
3 " "	2.00
2 1/2 " "	2.00
Buggy "	1.50

Sharpening Plow Shares

14 inch	.50
12 "	.40
10 "	.40
8 "	.35

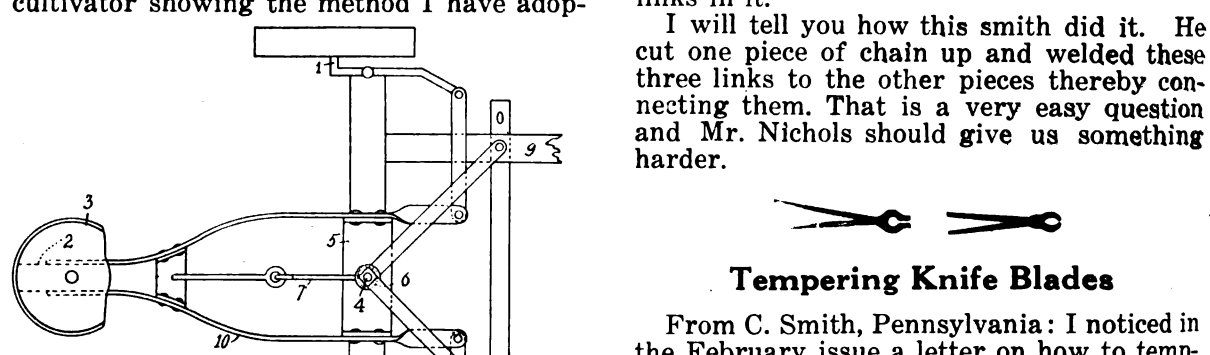
Putting On New Points

14 inch	1.00
12 "	1.00
10 "	1.00
Setting Plow Beams	5.00 to 7.00
Other work per hour	1.00 to 1.25

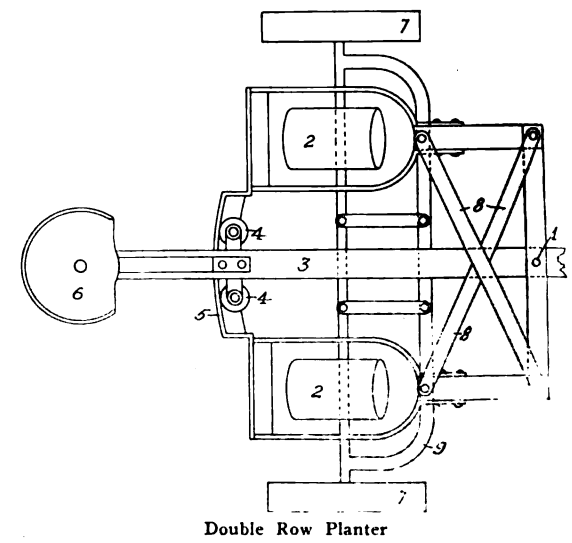
I do not do much shoeing but the prices are from $2.00 to $2.50 for new shoes. I am sixty-five years old, and feel that I am too old for shoeing. I do lots of other hard work and have had a lot of plow work and wagon work to do this winter. I expect to retire just as soon as I can find a man who will buy my shop.

Double Row Cultivator

I am sending you a sketch of a double row cultivator showing the method I have adopted to make these machines "wiggle tail." The double row cultivators do not come in this design and I often fix them, as shown in the sketch. The reason why I call these machines "wiggle tail" is because the wheels are mounted so as to turn with the seat. In other words you can steer the cultivators by moving the seat from side to side. In naming these parts I will refer to the illustration given herewith. No. 1 indicates the two wheel spindles which are pivoted upon the main body member. No. 2 shows the members beneath the seat and No. 3 is the seat itself. No. 4 indicates a long bolt which goes through the frame. This bolt is four-



Double Row Cultivator



Double Row Planter

teen inches long. No. 5 is the seat frame member made of flat iron which is riveted to the seat irons No. 10 on the ilustration, and swings upon the main frame member No. 8. No. 6 indicates two seats of iron braces which connect with the tongues at one end and serve to steady the bolt (No. 4) at the top. No. 7 is a brace for holding the seat and carries the eye at the front end through which the bolt No. 4 slips.

In Figure 2, I have illustrated a double horse wiggle tail planter. I have found that the farmers prefer the wiggle tail planter over any other kind. This two horse machine is guided by means of the pole from the seat. The numbers on this refer to the sketch as follows: No. 1 is the main bolt which passes through the tongue and supports the front of the planter. No. 2 indicates the location of the planters themselves. (I use Bill planters.) No. 3 is the extension of the tongue and carries the seat. No. 4 indicates two wheels which roll upon the member 5, and serve to swing the tongue to one side or the other as required. No. 6 is the seat. No. 7 the wheels. No. 8 the braces for supporting the front of the machine, and No. 9 the main body members. The sketches show clearly how both of these machines are made.

That's Easy Mr. Nichols

From C. M. Golladay, Virginia: I noticed in your January issue a letter in regard to Mr. Nichols who wants to know how a chain is made. He says that an Arkansas smith made it in three welds. There were five pieces, of chain and each piece had three links in it.

I will tell you how this smith did it. He cut one piece of chain up and welded these three links to the other pieces thereby connecting them. That is a very easy question and Mr. Nichols should give us something harder.

Tempering Knife Blades

From C. Smith, Pennsylvania: I noticed in the February issue a letter on how to temper a knife. I have done quite a bit of this work and I therfore would like to give my way of doing this job, because I believe it will help my brother smiths.

I might say that I am *not* from Maine. I lived in New York a long while and my shop mates always like to give and take any good

information or trade kinks. We are all looking for a great deal of help from our brother craftsman in Maine and I most sincerely hope that he will limber up and let us have some of his useful ideas.

My brother smiths speak of oil, salt water and various tempering fluids. I therefore would like to tell of a process which I have used for hardening knives. The substance used is paraffin. I made a V shaped vessel to hold the melted paraffin and put a clay dam on the near end to keep the paraffin from running out. I then sink the end of the V shaped vessel in the forge coal and heat the knife blade across the fire. When hot I hold the cutting edge in the paraffin to harden it. The back of the blade is kept soft and the cutting edge is hard.

The soft blade allows me to pene the blade straight if it becomes crooked while being hardened. If you try to pene a blade straight when you plunge it into a hardening bath of oil or salt water you are likely to crack it in pening.

The knife blades that I temper are always soft. I can harden and temper various straight edge tools in this paraffin hardening bath when a good edge is necessary for a cutting tool. I find that good cast steel is necessary.

A Lister Lay Aid

From L. R. Starr, Kansas: This is my first letter to our paper. I think we smiths

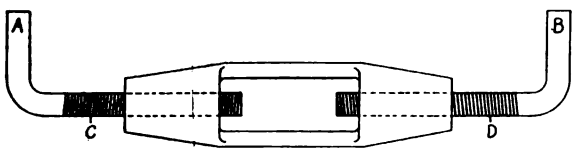


Fig. 1

should write to the BLACKSMITH & WHEELWRIGHT more than we do. I started blacksmithing ten years ago and hardly feel that I know it all yet. I repair all kinds of harvesting machinery and handle a small line

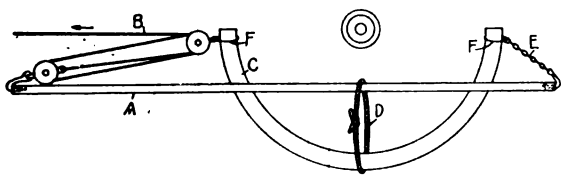


Fig. 2

of hardware. I have made a good living in this part of the State. I had trouble with Lister lays about ten years ago. They would spring together at the back.

I made a turn buckle pusher like the one

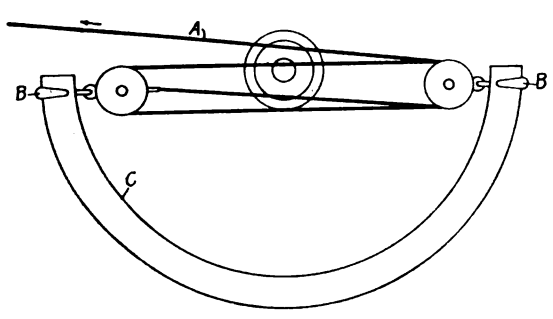


Fig. 3

shown in the illustration figure 1. A B worked in the back holes of the lay. C and D are right and left hand threads which spread the lister lay to its right shape and hold it there until I am finished sharpening it.

I use a block and tackle to open half rim wagon felloes as shown at figure 2. At A is shown an eight foot one and one-quarter inch pipe, at B rope, at C felloe, at D rope to keep the pipe away from the hub, at E chain, and F wire loop which pulls the felloe open. To pull it shut I put block and tackle as shown at figure 3 from end to end of felloe. At A is shown the rope, at B the hook, C the felloe which I pull shut as I drive the spokes in.

Toughening Soft Steel

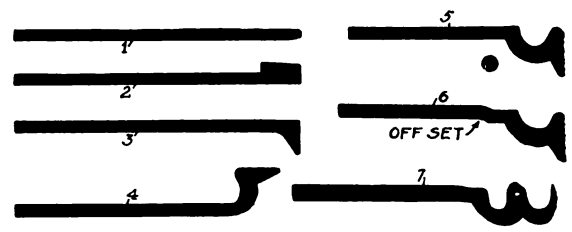
From W. H. Maxwell, New Mexico: Articles which are made of soft steel, Bessemer open hearth or low carbon crucible steel, can be greatly improved by heating them red hot and cooling them in oil. This process does not harden or soften this grade of steel but it toughens it in a remarkable manner. Every blacksmith and machinist will know that this is worth a great deal. A machinist can cut a gear from soft steel and then use this treatment. He will find that the gear will wear much longer than an ordinary one, and that the teeth cannot be broken off. I have made differential pinions which have stood a great deal more wear than the driving gear, and have never had one break where the teeth of the driving gear have been stripped. I found that the teeth on the pinions which I made were in perfect shape.

Hoof Nippers

James A. Johnston, North Dakota.—I believe it may interest some of the younger smiths if I try and tell you how I make noof nippers. I have tried out several kinds of steel but have not tried tool steel yet. I tried hoof rasp after I had worked out one pair from mild steel and the hoof rasp was a failure. Then a piece of spring steel three-eights by two inches. By being very careful these were a success.

I then took a corrugated flax tooth from a threshing machine cylinder and welded on the handle and formed them but these were not a success either. I was about to give up, but in looking over the scrap I found bearing links from an old Fairbanks platform scale (wagon). This steel must be about fifty years old—I myself have had it about fifteen years—and I found that this stuff was easy to handle. It can be brought to a yellow heat and quenched and a good file will just take hold slightly. They will stand up for cutting hoofs and not break. I have just finished my second pair of these and though I would let you and others share in my experience. I think you will be able to get the idea from the drawing.

First take a good rough piece of steel either three-quarters inch or seven-eighths inch by twelve inches, flatten about one and seven-eighths inches as shown in figure one. Do not heat too high. Then heat and flatten



Various Steps in the Making of Hoof Nippers

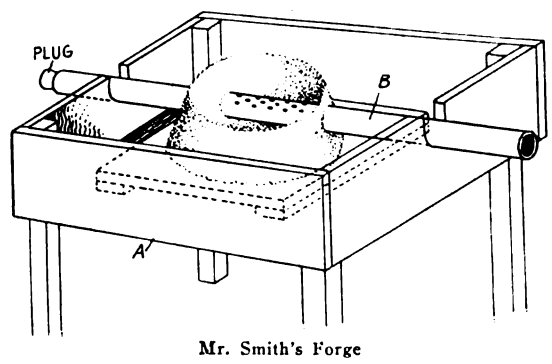
the opposite way, edge of jaw up. Use flatter one and seven-eighths inches from end as shown in figure two. Heat and turn down to right in vise as shown in figure three. Set up about seven-eighths inches, so as to throat full and strong. Now heat and turn the handle to the left at right angles, as shown in figure four. Then heat and turn to the right make a sharp turn, round up the curve over the horn of the anvil and finish up to jaw as shown at figure five. Put offset in handle one-quarter inch or so that the handles will match as shown in figure six. Now turn the jaw.

Be careful at this point or all the work is wasted (as shown by figure seven). Make another one exactly like the first, drill the hole and rivet up, fit the jaws, sharpen and then harden to suit. Put the rivet in hot and you will find it will contract enough so that it will make an easy yet tight joint.

An Easily Made Forge

From C. Smith, Pennsylvania.—I have noticed that the rural horse shoers and general blacksmiths have an unusual run of work and as they speak of putting up another forge, I thought that I would give an idea of an easily made forge which will not be in the way when not in use. A few cents worth of wood or a good sized dry goods box or hogsnead cut to the right height will do for a convenient forge.

A piece of three inch pipe will do for a tuyere iron as shown by the sketch. I have worked on home made forges and know their worth. I thought that it might be of some benefit to blacksmiths who are about to put up an extra forge to know about the



Mr. Smith's Forge

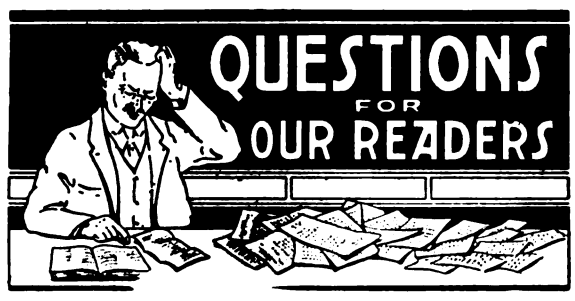
easy construction which would enable them to get over the difficulty.

The sketch will clearly show the forge in question. A flat stone or piece of flat iron should rest on two cross irons on the bottom board, so as to prevent the fire from burning the bottom and fill the forge deck with dirt or ashes. Make a duck's nest hole where the tuyere iron holes are and have a scraper to clean out the ashes as they accumulate in the pipe removing the end wooden plug to do so and replacing plug tightly when finished. The height of the forge should be measured from the floor to your knuckles when your hand is closed.

The anvil also should be the same height. Use a little common sense and you can cheaply make a useful, handy forge. Set the side boards on a shoulder on the post and nail a few long nails into the bottom edge of the side board to strengthen the bottom cleats the floor rests on.

Make any improvements to suit yourself. Keep the matter of strength in view as you will probably set heavy tires and weld large axles. I have seen lots of work done on a forge of this kind. A bellows can blow directly into the tuyere or a fan can be connected to suit your convenience. This kind of a forge will not strike your pocket-book very hard. I have worked at nearly all sorts of forges from the old fashioned hob or stone forge to the present day forges.

I wish all the readers of the BLACKSMITH & WHEELWRIGHT a very successful New Year.



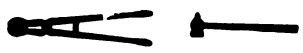
Case Hardening

From J. E. McCorkle, Kansas: I have been reading the BLACKSMITH & WHEELWRIGHT for several years and have never submitted any questions. However, I have a question now I would like to have the brother smiths' answer.

I have several hundred pieces of open hearth steel which I want to case harden, about one-sixteenth of an inch thick. The pieces are six to ten inches long, one inch wide and five-sixteenths of an inch thick. I would like to have the centers soft so that

the pieces will not break, but I should like to have the outside so that you cannot file or cut them with a file, hacksaw or chisel.

I should like to do this as cheaply as possible.



Heating Wagon Tires

From S. Morcombe, Canada.—Can a brother smith give me a description of a furnace for heating wagon tires. Please give dimensions and all particulars.

To Stop Horses From Forging

From A. M. Hargrove, Kentucky: Will some one let me know through the BLACKSMITH & WHEELWRIGHT how to stop a horse from forging, corking and side cutting?

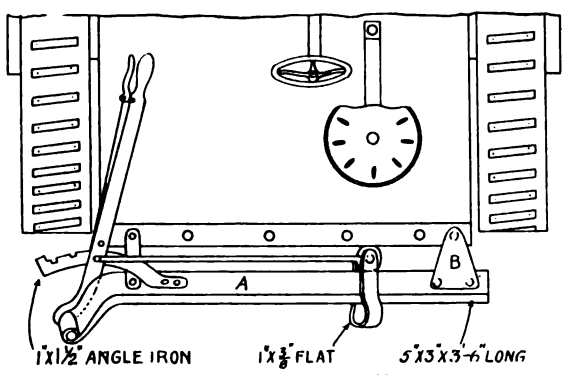
Tempering Mill Picks

From T. E. Trussell, Virginia: I should like to read of some reliable solution for tempering mill picks. I have quite a lot of this sort of work to do, but some of them do not stand up as long as they should.

A SHIFTING DRAW BAR AND TRACTOMETER

By George G. McVicker, Nebraska.—With the coming of the farm tractor the country blacksmith must plan and develop means for his share of the necessary repairs and attachments that these machines require. Unlike the automobile, the tractor is a field tool and is the blacksmith's customer as well as have been the hoofs of horses. With this idea in mind, I shall describe some of the plans which I have developed and which are giving satisfactory service to tractor owners.

Having used tractors myself on side hill fields, I knew that there was need for some type of a draw bar which could be quickly shifted and thus cause the plow to cut more or less land. For going one way across the field, the tendency for the plow



Shifting Draw Bar for Farm Tractor

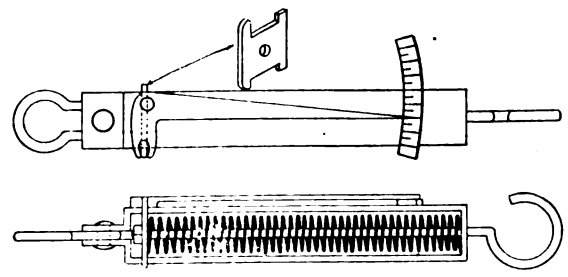
to creep or rather slide further into the unplowed land made it necessary to either change the guide arm on the tractor or stop at each end and set the plow hitch over on the draw bar. On the return on the other side of the land, the conditions were of course reversed and unless these changes were again made the plow would cut nearly a furrow less than it should.

The accompanying drawing, figure one, shows the plan of a shifting draw bar which I made and its simplicity and perfect work makes it an attachment which will create a demand when once seen and used. The main bar A is made of five-eighth inch by thre inch flat stock and is cut three feet six inches long for tractors up to fifteen horse power draw bar rating. The front of the clevis is equipped with a two inch steel roller to provide for shifting while draw bar pull may be on the plow. One of the straps for attaching to the permanent tractor draw bar should be made with two holes or else an angle brace equipped to prevent side strains from loosening the connecting bolts and from cramping the roller at the end of the clevis between the permanent and the attached bar.

The shifting lever may be forged, but I have used ones taken from old farm machinery such as disc or sulky plows. The attachment is easily placed on most any tractor and once used will always be used if side hill land is to be worked.

* * * * * *

Another device for the blacksmith to make and sell to tractor owners is a device for showing the draw bar pull of a tractor. An operator many times stops and examines the oil supply, bearings, etc., of his tractor fearing that they are at fault when the tractor labors hard. Oftentimes the real cause is some trouble with the harvester plow or other tool being pulled. The accompanying drawing figure two shows an easily constructed device of this kind which can be made and sold for about one-tenth



A Tractometer any Blacksmith Can Build

the amount asked for devices which give no better service.

The frame is made of one-quarter inch by two inch strap stock and should be cut thirty inches long, although this depends somewhat on the spring used. The ring and the rod are of five-eighth inch by three-quarter inch round stock while the spring is of five-sixteenth inch, nine inches long and was used as a compression spring on the pressing chamber of a hay press. The plate washer which also operates the pointer is of one-quarter inch flat and cut so as to guide the end of the draft rod in the frame.

This of course, does not show the pounds pulled unless checked in some manner, but any operator will soon note the position of the pointer for any normal pull of the implement being operated and any extra steam or draft quickly shows him whether it is the tractor or the implement at fault. This, like the shifting bar, need not be built especially for any particular tractor, but can be used with any up to about twenty-five horse power draw bar pull. Heavier frame and heavier springs such as may be found around most any railway section tool house will answer for larger tractors.

More owners would use a device of this sort if they could secure one at a reasonable price and this is an opportunity for any blacksmith to furnish them.

WANT ODD AUTO LICENSES

Curious and various were the requests made of the office of William R. Dill, Motor Vehicle Commissioner, of New Jersey, by motorists with fanciful ideas as to license numbers they would like to have for their cars in 1921. Mr. Dill said yesterday that he had about $20,000 in license fees which he would have to return to applicants for new numbers because his department could not possibly accede to the suggestions.

One man wrote in detail how gratifying it would be to have an automobile number that corresponded with the license number of his pet dog. Mr. Dill was deeply touched, but he had to send back the man's money.

Here are some of the other requests made by automobile owners:

A historian wanted the number 1776 for sentiment which he cherishes about his ancestors of Revolutionary days.

Several college graduates wanted numbers to correspond with their year of graduation.

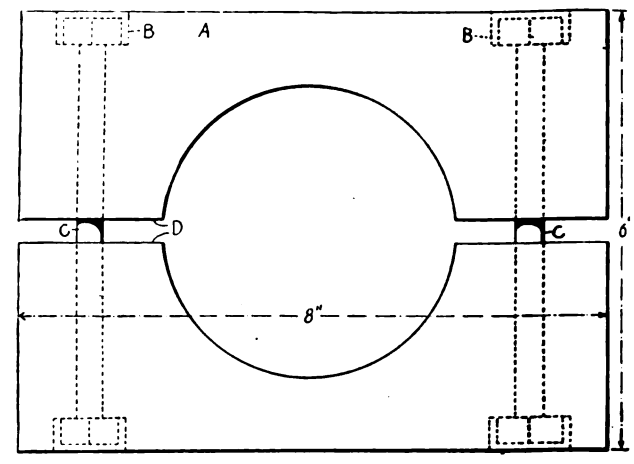
A host of people wanted numbers to correspond with their telephone or house numbers.

Several firms wanted numbers which represented an arithmetical progression.—*New York Times.*

A PISTON VISE

By C. SEON

A serviceable, cheap piston vice can be made out of a piece of two inch by six inch elm wood, as shown at A, or any other wood that will not split easily. Mark the sides by



Showing How the Vise Is Made

placing a piston on the wood and describing a circle with a pencil, making an opening by boring a row of holes inside of the mark and finishing with a rasp and halfground wood file. It can be finished on the lathe, if one is available.

After making an opening to fit the piston, bore holes "B" at each end of the block and place two old valves or bolts "C" across the block to act as guides. Countersink the ends of these well so that they will not touch the vise jaws when the blocks are placed in the vise.

Saw out strip, D, about one-quarter or three-eighths of an inch lengthwise of the block, put cotters in old valves or burrs on bolts and the vise is ready for use by placing blocks between the jaws of a blacksmith's or machinist's vise.

BABY CYCLONES

Kansas automobile owners have other things to worry over besides auto thieves and fires. They have also "twisters" to keep them guessing. Now a twister is nothing more or less than a young undernourished cyclone that runs wild upon the western prairie during certain seasons.

The twister is at times a playful animal, but it often exhibits unusual strength. A typical exhibition of this is clearly shown in

Results of a "Twister"

the accompanying photograph. In this case the young cyclone vented its playfulness on a country-town garage. While some of the cars were only damaged, the building was completely demolished and the most of it removed from the premises.

As a last and convincing argument that the cyclone is a real worry it can be truthfully said that the next time the "twister" visits this spot it might take the cars to some other township and leave the garage standing.

WANT ADVERTISEMENTS

ADVERTISEMENTS of SHOPS FOR SALE or TO RENT, SHOPS WANTED or SITUATIONS or HELP WANTED,

will be inserted under this head at 3 cents a word, including the address, for each insertion, payable in advance; but no advertisement will be accepted for less than 60 cents, however small.

Remittances may be made in postage stamps where the amount to be sent is less than $1.00. Address

M. T. RICHARDSON CO., Advertising Department,
71-73 Murray St., New York. Publishers of the Blacksmith and Wheelwright

For Sale

FOR SALE

24 x 8; 28 x 12; 18 x 6; Lincoln miller; double end punch and shear, heavy emery grinders; new steel truck, other machinery. Bicknell Mfg. & Supply Co., Janesville, Wis.

FOR SALE

Blacksmith shop in good live town of 1,000, only shop and plenty of work for two men the year round. Frame building 44 x 60, established 15 years; large territory and good prices. Electrically equipped. Wm. I. Scheetz, Hanover, Kansas.

FOR SALE

Blacksmith and wagon shop; well equipped with all tools, stock and machinery. Good country trade; enough work for two men. Lot 50 x 160, shop 24 x 40, with good well. Selling account of poor health. Joseph Byczek, Arriba, Colo.

FOR SALE

Cheap: Blacksmith shop, tools, stock, machinery; price $1200.00. Retiring because of poor health. Address F. Helmig, Chana, Ill.

FOR SALE
CARRIAGE SHOP

And machines and tools and materials that cost over $4000 for sale at a sacrifice. For terms apply to T. Ball, Sinton, Texas.

Wanted

WANTED

Country or small town blacksmith business with chance for automobile work or first class location for same, in New York, New Jersey or Delaware. G. T. Whitten, 19 Hayes St., Framingham, Mass.

Printing

100 Envelopes, 100 Statements and 100 Note Heads $3.00. S. L. Printing Co., Warren, Ill.

Patents

PATENTS FOR INVENTIONS.

H. W. T. JENNER, patent attorney and mechanical expert, 622 F Street, Washington, D. C. Established 1883. I make an examination and report if a patent can be had and the exact cost. Send for full information. Inventors assisted in developing ideas and inventions. Trademarks registered.

For Blacksmiths

BLACKSMITHS, LISTEN!

Any handy man can make more money doing hard jobs easily. Forging and solid welding with Toy's modern methods of blacksmithing, hardening and tempering to a standard with collard tempering charts. All for one dollar. Samples free. 52 years a machine blacksmith. W. M. Toy, Sidney, Ohio.

"Sample received and it is all you claim for it. For amount enclosed please send by express 25 lbs. Uniflux." A. Barton of Kosse, Texas writes us the above. You also need Uniflux "Master of Service" Welding Compound for forge welding. Request Circular or send 10c for Sample. Goruse Company, Elmira, N. Y.

SPARKS AND SHAVINGS

Laffitte Welding Plates.

The Phillips Laffitte Co. Philadelphia, Pa., manufacture the well known Laffitte Welding Plates. These plates become more popular every year and more blacksmiths than ever are using them. They are great time and labor savers and for that reason are well liked.

The Phillips Laffitte Co. will be glad to send samples to blacksmiths who are interested.

Harvey Springs.

Harvey Boltless Automobile Springs which are manufactured by the Harvey Spring and Forging Co., 1083 Seventeenth St., Racine, Wisconsin, are products which should be investigated by every blacksmith. These springs are extremely well made are known to be durable and the manufacturers guarantee their easy riding qualities.

Full information may be obtained by writing to the makers.

Phoenix Horse Shoes.

Most blacksmiths know that the Phoenix Horse Shoe Company of Chicago, Ill., is a large manufacturer, but not all know that this concern is the largest manufacturer of horse and mule shoes in the world. Blacksmiths who use these shoes testify to their excellent qualities. The Bull Dog Toe Calks are almost universally used.

It will pay blacksmiths to write to the Phoenix Horse Shoe Co. for data regarding their products.

Warner Blowers.

The Warner Electric Co. of Kalamazoo, Michigan, manufacture the Warner Blowers which are extremely well built, sturdy machines. This machine is said to give any speed desired. It is made for one hundred and ten volts current, twenty-five to sixty cycles only.

This company agrees to send the blower on a thirty day trial, for they feel sure that this trial will convince smiths of the excellent qualities of the machine. At any rate it will help the readers of the BLACKSMITH & WHEELWRIGHT to write to this Company for the folders on forge blowers, for they will be sure to obtain information from it which will be to their advantage.

Rochester Helve Hammer.

The West Tire Setter Company of Rochester, N. Y., manufactures the Rochester Helve Hammer, which is a very well known product. The machines are popular and the springy forging blow is one feature that makes it so well liked.

Any length, weight or force is instantly secured, while the machine is running. There are many other features about this machine which blacksmiths will be interested in and it would be to their advantage to write to the manufacturers for the Rochester Helve Hammer book.

Buffalo Products.

Very few concerns manufacture such a large line of products as does the Buffalo Forge Co. of Buffalo, N. Y. This line includes forges, electric blowers, drills, floor and post type, shears for cutting angles, bars and sheets. The shears cover every size from the little bench type hand power shear to the heaviest power shear made. Blacksmiths who are anxious to get ahead are beginning to realize the necessity of using up-to-date tools and it would pay them to investigate these tools made by the Buffalo Forge Company.

At any rate it would be to their advantage to write to Department Six for the complete catalog.

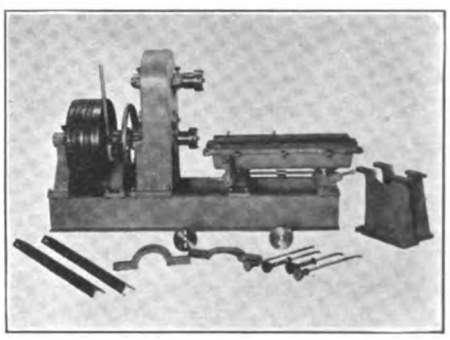
C-O Universal Burning-in Machine.

One of the most important announcements for many months to the automotive trade, jobbers and garage repair men, is word of the development of a Universal Burning-In And Running-In Machine, designed and built by the Canedy-Otto Mfg. Co., of Chicago Heights, Ill. This company has pioneered many note-worthy improvements in Forges, Blowers, Drills, Motor Stands and other repair equipment for shop work and the trade will be quick to recognize the unusual importance of this announcement of a Universal Burning—In Machine, which will handle any motor regardless of type or make.

The manufacturer claims for this machine, that it will positively burn-in and run-in the bearings of any type motor. Only one attachment is required and this is needed only for burning-in, valve in the head V-type motors. It is quickly attached and comes as part of the regular equipment. This attachment will also handle motors which do not have detachable heads, an operation which has puzzled the repair man for many years.

The table is raised and lowered by a single control. This table is grooved like all high class machine tool tables and the motor clamps can be adjusted to size of motor. The table also serves as a sump or crank case for the motor, so that the crank-shaft splashes in fresh oil, in every way similar to the actual performance of the motor in operation.

The clutch is an extra heavy toggle type, driving through a silent chain, which is so noiseless, that the operator can test the timeing of the motor or



Universal Burning-in Machine.

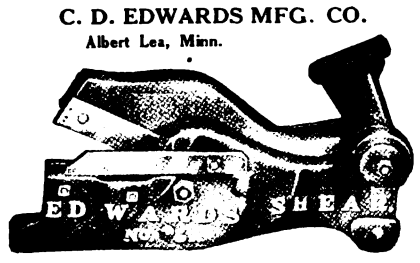
detect noises after the bearings have been run-in.

The machine requires a floor space of only 90 inches over all, with an actual base measurement of 79 inches. 20 H. P. is sufficient to run the machine to capacity, under the most severe conditions, with the largest of motors. A single lever controls the raising and lowering of the table with a tension lock. All parts are highly machined to the usual standard of accuracy, maintained in all Canedy-Otto equipment.

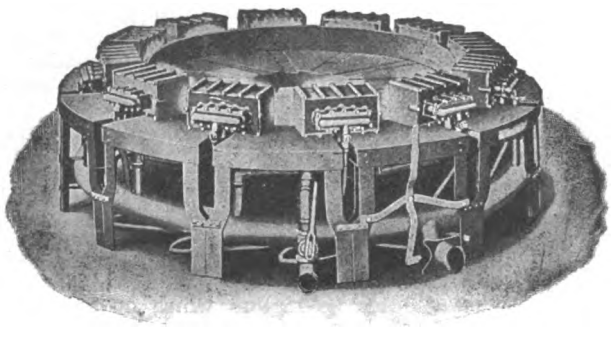
Manufactured as it is by the largest builders of Automotive Equipment in the world, its dependability is assured before being offered to the trade. Detailed illustrated bulletin will be gladly sent to anyone who is interested. Samples are being delivered to Canedy-Otto jobbers in various parts of the country. Inquire direct of the manufacturer for literature.

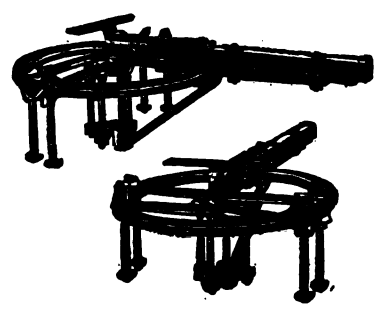
Index to Advertisers

CLASSIFIED BUYERS' GUIDE



The man who does not advertise simply because his grandfather did not, should wear knee breeches, silk stockings, and a wig.





BLACKSMITH AND WHEELWRIGHT

and TRACTOR REPAIR JOURNAL

Vol. LXXXIII. No. 6 JUNE, 1921 TERMS ONE DOLLAR A YEAR

Practical Horseshoeing

Treatment of Injured Hoofs and Special Tools to Accomplish It

THE horse is naturally sensitive, and many animals will manifest signs of pain, etc., when the pincers are manipulated over the hoof to discover any sore spots. The operator must exercise himself to distinguish between natural sensitiveness and actual pain. Naturally, horses will, like people, differ widely in this matter. In short, some cases will perhaps be difficult. The experimenter may then proceed as follows. He quits the lame foot and works with the pincers on one of the other feet, preferably the companion foot. That is, if the lame foot is a fore-foot, then he experiments with the companion fore-foot.

The purpose of this experimenting with an unaffected foot is to discover just how the animal behaves when the pincers are used on a perfectly sound hoof. Then he returns to the lame foot and seeks to find a spot sensitive in a different way. The pincers are never to be used in any strenuous way. Roughness is to be discarded. The pincers are used to test the surface point by point. The same pressure is used right along, each point or spot being tested just as the others in the same region. Then the horse may be expected to wince when a sore spot is really found. How hard to make the pressure for the test will depend upon conditions. Sometimes, the area being tested will be one where the horny or other material is thin and yields readily. Naturally, the operator will proceed cautiously here and will use only a gentle pressure.

In such a case, the result may be that "the tender spot is quite sufficiently indicated by

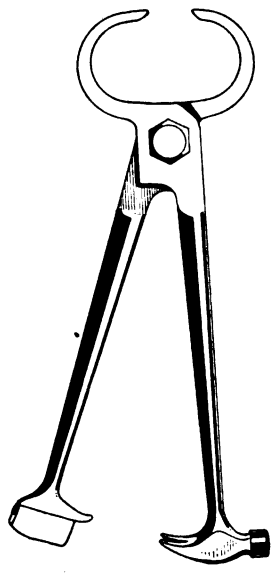


Fig. 1. Combination Farrier's Tool. This is a Combination Pincers, Hammer and Buffer. Since it occupies no more space than the ordinary pair of pincers it can be carried without inconvenience and is useful in removing a shoe in an emergency. By removing the nut, the hammer and buffer can be used to cut the clenches, and by replacing it a pair of pincers for removing the shoe and "trying round" the foot is obtained.

slight quivering of the muscles of the shoulder and upper limb." The pincers are, however, not always successful. That is, there may be a tender spot, but the pincers may not discover it. Light blows with the hammer may often be resorted to as a means of detection.

The three symptoms are being considered in logical order. The most readily determinded one is first. This is lameness. Next comes sensitiveness. And finally comes heat. This will ordinarily be the right way. But, in some cases, it may be that an increased warmth is more readily discovered than a tenderness. In short, if there is much difficulty in locating the sore spot, one may feel over the parts and seek to note a place warmer than it should be. The hammer may now be used to test the warm spot with respect to

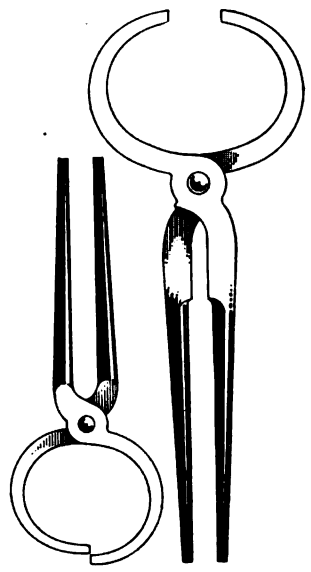


Fig. 2. Special Pincers Designed for Examining Diseased Feet.

sensitiveness. The lateral cartilages are to be observed as well as possible and the several joints tested by passive movement. By manipulation and the like, one seeks to discover any super-sensitiveness that may be present.

The *causes* that may produce inflammation within the foot are rather numerous. (1) The horse may be born with some faulty formation of the leg or irregularities in the hoof of such character as to bring about a wrong distribution of pressure when he puts his weight on his foot. Such causes are technically called *congenital causes.* If a horse in middle life suddenly gets inflammation within the foot, it is fairly certain that this could not happen from congenital causes alone; since such causes should have brought on the trouble long before, if they by themselves were competent to bring on the disease. At the same time, congenital causes may *pre-dispose* a horse to inflammation inside the foot.

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Fig. 3. Method of Applying a Poultice.

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CLASSIFIED BUYERS' GUIDE

BLACKSMITH AND WHEELWRIGHT

and TRACTOR REPAIR JOURNAL

Vol. LXXXIII. No. 6 JUNE, 1921 TERMS ONE DOLLAR A YEAR

Practical Horseshoeing

Treatment of Injured Hoofs and Special Tools to Accomplish It

THE horse is naturally sensitive, and many animals will manifest signs of pain, etc., when the pincers are manipulated over the hoof to discover any sore spots. The operator must exercise himself to distinguish between natural sensitiveness and actual pain. Naturally, horses will, like people, differ widely in this matter. In short, some cases will perhaps be difficult. The experimenter may then proceed as follows. He quits the lame foot and works with the pincers on one of the other feet, preferably the companion foot. That is, if the lame foot is a fore-foot, then he experiments with the companion fore-foot.

The purpose of this experimenting with an unaffected foot is to discover just how the animal behaves when the pincers are used on a perfectly sound hoof. Then he returns to the lame foot and seeks to find a spot sensitive in a different way. The pincers are never to be used in any strenuous way. Roughness is to be discarded. The pincers are used to test the surface point by point. The same pressure is used right along, each point or spot being tested just as the others in the same region. Then the horse may be expected to wince when a sore spot is really found. How hard to make the pressure for the test will depend upon conditions. Sometimes, the area being tested will be one where the horny or other material is thin and yields readily. Naturally, the operator will proceed cautiously here and will use only a gentle pressure.

In such a case, the result may be that "the tender spot is quite sufficiently indicated by

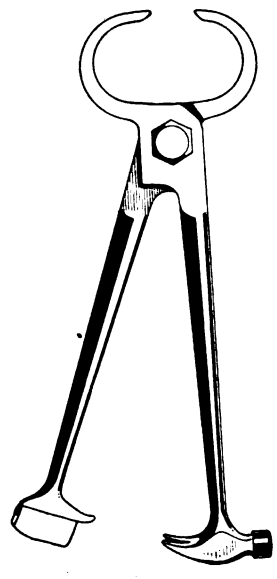

Fig. 1. Combination Farrier's Tool. This is a Combination Pincers, Hammer and Buffer. Since it occupies no more space than the ordinary pair of pincers it can be carried without inconvenience and is useful in removing a shoe in an emergency. By removing the nut, the hammer and buffer can be used to cut the clenches, and by replacing it a pair of pincers for removing the shoe and "trying round" the foot is obtained.

slight quivering of the muscles of the shoulder and upper limb." The pincers are, however, not always successful. That is, there may be a tender spot, but the pincers may not discover it. Light blows with the hammer may often be resorted to as a means of detection.

The three symptoms are being considered in logical order. The most readily determinded one is first. This is lameness. Next comes sensitiveness. And finally comes heat. This will ordinarily be the right way. But, in some cases, it may be that an increased warmth is more readily discovered than a tenderness. In short, if there is much difficulty in locating the sore spot, one may feel over the parts and seek to note a place warmer than it should be. The hammer may now be used to test the warm spot with respect to

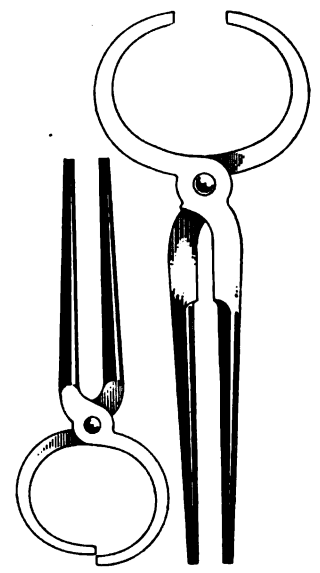

Fig. 2. Special Pincers Designed for Examining Diseased Feet.

sensitiveness. The lateral cartilages are to be observed as well as possible and the several joints tested by passive movement. By manipulation and the like, one seeks to discover any super-sensitiveness that may be present.

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Forty-eight hours is a good and proper length of time for the poultice. It is to be moistened every now and then, so that it will always be soft. The poultice may be left on, until nearly all of the pain is gone, or until it has been greatly lessened. There is a caution to be observed. The poultice method is not to be used, if matter is known to have formed in the foot. The poultice tends to favor the discharge of matter at the coronet. The object in using the poultice is to soften horny material.

An alternative to the linseed poultice is a heavy blanket of wet linen. Thus, six or eight thicknesses of linen cloth may be wound round the hoof, secured in place, and then kept wet with water.

Instead of a bandage or straw band to keep the linen in place, a leather or felt boot may be used. This is probably a neater method. If the poultice is used, the hoof is to be well washed when the poultice has been removed. In any case, the hoof may be rubbed with fat or vaseline.

When suppuration is beginning or is about to begin, one is to expect at about this juncture that the *digital arteries* will manifest a rather strong pulsation. The pain may be continuous and severe.

Now, just where are these digital arteries? The illustration herewith will perhaps assist the reader in locating them. In general, an artery is a tube carrying blood from the heart to the surface of the body or to some extremity of the body. Naturally, there is more or less pulsation in the tubes for the reason that the pump, known as the heart, is engaged in driving blood through them. As the pump throbs, so will the arteries feel the pulsation.

The Arteries

The "pulse" which the doctor feels for in the wrist of a human patient is merely the throb of an artery near the surface at a particular point in the wrist. Now, in the foot of the horse, there are two arteries which run down near the rear of the pastern bone and also of the coronet—these two bones lying one above the other, between the fetlock joint and the pedal joint. But one or two inches above the fetlock joint these two arteries are united, so that from this point up the metacarpus bone there is but the one arterial tube. The matter may be put differently. Thus, there is an artery towards the rear of the long straight bone above the fetlock joint. This is called the metacarpal artery. As it continues down the metacarpus, a point an inch or so above the fetlock is reached where the artery divides into two branches. One follows the limb on down on one side, and one

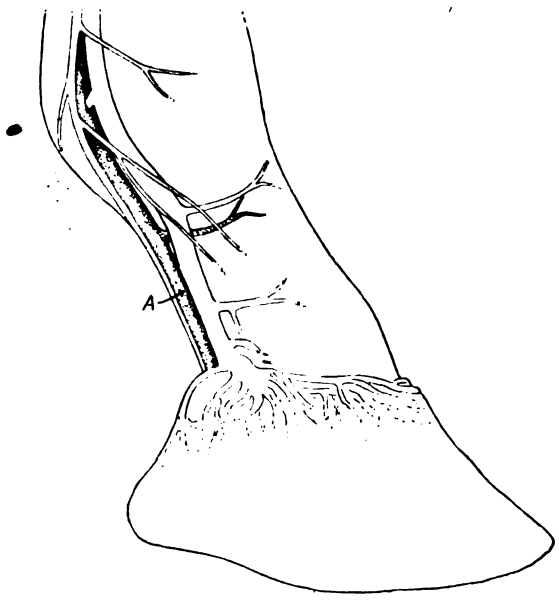


Fig. 4. The Fore-foot showing the Digital artery at A.

on the other side. But both branches remain near the rear of the pastern and coronary bones. When the pedal bone is reached, each of the digital arteries divides up to form arterial terminals bearing other names.

So, when the farrier wishes to examine the foot to see whether there is any unusual arterial throbbing in the digital arteries, he feels along the proper region near the rear. That is, he starts a little above the fetlock and feels on down the foot to the hoof. If there is considerable throbbing of an *unusual character*, then the farrier may consider that pus has already formed. If a veterinary is not to be called in, and the farrier is compelled to go ahead, he may begin further proceedings by seeking to locate the *most painful spot* in the sole. After this has been located, and the farrier is thoroughly convinced that no mistake has been made, he proceeds to thin the horny sole all around the spot where the pain is most severe. This thinning is continued "until the sensitive structures are reached, the bearing surface of the wall being left intact."

There is a special form of knife with a slender blade which is proper to use. There is also another form shown in the accompanying illustration. "The margins of the opening, so far as they are formed by the sole, should be thinned until they yield to the pressure of the finger. If pus be discovered, the parts are next flooded with warm 5 per cent carbolic, creosote or creolin solution, and covered with carbolic, sublimate, iodoform, or salicylic wool. There is some advantage in afterwards painting the parts with a resinous tincture, like tincture of myrrh or the compound tincture of myrrh and aloes.

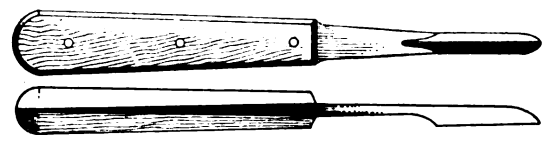


Fig. 5. Special "searcher" used in giving exit to pus.

The dressing is held in position by broad strips of gauze and a shoe with leather sole applied. A better way to fix dressings in position is by thrusting two thin strips of wood cross-wise between the dressing and shoe."

It may be that no pus at all will be discovered. In this case, one may continue with cold poultices or cold baths. On the other hand, if pus is found, it is of some importance to pay attention to its color. If it is of a gray color, the inflammation is probably not deep at all, and the case may be considered a mild one, responsive to treatment. However, it may have a yellow color and be rather thick. These characteristics indicate a more deeply seated trouble, and one not so easily handled. This may be true, even if the *amount* of pus is quite small. Where thick, yellowish pus is found in any amount at all, it will be well to consult a veterinarian surgeon.

When a shoe has to be put on to a foot affected with inflammation, the form should generally be modified. At the place where the foot is affected with pain, the width of the metal may be increased. It may also be possible to add to the length of this part of the shoe. The idea is to increase the area of the bearing surface. Then, at the very spot where the most pain seems to be, the rasp may be used to remove a little of the horn with the purpose of preventing any actual contact of the hoof with the metal at this spot. However, the horn may come into gentle contact perhaps, when the full weight comes on the foot. If the region where horn is rasped away is considerable, the removal of the horn may prove ineffective, as the hoof may yield enough to let this part come down on the metal. In such cases—that is, in cases where a considerable length of bearing surface would have to be removed, it may seem best to use the bar shoe.

The Bar Shoe

The *bar shoe* is one which is a complete ring, the two heels being connected by a cross-bar. The effect of this arrangement is to provide a means whereby the frog may participate in supporting the weight. The rear of the frog bears on the bar.

The bar shoe is used for various purposes. When employed, one may even cut away horn and relieve the pressure just about anywhere it may seem desirable to do so. Thus, the metal may be thinned for an inch or the like at just about any place. Or, the shoe may be cut away entirely and be permitted to have a gap. Thus, if it is desired to relieve the heel on one side, the bar shoe may be cut away at this region and an inch, say, left out.

A horse may have a broad, flat hoof or may have to work on hard surfaces. The ordinary shoe may not provide enough contact surface. Sometimes, one may broaden the metal and cause the shoe to come into contact with a small part of the sole. This may be sufficient and meet requirements. On the other hand, it may seem desirable to use a bar shoe and in this way increase the bearing surface, the frog now being included.

Again, horses with weak heels may have their heels bent inwards, when the ordinary shoe is employed. This bending in may result in contraction of the hoof or in corns, unless it is corrected in time. "The cause is the shape of the shoe, which relieves the frog and sole of weight at the expense of the heels."

THE AUSTRIAN BLACKSMITH

DO you know, that the blacksmith shown in the picture undoubtedly looks upon his American brethren as bound in by the rules of the advanced civilization? When he sees a picture of an American smith shop, neatly built, he probably feels very superior. Instead of envy he may feel pity.

For him, the sky is his roof, the forest the walls, and good old Mother Earth the floor. He doesn't have extensive racks for the horseshoes, or chests for the tools. Perhaps he doesn's know the difference between a drilling machine and a lathe, or a tire puller

(C) Keystone View Company

Unconventional but Comfortable.

and a disc grinding machine. But, we shouldn't be surprised for all the crudeness of his equipment, that the horses he does shoe are shod properly.

It has often been the wonder of the tourists that men of all trades throughout Europe turn out marvellous work with poor tools and few of them. Instead of accurate tools they have accurate labor, instead of efficiency in the way we have come to accept it, they have love of work.

He Didn't Cash It, Strangely

The Mudcombe bazaar was a great and important event—for that village—as the Squire was paying a visit.

The star sideshow was a huge "grab bag," and sixpence was charged for a "grab".

The respectable and respected Squire paid his sixpence, took his dip and drew out a trade card inscribed thus:

"Good for one funeral, if presented within six months. J. Diggemin, Undertaker."

An Appalling Predicament

The situation of the young Irishman about whom Answers tells the following anecdote was indeed unusual. He had just informed a friend that his sister had been blessed by the arrival of a new baby.

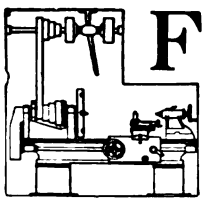
"Boy or girl," asked the friend?

"That's just what is bothering me," was the reply. "Bedad, they don't say in the letter, and now I don't know whether I'm an uncle or an aunt."

Cyanide Hardening

A Process Which Will Enable the Blacksmith to Make Extra Money

BY DAVID BAXTER



FOR those who do not care to go to the expense of installing a hardening furnace the cyanide process of hardening the surface of small articles such as piston pins, roller bearings, keys, small cut gears, and valve stems, offers considerable opportunity for doing a good grade of work.

While furnace hardening is probably the best method, the cyanide process has several advantages. One of these is that it is simpler and requires less time. Another, that the equipment required is negligible; a cast iron pot or ladle being about all that is needed outside of the usual shop equipment.

There is no doubt that the smith who employs the cyanide process should have considerable technical or scientific knowledge in regards to degrees of heat, carbon content, angles of preheating, and so forth, if he intends to follow this work along strictly scientific lines; no one can deny that the possession of such knowledge would help him very materially. But how many blacksmiths or machinists have the time to absorb all of the theories, formulae and other technical terms? Very few indeed; what they want is information stripped of all scientific verbiage. And that is what I am going to endeavor to do; I am going to try herein to tell you how to do cyanide hardening, as it applies to every day mechanics.

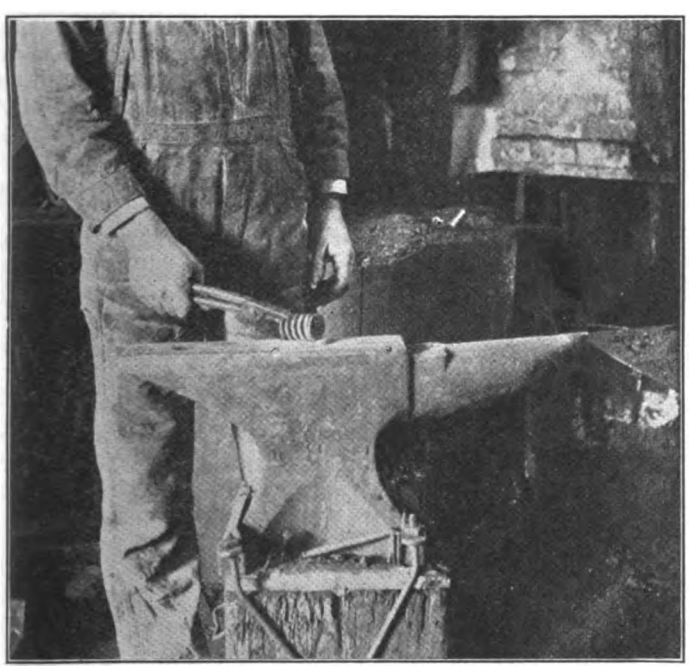


Fig. 1. Rub the Heated Spring in a Small Quantity of Cyanide Crystals

The best way to do this, I believe, is to take specific examples and put them through the details of the method, giving the how and why of each step in the proceedings. Then each individual will have an option of changing minor details to suit his own shop conditions. Remember there is nearly always some leeway in everything.

The cyanide process in its simplest form is illustrated in Fig. 1. Let us start with this and work up to the more complicated practices; or start with a mere superficial hardening and work up to jobs where the hardening penetration is to be deeper. The instance of a small coil spring as shown in the picture will serve to make this process quite clear. It might be well to state here, though, that the spring must be of steel as the process will not apply to brass. Also a spring can not be hardened too much or it will be so brittle that it will fly to pieces when put under a stress. The idea of hardening this spring is to make it stiff or more "springy," and only a very thin skin of the surface is hardened.

This is accomplished by first placing a spoonful or so of the cyanide crystals upon an anvil or other convenient location; then heating the spring to a dull red and rolling it in the cyanide. The crystals melt and commence to crawl over the surface of the spring. As this happens the spring is held up and turned over and over until it is entirely coated with the creeping cyanide. Then the spring is quenched or dipped in a tank of cylinder oil.

Another Example

Another example of this simple form of hardening is cited in the hardening of such articles as the end of a valve stem. The valve stem is heated red hot and the end is pressed down upon a cake of cyanide. When the cyanide melts and coats the end of the stem it is dipped in water or oil until cold. The cake of cyanide is made by melting the crystals and pouring them in a metal or clay mold.

To impart a few more degrees of hardness the article must be immersed in melted cyanide. This of course is not appliable to coil springs for the reason given above. This process is for small piston pins, roller bearings, set screws, etc., whereby a fairly hard wearing surface is desired. First, a small vessel such as a babbitt ladle, is nearly filled with cyanide crystals. This is then placed in the fire of a portable forge. Any other convenient heater will do, a gas flame or oil burner. The cyanide is heated slowly until it melts and settles in a pool in the bottom of the ladle. The heat is then increased until the molten cyanide is red hot; being careful not to raise the heat fast enough to burn a hole in the bottom of the ladle.

Speaking of the ladle: only a cast iron one should be used because a steel ladle will tend to draw the carbon out of the cyanide and thus weaken the effect of it upon the article to be hardened.

While the cyanide is melting and attaining the red stage of heat, the article to be hardened is also being heated, in the fire

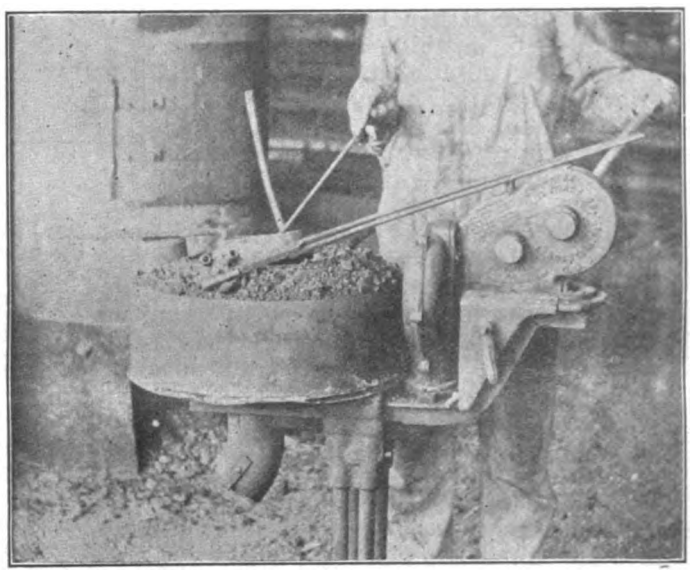


Fig. 2. Cyanide Hardening with a Babbitt Ladle

around the ladle. Let us say a small piston pin is to be hardened. This is placed in a clean part of the fire beneath the ladle. It is turned and rolled in the fire until it attains a bright red heat. Not sufficient to cause an oxide scale to form on the surface but considerably hotter than the molten cyanide. This should be ready by the time the piston pin is bright red in all parts. That is, the pin should be the same color all over; no dull spots mixed with brighter portions.

As soon as the cyanide and piston pin are ready the pin is quickly deposited in the molten bath of cyanide. The operator should be careful that the tongs are perfectly dry and that no moisture-soaked coals adhere to the piston pin as there is danger of an explosion if water comes in contact with melted cyanide.

The Process

The piston pin should be entirely submerged. It is allowed to remain thus for from five to fifteen minutes, depending upon how much it is to be hardened. During this interval it is rolled over several times with a cast iron rod to be sure that the cyanide is evenly spread over the surface of the pin. That is, the pin is not allowed to rest the entire time upon the bottom of the ladle. This phase of the process is illustrated in Fig. 2.

After the pin has remained in the cyanide bath its allotted time it should be hard enough for ordinary purposes. But to intensify the

hardness it is taken out of the cyanide and dipped in water or allowed to cool in oil the same as the coil spring. When quenching piston pins in water it sometimes happens that they are distorted by the extremely rapid contraction, particularly if the pin has not the same degree of heat all over. And, too, this distortion is aggravated by the way the pin is dipped. If the pin is dropped into the water flat the down side cools and contracts before the upper side, and as a result the pin is pulled crooked. To minimize the danger of distortion the pin should be dropped into the water endwise. If it is dropped straight and continues straight into the water the contraction will be uniform around the pin and will mount evenly as the pin passes into the water. But even this does not always produce a true pin, so it is better to have it a fraction over-size before immersing in the cyanide. It may be ground true after it is hardened.

Another Method

A variation of this method of hardening, or perhaps it is a variation of the coil spring method, is to heat the article to be treated, hold it in the molted cyanide a few minutes, then reheat it and again immerse it in the cyanide. After this it is quenched in water or oil. Consider for instance, the valve stem: Get the cyanide in the ladle to a molten red stage. Heat the end of the valve stem red hot. Be sure it is clean and then lower the heated end into the cyanide bath. Hold it there a few minutes and then heat it bright red again, and again dip it into the cyanide, after a few minutes, plunge it into water. Strong salt brine is said to impart a harder surface than plain water.

The theory in all of these examples of cyanide hardening is that the carbon is absorbed by the steel, the depth of the hardening penetration depending upon the heat condition and upon the length of time the article is submerged in the cyanide. Literally speaking the article must be heated enough to open its pores so the carbon can soak into them; then the article must remain in the cyanide long enough to permit the cyanide to soak in.

The idea of the quenching is to close the structure or grain of the metal very quickly. In other words, to close them tightly; thus causing a close-grained, hard surface. The sudden immersion in water imparts what is known as a chilling effect, or in the parlance of the foundry, a glass hard outer crust.

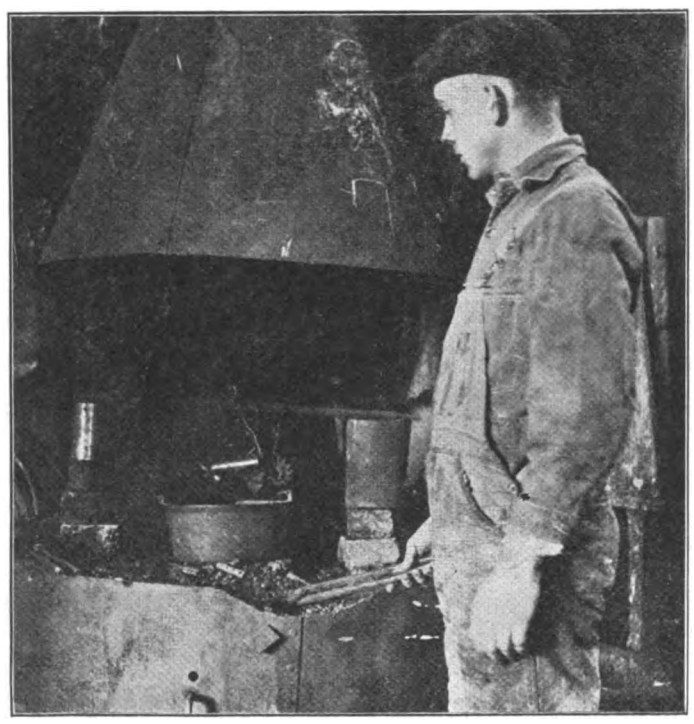


Fig. 3. Cyaniding Several Articles at One Time.

To increase the penetration the articles are suspended in the cyanide for half an hour or more. This is handily accomplished by hanging them on wire hooks from a cross rod above. Several different articles may be treated at one time in this way. However, they are not permitted to touch each other or to touch the sides or bottom of the cyanide pot. In this process, as when using the babbitt ladles, the cyanide pot should always be made of cast iron and should be heavy enough to retain the heat.

This pot is partly filled with cyanide crystals which are then melted over a slow fire. As soon as the cyanide settles into a molten red mass the suspended articles are lowered until they are entirely submerged. Then the fire is slowly increased until the cyanide boils. This boiling is similar to that of water boiling. The submerged articles are boiled in the cyanide the desired length of time, twenty, thirty, or forty minutes.

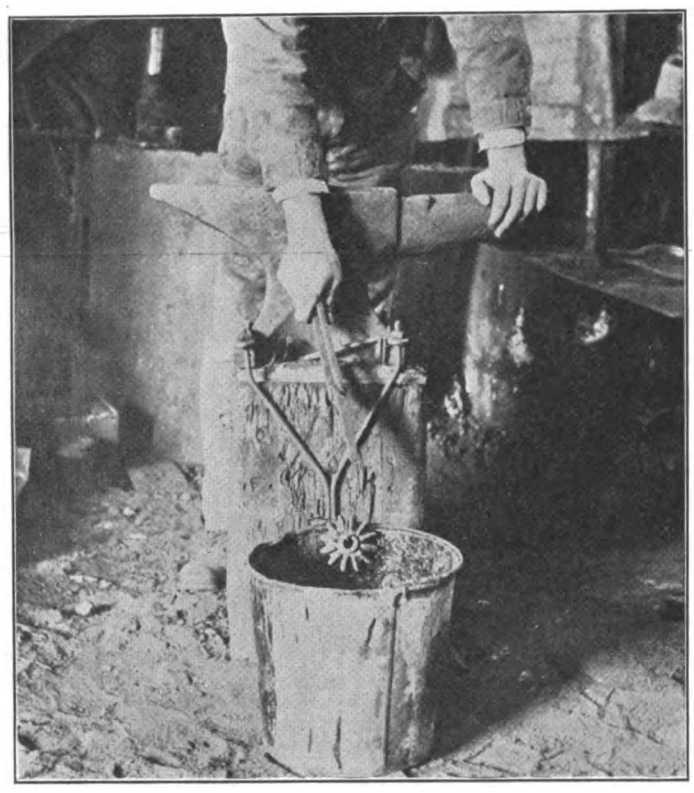


Fig. 4. Quenching a Small Gear after Heating in Cyanide.

Then the articles are lifted out one at a time while they are still red hot and quickly dropped into the quenching tank or bucket, being careful about this part of the process as cautioned above lest the articles are warped by unequal contraction. Fig. 3 shows the articles suspended above the pot and Fig. 4 shows the act of quenching a treated gear.

After the hardening articles are all removed, the cyanide is allowed to remain in the pot until cold. Then, when necessary to use it again, it is merely placed over the fire and re-melted. One potful may be used several times before discarding. It is emptied when molten.

The smith should know that cyanide is deadly poison and that the fumes which arise from it while it is heating are poisonous. He should be careful about inhaling these fumes. In fact, it is best to have a hood or flue above the cyanide pot to catch the gas and carry it out of doors.

The smith should also be careful about handling the stuff, particularly if he has a cut or sore on his hands or if his hands are moist.

If either of the cyanide processes are to be successful the worker should be sure to obtain a pure grade of cyanide as a weak or inferior brand will not produce the desired result. With good chemicals and careful attention to details a surface hardening can be applied that will add considerable to the wearing qualities of the article treated. Nor, as stated in the beginning of this discussion, is it necessary to have heat measuring or testing instruments, or scientific formulae.

The less you have to say about your competitors the better, but if you must talk about them, see that you say something good.

Get busy, keep busy and the accomplishment of some good to somebody will be your reward.

COMMENTS ON BROTHER MERGL'S LETTER

From E. E. Panzer, Iowa.—I am a reader of the BLACKSMITH & WHEELWRIGHT and consider the magazine great. There is very little of it that I do not read.

In regard to Brother Louis Mergl's letter, relative to the farmers coming to his shop, having their shoes fitted up, buying nails and then nailing the shoes on themselves. This seems to be some farmers' delight. They think that they are saving a little money. I have the same sort of customers at my shop.

Brother Mergl says that he does not like to do this kind of business. I do not like it either, but I believe the best way is to do all the work for them that you can, charge them a good price and they will be satisfied. If you refuse to do their work, they will not like to come back. I have a shop which is 24 x 40, one story and am located in a very good section for general work.

I have had customers ask me if they could use my tools and one corner of the shop to build themselves a wagon box or wood rack. Don't you think that is real nerve? I cannot tell the brother anything about the Justrite Blade Sharpener, but I can tell him a little about a power hammer that I have installed. It is a No. 25 Mayer Hammer and surely is a good investment. I would advise Brother Mergl to investigate the Mayer Power Hammer or Little Giant Power Hammer. I give the prices that I charge below:

Steel Center shoes all sizes	each	$1.00
Never Slips	"	1.15
Common	"	.75
Resetting	"	.50
Never Slip calks put in shoes	"	.07
Sharpening Plow Shares all sizes	"	.75
Pointing " " " "	"	1.75
Sharpening corn plow shovels per set 4 or 6	"	1.50
Pointing corn plow shares per set	"	4.00
Sharpening roller cutters	"	.50
Sharpening discs per blade		.25
Buggy Spokes	"	.40
Wagon "	"	.50
Buggy ½" rims	"	1.25
Wagons ½" "	"	2.50
Setting buggy tires		1.00
Setting wagon "		75 to 2.00

HIS DEFINITION

Mr. Bully was cross-examining a downtrodden witness.

"Now, sir," he thundered, "you have stated under oath that this man had the appearance of a gentleman! Please tell the jury how a gentleman looks—in your estimation!"

"Well—er—a gentleman looks like—er—a—er—" stammered the poor confused witness.

With unmerciful sarcasm the counsel plunged to the attack again.

"I don't want any of your 'ers,' and remember you are on oath! Can you see anybody in the court who looks like a gentleman?"

The witness's eyes for the first time showed anger, and he blared out:

"Stand out of the way and then perhaps I can. You're not transparent!"

NEW YORK PRICES

From J. H. Coeg, New York.—I have noticed many requests on your part for information as to prices that the smiths charge, and am therefore stating my prices below:

Common Stock Shoes from 1 to 3 per set	$2.50
Common Stock Shoes from 1 to 3 per set, resetting	1.50
Common Stock Shoes from 4 to 6 per set	3.00
Common Stock Shoes from 4 to 6 per set, resetting	2.00
Common Stock Shoes from 7 to 8 per set	4.00

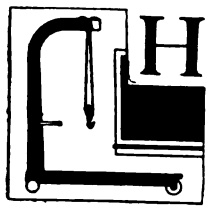
Common Stock Shoes from 7 to 8 per set, resetting	2.50
Bar Shoes from 1 to 4 each	1.50
Bar Shoes from 5 to 7 each	2.00
Side calks each	.10
Rubber pads from 1 to 3 each	1.50
Rubber pads from 4, 5 and 6 each	1.75
Rubber pads from 6 to 8 each	2.00

On hand turned shoes, I charge according to the amount of work done. On repair work I charge $1.00 an hour plus the cost of the stock and add a good profit.

Small Florida Shops

A Real Up-to-Date Shop and Its Efficient Equipment

BY J. F. HOBART



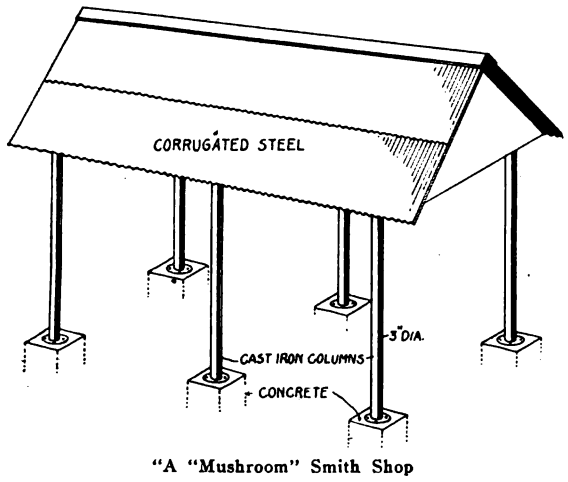
HERE we are at Tampa, that quaint old city which doesn't "get full" each winter on Tourists as do most of the neighboring cities and towns. Tampa takes in and cares for several thousand tourists each winter, but doesn't "go on a tear" with them and in Tampa they won't graft more than half the funds the Blacksmith takes there with him.

I got off the trolley at The Lafayette street bridge and strolled south a few blocks along the water front until I came to the ship-shop, right on The Hillsboro River, of The Tampa Shipbuilding & Engineering Company. A year ago there were mighty hot doings down there and as you pass along, you will see some of the ruins of a great fire which cleaned out several blocks of old frame structures and made way for better buildings. It was a pretty sight, that fire. I stood on the bridge at that time and watched one frame building burn to the ground. It was one of the old-timer frames of heavy timbers with framed-in girts and studs, with big heavy rafters and covered with boards all of long leaf yellow pine.

Results of the Fire

That frame stood until it burned to the ground. Hardly a timber fell, but burned away in its place. First the roof and siding burned away, then every timber, rafter and stud were lines of fire like a building in fire-works on the Fourth of July. Then the lighter pieces burned to ashes but the timbers stayed in place until reduced to coals. It was a mighty impressive sight and made me wish that its frame had been put together by blacksmiths instead of by carpenters. Then, made of steel and riveted, there would have been no impressive fire and the building would be there today.

Just beyond where the fire was stopped, stands the smith-shop of the Engineering Company and a funny looking shop it is too. At first sight it looks like a big square toad-stool—if there ever was such a thing—on six stems instead of on one. When they built that shop, they constructed six massive un-



"A "Mushroom" Smith Shop

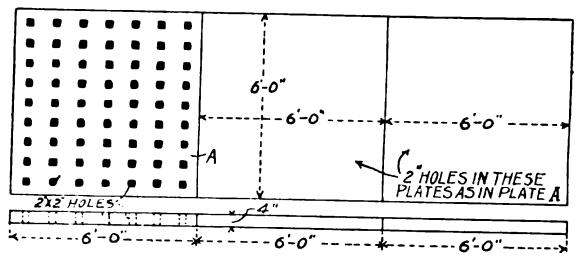
der-ground concrete foundations, bolted six cast iron columns, each six inches in diameter, one to each foundation and then built the steel roof on top of the six posts and that is all there is to the smith shop in question—save what is in it, and that is a good deal.

A railroad track lies along the shop just outside and a 36-inch industrial track runs right through the middle of the shop building and into the machine shop a few feet distant. A big swinging crane stands just inside one end of the shop and commands fully two-thirds of the shop floor as there are no posts inside, the entire roof-structure being carried upon the six cast-iron posts as shown by the accompanying figure.

In construction, however, the shop is far from being of the "mushroom" type, the heavy cast iron posts and the galvanized corrugated steel roofing presenting a massive construction which is very pleasing to the eye. The floor of the shop is dirt; by this time the iron scale and rust particles have so well mixed with the Florida sand that the floor has packed hard over most of the surface.

The Shop Tools

There are plenty of tools in this shop for doing anything and everything from making a boat hook or a mule-shoe to the forging of a ship's anchor! The crane swings over two of the three steel forges in the shop. The



Eighteen Foot Floor Plate

fourth, however, is a portable affair, used for rivet heating a good deal, and may be placed anywhere. Its usual location, however, seemed to be at the end of the shop farthest from the three large built-in-forges, one of which is in an extreme corner of the shop while another forge is in the middle of the floor at one end in line crosswise with the corner forge.

A single blower supplies the three forges. The blower runs all the time and each fire pipes off what air is required, gates at each forge giving perfect control of the blast. There are two power hammers in this shop, each driven by its own independent electric motor. The smaller of these power hammers is located adjacent to the center forge and therefore stands in the middle of the shop sidewise, and about 12 feet from the end of the shop where the crane stands close to the middle-shop forge.

The other power hammer stands close to the side of the shop beside the corner forge. This arrangement enables the crane to serve both forges, both power hammers, and also to swing over to the opposite side of the shop, where beside the mid-shop forge a massive floor plate is located,—a plate big enough for a quadrille set to dance upon. The third steel forge stands near the floor plate.

The power hammer which is beside the corner forge is *some* tool. I have never seen another tool like it. It is a power hammer, driven by its own electric motor, yet that hammer works and is controlled exactly like a steam hammer and behaves in use exactly like one of the better class.

An Electric Steam Hammer

When it is desired to use this hammer, the Smith's striker starts the electric motor and in ten seconds, the big hammer is ready for use. The motor works some kind of an air compressor which seemingly keeps just one or two cylinders full of compressed air ahead ready to be turned into the working cylinder. The hammer is worked by means of a lever which actuates the valves of the vertical power cylinder. The striker or helper worked the valve lever in the same way as when using a regular steam hammer.

It seemed as though the motor-driven air compressor drew in the exhaust air which was discharged from the hammer and compressed that air in a small container, ready to be admitted to the working cylinder for the next stroke. There appeared to be mighty convenient "give and take" air arrangement at that hammer, whereby there was always a cylinder full of compressed air ready, no matter how fast the hammer might be working. Still, there was no big air receiver—not in sight, anyway. The tool seemed to be entirely self-contained and consisted entirely of the hammer cylinder, the motor driven compressor cylinder and the electric motor.

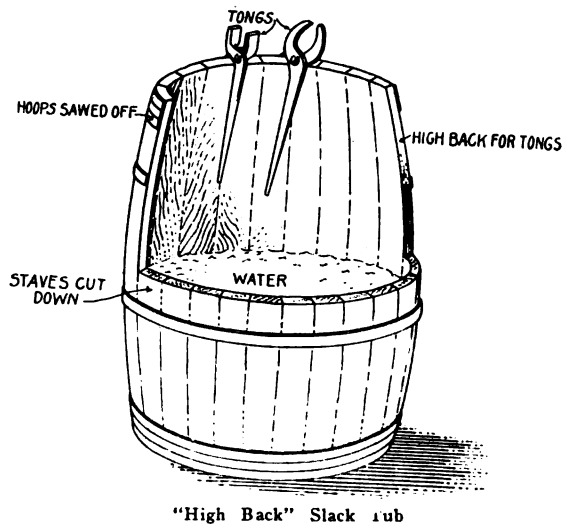
The Third Large Forge

The remaining steel forge was located upon the opposite side of the shop from the air-power hammer. This forge was placed close beside the big floor plate and seemed to be used more for bending angles and flanges, than for regular forging purposes. It was arranged so as to give either a small or a very large fire. I noticed a lever arrangement bolted to the big floorplate by means of which some heavy bending had evidently been done. Judging from the size of the lever and the piles of black scale adjacent, a large number of heavy pieces of steel had been bent to exact dimensions.

The Floor Plate

Many a time, the writer would have been glad of the use of a floorplate one tenth as good as the one in this Tampa shop. The plate was cast iron, planed on top and edges, four inches thick and eighteen by six feet in size! It was made up of three sections each six feet square and placed side by side upon a solid foundation which held the three plates level and true with each other at all times no matter what might be done on the plates, or how heavy hammering was done there.

When the smith wanted to true up some piece of work, regardless of how large or what shape it might be, he placed the work



"High Back" Slack Tub

on the floor plate and belted down the crooks with a big sledge. Or, on other work, he blocked up and bolted down as was found necessary, then hammered the work until it fitted the measurements or the pattern. If work had to be held for bending, a couple of stout bolts through the two-inch square holes, a clamp-bar on top of the work and it was fixed hard and fast to the floor plate where all the necessary sledge work could never drive the work out of place!

A Handy Slack Tub

Slack tubs in this shop were made of oil barrels, one side of which had been cut down, the other side left high for tongs to be placed thereon. As shown in the engraving about

(*Continued on page* 13)

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OUR EDITOR'S LETTER

FOR a great many blacksmiths the busiest time of the year is beginning. The months when there is scarcely a minute's rest from early in the morning until dark at night are hard ones for the smith. There is a heavy physical and mental strain and if it were not for the fact that the smith is a strong man, he would find difficulty in bearing up under it. Yet everyone knows that the smith is happiest when he's busiest and perhaps that's why he manages so well.

It is therefore all the more to be regretted that the smith, for all his trouble and work, does not feel at the end of the rush season that he's gained very much. It is even sadder that this is his own fault, to a great degree.

Now, let's see what we can do to help our brothers remedy this. We will not go into the question of prices now, although of course that is one of the main reasons for the trouble. Instead we will take up the peculiar method that so many smiths have of being paid for their work. We will also show that for the most part the customer's insistence on postponing payment for work is the worker's fault.

Among the many letters that come into this office we found two that gave us the idea for this letter. One was from brother Overton, and it was written on his regular billhead. The words "Prompt payment will be appreciated" were printed on it. In this letter Mr. Overton also complained that the prices obtained in the East are very low.

The other letter was from P. E. Stephens. It was written on his regular letterhead which bore the words, "Cash? Yes, it's cash now, boys, when we do your work you make us walk too much and wait too long when we give credit." Brother Stephens says that his business has changed entirely for the better since he has changed his method of transacting business.

Now contrast these two letters. The one very politely requests prompt payment, or rather it doesn't even request it—it mentions don't. But we don't believe that "appraciat- prompt payment.

By no means do we want the readers of the Blacksmith & Wheelwright to believe that we advocate "blackjack" methods. We don't. But we don'e believe that "appreciating" prompt payment will really get it. We feel that Mr. Stephens' friendly, but decisive tone will accomplish something.

This is something worth while thinking over. It may show why, after the summer is over, you are no better off than you were in the Spring. Because, you see, this whole "credit" system, as far as blacksmiths are concerned, is wrong. Blacksmiths will not get anywhere if they continue this old way of doing business. We know, that it's hard, very hard to change, and perhaps for a time it may mean a loss of a little business, but it *will* mean that what business is obtained will be paid for. It will mean less worry for the smith—for he never was a good bookkeeper. It will mean that when he shuts up shop at night he will know what is *his*, and not have to say, "Well, I'll have this if John pays me, and I'll have so much if so-and-so pays me."

Do you know that in practically every department store in New York City, it is necessary to place one hundred dollars as a deposit before the concern will open a charge account with you? Do you know that there is a store in New York in which it is necessary always to have on one's account sufficient money to cover all purchases made, if a "charge" account is desired. That is to say, if for convenience, one desires to charge all merchandise bought, it is necessary to have an account with the store in which money to cover this is placed, *before* purchasing.

Now if big organizations take such steps to safeguard their money, why can't the blacksmiths who can ill afford to lose a single dollar?

Suppose that when a man came in to have a horse shod, you said to him, "You'll have to pay me before I do this job—that's the new rule." Suppose that he did pay you, and then you said, "I'm sorry, but I can't shoe your horse now, I've just found out that I haven't any horse shoe nails?" And you kept his money. Can you imagine just the sort of a tantrum the man would be in? Well, isn't that just what he's doing to you all the time? He's coming to you, accepting your work and materials—which represent money—and then saying, "I'm awfully sorry, but I can't pay you right now; I haven't the money, but I'll pay you as soon as I can." Isn't it the same sort of a thing?

Now the question is, have you the courage to change? Are you sufficiently confident in your work and your reputation so that you can strike out and insist on getting what is yours?

Paste up such a sign in your shop as Mr. Stephens has on his letterheads. And do you know you will really be doing your customer a favor? Tell him so. Jolly him along a little bit, and make him feel that he'll rest easier if he doesn't owe you money.

What do you think of this? Write in and let us know what your opinion is. If you've been successful (and we don't believe it) with the credit method, tell us about it, and why you prefer that to the straight cash way. If you've changed to the "pay as you enter" idea, give your brothers the benefit of your experience by writing to the old B. & W.

Because a man does not agree with you as to the best way of running your shop, that is no sign that he is wrong. You may be mistaken yourself.

Mutual Insurance for Blacksmiths

ONE of our readers, Mr. Snider, from Ohio has made a suggestion which deserves the consideration of every smith in the country. Mr. Snider suggests that insurance on blacksmith and repair shops is unreasonably high and that it might work to the advantage of the smiths to form some sort of a mutual benefit organization which would have as its object the insuring of blacksmith shops. He has asked us to put the question before our readers and see what they think about it. We would like to have the opinion of our readers.

Mutual insurance is not a new idea for such organizations have existed in this country for nearly a century. One of the largest organizations of this kind was formed about eighty years ago by a number of cotton mill men in New England. These men felt the need for cheap insurance and met together with the idea of setting aside a certain sum of money each year in an insurance fund. Withdrawals from the fund were made when one of the members suffered a loss by fire. A few years of experience resulted in showing just how much money, per year, was necessary to cover such losses and basing their deposits upon experience, they soon arrived at a definite premium rate.

As the organization exists to-day it covers a large part of the country. Long ago it ceased to specialize in cotton mill insurance and branched to other lines. At present it embraces nearly every class of manufacturing in the country.

Under the present system a member deposits a certain sum of money, termed the premium. In return for this the member receives a policy which is merely a promise to pay a certain amount of money in case of fire, or other causes. At the end of the year a portion of this deposit is returned to the member. The un-returned portion repersents the member's share of the losses sustained by other members, also the cost of maintaining the offices and paying the employees.

The true "Mutual" insurance company has no un-divided profits. It pays a dividend to the member as outlined in the previous paragraph, and there is no such a thing as a stock-holder.

It would be a practical matter for our subscribers, for instance, to form such an organization. They would be governed by state laws and at first the insurance would cost more, probably, than it could be obtained elsewhere. But as time went on and the number of members increased there would be a larger number to share the losses of the few and the costs would drop.

But such an organization has its disadvantages. Blacksmith shops are not standardized. John Smith's shop is built of wood and he is careless with his forge. The risk is great and the chances are that John will have several small fires in the course of a year. Henry Jones' shop, on the other hand, is made of concrete. Hardly a chance that anything in it will burn. Obviously you couldn't expect Henry to pay as much for his protection as John.

In order to assess the premiums it would be necessary to maintain inspectors who would travel over the country and visit the various members with the idea of preventing fires and fixing rates. All of this costs money.

Present day insurance costs are based upon statistics. It is found that blacksmith shops are subject to frequent fires. This being so it is only fair that they should pay larger premiums, than those shops where fires are infrequent.

In order to start a mutual insurance company the law requires that a certain amount of money be deposited in a fund to protect the policy holders.

To start such an organization as our friend suggests requires considerable, solid support; money, and the heads of a number of big executives with much experience.

CYANIDE HARDENING

(*Continued from page* 11)

one-half the staves are shown cut away down to the bung-hole level, while the remainder of the staves are left full height. The "high back" was hung full of tongs, those most used being kept on the back of the barrel where they were always handy. The little used tongs were kept on one of two bar steel racks located at the end of the shop back of the forges, almost outside of the shop and close to the mast of the crane which served the three forges.

The placing of tongs upon the "High Back" is a great advance from keeping the tongs on the edge of the slack-tub with one leg of each pair immersed in the water in the tub. Tongs, especially if there be many of them, kept thus on the top end of a low tub, are in the way a good deal and sometimes become quite a nuisance to both the smith and his helper. Placed on the tops of the staves left at the back of the slack tub, the tongs are never in the way, and the legs are not dangling in the slack-water to feel wet and uncomfortable when grasped by the smith.

Steel Tool Racks

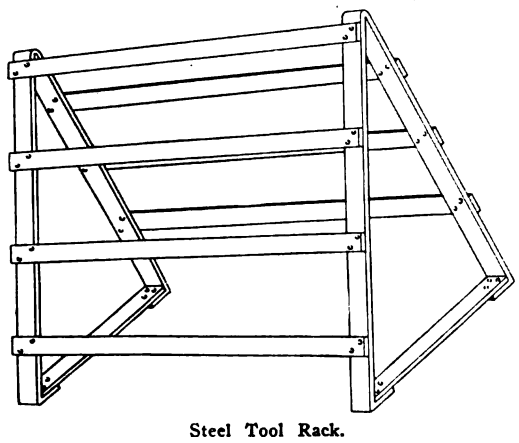
There were so many tools in this shop that some place had to be made for keeping them permanently located so as to be readily found and easily accessible at all times. Two steel racks had been made and at the time I saw them, they were completely covered with tools. One of the racks was about six feet long and high and was made of ¾ inch by 4 inch black steel, bent and riveted as shown in the cut with seven rails or bars upon which tools were hung as thickly as they could be placed. I'll wager there were 200 pairs of tongs hanging on one of the racks, besides a whole raft of cutters, swages and other smith tools.

The other rack, a bit smaller and made of three-inch bar steel was loaded with tools belonging to the big power-hammer with the ten-inch "air-steam" cylinder. It would require a couple of columns in this paper to barely enumerate all the tools which were hanging on these racks—therefore I won't try it!

Sows and Swages

I believe I glimpsed half a dozen "sows" in this one shop. There were all sizes and shapes of that handy tool to be found and usually each was placed upon wooden blocks, a block to each sow, and the blocks were sections of timber much like the regular anvil block. The blocks were sawed square at either end and were large enough so that they would not tip over easily while in use. Some of these blocks were 16 to 18 inches square and a few were round sections of tree-trunks made of long-leaf yellow pine, as were all of the blocks, those for the anvils included.

The blower, its motor and nearly all the

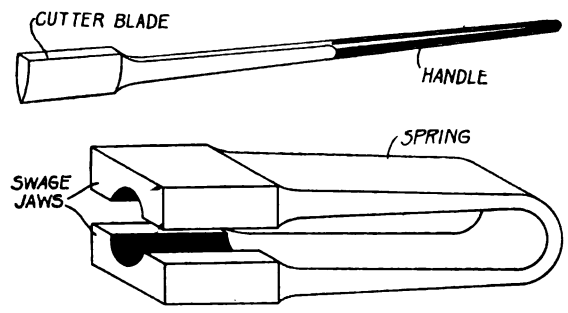


Steel Tool Rack.

other machinery required in the shop, were placed under the roof in the little "attic" or what would have been one were there a floor laid upon the beams of the roof trusses. Thus the entire shop space was clear of everything which might interfere with handling large work. There was not a post or a belt or a pipe in the way for all such things were arranged to pass up or down close to one of the six posts which supported the roof of the shop.

Hanging all over the smaller rack and scattered on the ground back of the big power hammer, were all sorts of tools for use with that machine. There is not space available in this story to even list the many ingenious tools to be found in this collection. However many were formed something like that shown in the engraving. This shows one swage for rounding up four-inch forgings, short work only being handled with this tool. When long sections are to be rounded, a swage is used in which the hollows run crosswise in the jaws instead of lengthwise as shown by the picture.

The swage jaws are made heavy and strong to hold their shape under heavy blows in the big hammer. The tool was forged straight, the jaws formed and the groove forged in roughly, then the tool was bent over upon itself as shown and the grooves finished by hammering the jaws with a piece of cold rolled steel between them, alternated with hammering on top, bottom and sides with the cold steel shape removed. The spring of the bent-over portion was sufficient to allow the jaws to open enough to receive and release



Power Hammer Swage and Cutter.

work, and stiff enough to always hold the grooves in exact alignment.

In use, this tool was usually picked up by the crane and the spring end either held by the crane during the forging process, or if the crane was needed to handle the work, the swage would have its spring end propped up on a light steel trestle or "horse."

Ten or fifteen of these swages of various sizes were seen in this shop around the hammer or on the rack together with a large number of other tools evidently made for special forging operations, A large number of other tools were in evidence, many of the type shown in the engraving with the swage. This cutter takes the place in power hammer forging, of the anvil dead-head, also of the handled cutter or cold chisel so much in evidence in hand operated smith shops.

These tools are usually made by the smith as required. Some of the tools have plain handles as shown, others have welded "shovel handle" ends of elaborate make, while others of this class of tools have the end bent at right angles to give the hand a better leverage when holding the tool in cutting position. Sometimes a plain unwelded eye has been turned in the handle end of one of these tools and in case of necessity a stick or a hammer handle may be thrust through the eye to steady the cutter and to hold it steadily in position under impact of the hammer blow.

Benches and Vices

There were very few benches and vices in this shop. I only noticed two vices and only an apology for a bench. Surface and floor plates take the place of benches in this shop. A thick flat piece of cast iron, planed on all six sides and placed on a block or on two oil barrels, forms an ideal bench and chunks of cast iron, well machined, 18 inches square and two to four inches thick were seen in profusion around this shop. The helper required only a few seconds to turn a sow down flatwise on its block and to lay a flat plate on top of the sow. What better workbench could be desired?

Of the two vices seen in this shop, both were of the "leg" type and the smaller vise was attached to a small but stout and very narrow bench placed between two of the round cast iron supporting columns of the shop. The necessary filing, chipping and thread-cutting on small work was done at this vise. Only small stray jobs were done here however, for if there was a considerable amount of such work to be done, the material would be loaded on a little flat car and pushed along the 36 inch railway track into the machine shop 100 feet south, where thread tapping and such work could be done to better advantage than in the smith shop—a shop designed for smithing and for nothing else: and they certainly can do smith work in it—anything and everything which can be done in any smithy.

A Mammoth Vise

But the other vise—well, that was a "sock-dologer." It was the biggest vise I ever saw. The jaws were all of ten inches long and the tool must weigh nearly half a ton! It was fastened to a short post evidently set in the ground and in concrete at that. There was no bench room at all near this vise save the small space on top of the big post to which the mammoth leg vise was made fast, and as the vise took space on top of the post, there was not very much tool room there after all. Just room to place a hammer, chisel and file.

Special Tool Racks

Other tools when needed at the vise or elsewhere around the shop were placed on little plank affairs nailed up like open boxes a couple of feet to three feet square which were used lying on one side with tools inside and on top. Two holes bored in each of the opposite sides were fitted with rope handles, the short ropes being knotted inside of the box. Two men could easily carry one of these plank boxes to any place where it was needed, and there it did double duty, as a bench; also when required, as blocking to hold work in position.

Only three men were at work in this little shop at the time of my visit, but let a vessel tie up at the river building for repairs and a lot of smith work be required, and blacksmiths swarm everywhere. They come from the boiler and machine shops—duplex men who are good smiths when needed and boiler makers or machinists when those branches of work are more pressing than smith-work.

A WORD OR TWO FROM KENTUCKY

From Bennett & Company, Kentucky.—I have not seen anything from Kentucky in the BLACKSMITH & WHEELWRIGHT lately, and therefore I am sending a few lines about our shop. Our shop is 26 by 84. We have two electric fire blowers, one sixteen-inch blower, one 6 horsepower J. H. C. engine, one band saw and emery stand.

We have enough work to keep three men busy all of the time.

I notice that we do not get as good prices as some of the States, although better than a great many. I am sending some of our prices herewith.

Horseshoeing

Plain Shoes, up to No. 4	$2.00
No. 5 and up	2.50
Toed Shoes, up to No. 4	2.50
No. 5 and up	3.00
Resetting Old Shoes	1.50
Shoeing Stallion or Jack	5.00

Wagon Work

Spoking Road Wagon 1 1-2 to 2 1-4 per wheel	$4.50 and 6.00
New Rim up to 1 1-2	3.50
Up to 2 inch	4.00
Filling Wheel complete 2 inch x 1 1-2 rim, tire included old rim	7.50
2 inch rim	8.00
Tire Shrinking, 1 1-2 and under	1.00
25c extra for each 1-2 inch above 1 1-2	
New Tires 1 3-8 to 1 1-2 per set	16.00
2 inch	20.00
Axle 3 inch and under front	5.50
Hind	5.00

50 c extra for each 1-4 inch over 3 inches.	
Front Hounds $3.50, pair	6.00
Hind Hounds $2.50, pair	4.00
Tongue, plain, old irons used	4.00
Log Wagon, plain, old irons used	5.00
Mowing Machine Tongue same as road wagon.	
Sand Board	3.00
Bolster, front or hind	3.50
Reach $1.50. Brake Beam	2.25
Brake Blocks, each 50c, pair	.75
Set of Brakes complete	10.00

Buggy Works

Shafts, each	3.00
Cross Bar	1.25
Single Tree, sword end	.75
Single Tree, round end	1.00
Resetting Axle, front	1.50
Hind	1.25
Welding Shaft Irons, each	.75
Reach, double, each	1.25
Spoking Wheel	35 c per spoke
Rimming Wheel, tire extra	2.50
Tires, steel per set	10.00
Tires, rubber	16.00

Plow Work

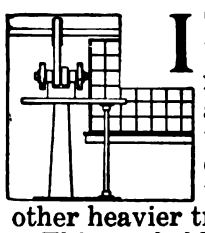
Double Shovel Beam	1.50
Helve	1.00
Handles, each	1.00
Jumping Shovel Beam, two horse	3.50
Breaking Plow Beam, two horse	3.00
Plow Beam, one horse	1.50
Jumping Plow Beam, one horse	2.50
Helve, short, $1.50. Long	2.00
Sharpening, double shovel, pair	.25
Sharpening single and coulter	.25
Sharpening plow shares, 2c. per inch of steel.	
Grinding Cast Points	2c per inch

Miscellaneous Work 75c. per hour, material used extra.

Smithing in the Fifteenth Century

How the Smiths of Long Ago Did Their Work With Crude Tools

BY H. H. MANCHESTER

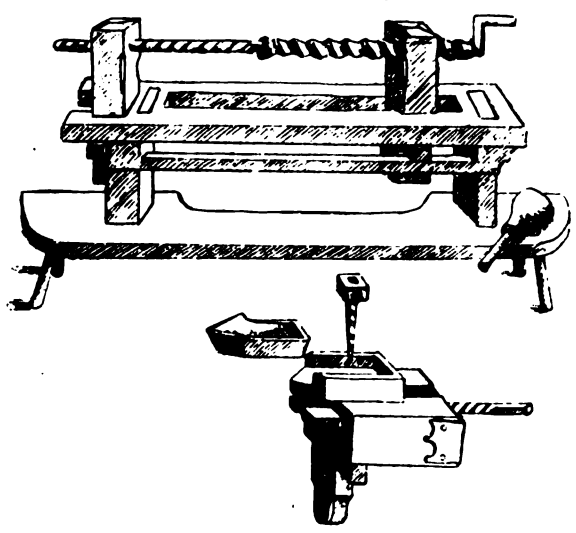


IT is characteristic of the 15th Century that we find a number of pictures showing attempts to make use of water power or hand machines in iron working, as well as in several of the other heavier trades.

This probably grew out of the successful use of the water wheel, which seems to have been employed in Roman times not only for grinding grain, but to have been applied by the Arabs in the Middle Ages for crushing sugar. The next application of this source of power seems to have been to blowing the bellows used to heat the furnace employed in making iron from the ore, and in working it afterwards.

Perhaps the oldest picture of a water wheel used in iron making is on a silver vase dating from about 1400, but it is rather indistinct. In one of the several military treatises, however, which dates from about the first part of the 15th Century there is a sketch of a water wheel being used to work two pairs of bellows to blow the furnace for a smith.

The earliest picture of a vice may be the one which is found in a house book of about 1475. In the same drawing just above this



A Vise and a Screw Cutting Lathe of 1475.

is a lathe probably used for cutting a bolt or screw. There is an earlier representation in a window painting of the 13th Century of a lathe being used to cut wood, but the one in the house book of 1475 is of such a size and shape that it may have been employed for metal, and if so is the earliest picture of the sort.

From near the close of the century date a number of sketches by Leonardo da Vinci, the great artist and engineer, illustrating his ideas for various power and hand machines. Among these are represented a rolling machine for iron rods, a rod drawing machine, a file cutter, a horizontal borer which may have been designed for guns, hand thread cutters for screws and nuts, grind stones interconnected by gearing, several forms of toothed wheels, and various methods of blowing the bellows. There is no evidence, however, that these machines designed by Leonardo da Vinci were actually made and put to work. On the contrary, the pictures of the 15th Century illustrating typical blacksmith shops prove that the work was carried on almost entirely by hand.

An Ancient Myth

One cut which shows a typical interior of a horse shoeing shop on a rather large scale illustrates a mediaeval myth which appeared in several forms. In one of these, a smith who was a great boaster had a sign on the outside of his shop that he was the master of all master smiths. One of the saints who was the patron of iron working happened along, and observing the sign stepped into the shop to see what kind of a man it was who claimed so much. He found the smith not only a great boaster but highly irreligious. So representing himself as a journeyman, he agreed to test his skill with the master of the shop. The first horse that came to the shop the master smith shod rapidly and neatly, and when he had finished remarked: "I guess you will have to do something to beat that."

When the next horse came to the shop, the saint instead of taking the hoof in his lap to shoe it, took off the lower part of the leg, and shoeing it with a few blows placed it back on again. He did this with each leg in turn, and the smith finally exclaimed: "Well that is a pretty good idea, I'll have to try it myself." He actually did so on the next horse, but as he could not put the leg back on again, he had to beg the saint to help him, who complied only on the condition that the smith would be converted.

The interior of a cutler's shop shows a frame for working a bellows with one hand, but no improvements in tools.

The best view of the interior of an armorer's shop dates from about 1500. It is taken from the White King, by Burghmair, which is a biography of Maximilian, the Emperor of the Holy Roman Empire. The engraving illustrates the visit of Maximilian to the shop of

An Armorer's Shop of 1500

his armorer, Conrat Seysenhofer, the one who forged for Henry VIII of England the suit of armor which is now preserved in the Tower of London. The picture probably illustrates most of the different sorts of tools then in use in such shops. Most remarkable are the large metal cutting shears which may be seen at the left of the picture and are fastened at an angle in a block of wood. This is probably the earliest picture of shears used for this purpose.

In the foreground of the picture appear a large number of different shaped punches, chisels, hammers, and files, as well as anvils suitable for different operations.

It was declared that this armorer had thirty front pieces and thirty back pieces of armor made in his shop at one time. This may imply sixty workmen, and some kind of division of labor. The emperor is reported to have warned Seysenhofer not to use the

A Mediaeval Drawing Illustrating the Myth of the Horse.

forbidden art in any part of his armor. Possibly this meant casting instead of forging, but there is no definite explanation.

In the 15th Century the guilds developed to such an extent that they split up into various specialized crafts. Thus instead of a smith who worked in all kinds of metals as in the earliest times, and instead even of a blacksmith who did all kinds of work in iron, we begin to find ironsmiths, armorers, cutlers, locksmiths, gunsmiths, nailmakers, surriers, and horseshoers, to say nothing of the crafts which worked in other metals.

A Cutler's Shop of the 15th Century

While this multiplication of guilds was proof of the increasing importance of iron working, the conflicts which necessarily arose between so many closely allied crafts made it possible for the new factory system which arose in the next century to compete with the guilds and eventually to supplant them.

WITH MR. PHILBRICK

From F. Eckleberry, Ohio. I should like to say a few words to Brother Willis Philbrick about the mistakes that he made. To me it seems that he is a good mechanic from the way he writes, but his advice is poor concerning the young blacksmiths keeping their mouths shut. I am an old blacksmith myself, but believe that I have kept too quiet for my own good. An art that few blacksmiths master is: Next to saying the right thing at the right time comes the art of few blacksmiths who should open their mouths to say something for their rights at the right time.

Which young blacksmith would want to follow in the footsteps of the old timer who worked from twelve to sixteen hours a day, and could hardly eke out a living and whose farmer neighbors became rich? The main object seemed to be to get out lots of work and to see who could do it the cheapest. Today the young blacksmiths say "I will do the work, and do it right, but I want the right price."

I think that the auto was a great factor in educating the smith. It is very sad for a blacksmith to make himself a servant to something so that his manhood is all taken out of him by a hydraulic pressure of excessive business.

I should not like to be merely a great mechanic, a great lawyer or a great musician. I should like to be also something of a man. Be glad each day of your life that you are living and do not hesitate to let people know it.

Shine where you are, old blacksmith man, you would make better mechanics if you would light up the world as you go. Do not be stingy with your good ideas. Perhaps they will help more than you know. It may be that you will make some work a little lighter with the beams from your life's steady glow.

"Let the young blacksmith do the pounding,
That's the way he draws his pay,
Any one can be a knocker,
Now be a booster every day."

DISAGREES WITH MR. LITTLEFIELD

From H. P. Eidit, South Dakota: I wish to answer the letter from Fred Littlefield, of Montana. The first thing I want to say is, however, that I believe that the BLACKSMITH & WHEELWRIGHT to be a number one magazine that every blacksmith ought to have.

However, in regard to this man's plow pointing and blade sharpening. It seems to me that he must have a factory to turn them out. When he states in his letter that in the month of May he sharpened forty to sixty a day, if we consider fifty as an average at fifty cents a piece, the amount is $25.00 a day. He also states that he made two hundred and forty-six points in this month at $1.75—this amounts to $430.50. Figuring $25.00 a day, and about twenty-seven working days in the month, the amount for sharpening for the month is $405.00. Adding to this the $430.50, which is the total amount for the points, we have a total of $835.50. This is to say nothing about the other work which comes along. Brother Blocksmiths, it is no wonder that the farmers want to cut down the prices. It seems to me that when he makes $1200.00 in a month, you cannot blame the farmers.

The price of $1.75 for pointing and fifty cents for sharpening is not fair. To me it would seem that if a blacksmith charges fifty cents for sharpening, he should charge $1.00 for pointing. If he charges seventy-five cents for sharpening, he should charge $1.50 for pointing. If you use six pounds of iron at seven cents per pound add your profit, and if you work two hours at $1.25 an hour, and this would be a fair price, but eight new shoes for $11.00 and resetting eight shoes for $8.00 is not right.

Wake up, Brother and then find the $3.00 difference. Charge $12.00 for new shoes and $6.00 for old and this is about right. The rest of your prices I consider all right. One spoke we charge $5.75 for and $2.00 for setting the tire on one wheel. Of course, if you put in six or eight spokes you can come down to sixty cents per piece.

Brother Louis Mergl of Nebraska sent in a fine price-list. Notice his prices and you will find that their relation to each other is fair.

TWO WRENCHES

From Charles Chism, Ohio: I am sending a rough sketch of a wrench that I have patented. It is easily made and may help some brother smith.

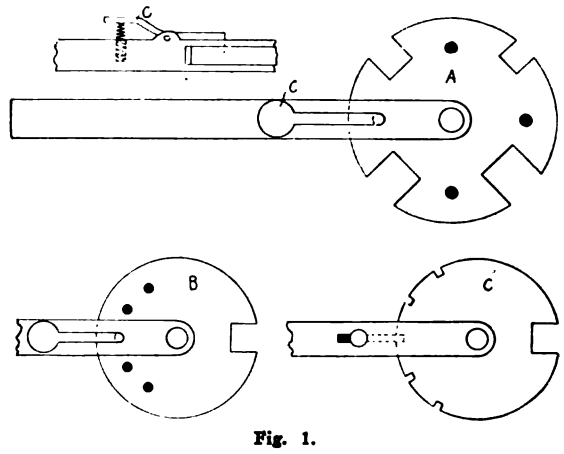


Fig. 1.

Take a piece of tool steel shown at A, figure 2, two by three-eighth inches and round it and make your wrench. Then file the ratchet teeth as shown at B. Take five-eighth inch or three-quarter inch round stock or as heavy as you want it to make the

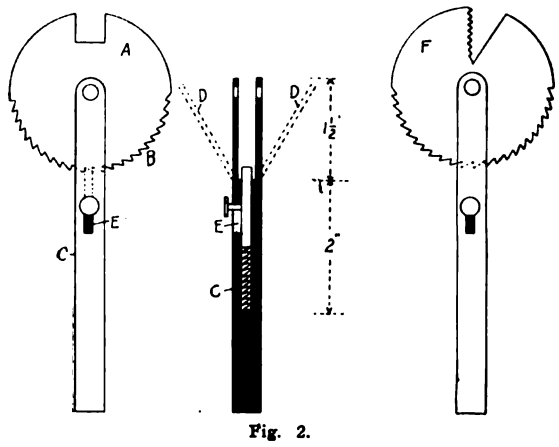


Fig. 2.

wrench handle, shown at C, and split it down one and one-half inches. Turn back as shown at D and drill down in the handle C, two inches for the spring. Cut a slot at E, then put in the wrench between the forks and the plunger will work in the ratchet. It will make a cheap handy wrench or a pipe wrench as shown at F, figure 2.

The wrench shown at A, B, C, figure one, is easily made also. The spring or catch D is seated in the handle. I have been making these wrenches recently and they work very well. There can be a dozen size wrenches for the same handle by just removing the bolts.

Repairing Vise Faces

From C. Smith, Pennsylvania: Very often in my friendly observation visits to shops, I notice that the vise is often in poor condition to hold work. I have noted its points of weakness. I came across a vise in a rural shop that was to me quite wonderful in its holding qualifications. I therefore examined it to find out what its special merits were, and noticed that the corners were well fitted together so as to hold any small piece of work, and also that its two faces were so formed that the edges gave a good grip to the pieces to be held.

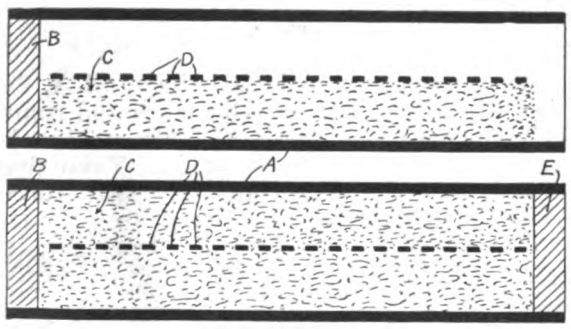
I find that it is troublesome to smiths to cut the faces of a vise, but by a simple method, I find that this is overcome. Vises are usually cut cold, but by the method I speak of, the faces after being fitted by not touching in the centers, but by biting at the corners, then being made red hot and with a sharp chisel chapped criss-cross, or any irregular way to make them rough. The chisel should have a handle about fifteen inches long.

Roughening the faces in this way, will make them hold much better. Then at a low heat coat the faces with "case on" or prussiate of potash. Harden in a solution of sal soda water.

A vise treated in this way with a well oiled screw and a brass or copper washer between the vise and the screw collar, so as to loosen friction will make the vise extremely serviceable. I advise the smiths not to use a vise, the face of which makes the job slip, but in this simple way to fix it so that the work is held firmly.

Case Hardening

From William Scrafford, Idaho.—In the April issue I noted that J. E. Corkle of Kansas asks how to case harden hearth steel, and do it cheaply. I have not had occasion to case harden steel very much, but I have done a little of the work, and if the formula I give below is of any use, Brother Corkle is welcome to it.



Mr. Scrafford's Method of Case Hardening.

I should advise him to experiment on a small scale first. Take a piece of three-eighth pipe as shown at A, about one foot in length. Heat one end and close together as at B, next take some dry bones and pound them up until they are reasonably small. Lay the pipe on its side and fill with small pieces of bone, as shown at C, to about one and one-half inches, then take some horse shoe nails as at D and lay them along inside of the pipe, so that they are not touching one another.

Cover the nails with dry bone as at C, and seal the end of the pipe with fire clay as at E. Place the pipe in a slow fire for thirty minutes and this should case harden the nails. With a little practice in timing the length of heat for the steel, I believe that you can learn to case harden to one-sixteenth of an inch. I cannot say whether or not this would be practical since I have no way in which to tell you how to heat the steels so that they would be the same temperature all around in such big quantities.

Tire Heating Furnace

From G. B. Maxwell, Missouri.—In one of the recent issues of the BLACKSMITH & WHEELWRIGHT, Brother Morcombe of Canada, wants a description of a tire heating furnace for heating wagon tires. I am sending a photo of the one that I built five years ago. I have never heated a tire on the ground since, and as can be seen from the picture of the two piles of old tires, we do a very good business.

Since this picture was taken, I have installed a gas engine and a fourteen-inch blower instead of the hand blower shown.

Photograph of the Tire Furnace.

The rollers are driven with a sprocket chain. The sketch herewith indicates the dimensions. I hope that the brother smiths will obtain helpful information from this data on what we call the "Roaster."

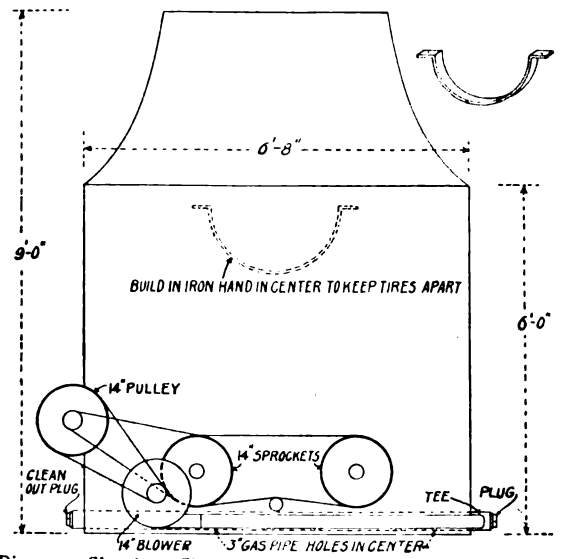


Diagram Showing Clearly Method of Building the Device.

It Happened in Our Office

It was after hours, and only a few harassed editors remained to burn the midnight oil. Our copy manager had gone home when a boy came in with some proofs for him to O. K. It was explained to him that the gentleman was not likely to come back that evening, and would he "wait until morning?"

The boy looked up, quite startled, and asked, "What! Wait here all night?"

"As men's heads swell," says a philosopher, "their brains shrink." But isn't it the other way—when their brains shrink their heads swell?

Platform Gears

Description and Sketches Showing How to Make Bent Futchel Gears

WE ILLUSTRATE herewith a heavy platform gear on which there is comparatively little iron work, the main and secondary futchels being of wood. The manner in which the parts are combined, serve to give a very strong gear, one that is not difficult to work and one which, owing to the simplicity in construction, can be put up by any man who has any knowledge of platform gear manufacture. It is intended for a short turn wagon, the kingbolt being placed six to eight inches forward of the center. This feature makes a working drawing a necessity, for without such a drawing it will be almost impossible to frame up the different parts and have all perfectly true and in their correct positions, and unless this is done the gear will not wear as it should, neither will the line of draft be at right angles with the

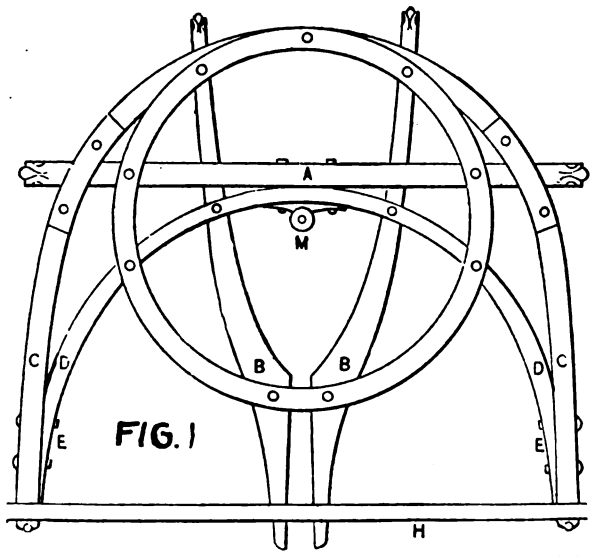


Fig. 1. Ground plan of under carriage, showing bent futchels and location of kingbolt socket forward of the main bed.

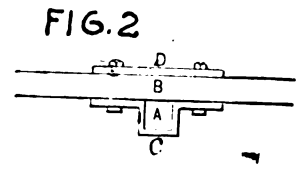


Fig. 2. Manner of Securing Futchels to Main Bed.

axle. Care must be taken to keep the bent pieces up to their proper form. Woodworkers who have had much to do with bent timber know of its tendency to contract on the circle after having been dressed up, and it is this contraction that must be guarded against; to do this nothing is better than an outline drawing of the bent piece upon plank of sufficient width and length. Then when the piece is dressed to the shape lay it upon the diagram, and set in good stout spikes at the points outside and inside, that will prevent its changing form. Leave this piece on the form until all other parts of the gear are finished, then put the bent parts in place and secure them by bolts or clips. Fig. 1 shows the ground plan of this gear: A, the main bed, requires to be made of first-class white oak for an ordinary two-horse truck. This bed should be 2½ inches thick and 5 inches deep in the center, as it sustains the entire weight, the ends resting upon the centers of the heavy elliptic springs and the center receives the strain from the kingbolt; B,

Are You Getting Your Share of This?

There are times when trade is not so brisk and many and many a dollar can be added to your profits.

Do you ever notice how many Fords or automobiles need new top covers now and new celluloid in their curtains? You are driving your own customer away by not doing it for him and you are losing a big share of profitable business that is yours. You may be busy now, but remember your customer prefers to have one man do all of his work. Your customer's car needs just as much attention (probably more so) than does his horse or farm wagon.

If he takes his car to the factory to have new celluloid put in his rear curtain the factory will charge him at least $2.50 for doing it. You probably have not done this work because you needed a special sewing machine to sew this celluloid in or probably you were afraid to try it. It is the simplest thing in the world. Any body can do this work in a few minutes.

We visited with our old friends, the Wheel Top & Hdw. Co. of Cincinnati, Ohio, the other day and were surprised to see the quantities of top covers and rear curtains that they were making and shipping for all kinds of cars and to all parts of the country. These top covers were not only Fords, but were for all kinds of cars. We were informed that many an old time smith was doing this work nearly altogether. They also informed us that they were giving the Blacksmiths the benefit of their wholesale prices.

Ford covers can easily be carried in stock because a cover will fit any Ford Car from 1915 to 1920.

Our suggestion would be for you to get in touch with the Wheel Top & Hdw. Co. of Cincinnati, Ohio and get their number 67 catalog and they will quote you wholesale prices. Don't let this golden opportunity slip by you.

Titanic Springs

Many blacksmiths are finding it not only practical but profitable to sell automobile springs. Many are already selling Titanic Springs manufactured by the Tuthill Spring Co., 760 Polk St., Chicago, Ill. and it would pay those who are not already familiar with the Titanic line to investigate it.

These springs are constructed with a "Hump Center" which it is said is unbreakable and thereby avoids accidents. The manufacturers guarantee them forever against center breakage.

It will be to the advantage of smiths to write to their nearest distributor for full details.

Columbia Calipers.

Very efficient tools are the Columbia Calipers which are manufactured by the Columbia Caliper Co. of Marietta, Pa. They are well built and noted for their accuracy. They do away with any hit or miss work and make blacksmiths certain when doing a fine job. The Columbia Caliper Company is the successor of the E. G. Smith Co.

the hounds which are reduced in thickness back of the face of the bed, the shoulder being cut on the top side and boxed into the face of the bed one-eighth of an inch, to take the strain from the shoulder. The hounds may be reduced in thickness between back end of the jaw, but not so much as to make

Fig. 3. Main bed, showing location of futchels, fifth-wheel bearings and hound mortises.

a shoulder less than three-eighths of an inch deep. The main futchel, C, should be bent of fine second growth white oak, and 1¾ inches wide. The depth should not be less than 2 inches. This may have to be increased if the ends of the bed are cut down more than the amount necessary to bring the top of the futchels on the same level as the fifth wheel bearings on the main bed, as the rear of the fifth wheel plate must rest upon the bend of the futchel and be bolted thereto. The secondary futchel is used as a brace. It need not be as thick as the main futchel, but it must be framed so that the top is level with the top of the bed and the main futchel, as it, too, rests against the underside of the fifth wheel plate. The ends are securely bolted to the main futchel as shown at E. The hounds, B, being lower at the fifth wheel than the bearings on the main bed makes a segmental block necessary between the fifth wheel plate and the hounds. Thimbles must be placed on the rear securing bolts of the fifth wheel to level up between the plate and the hounds. A straight drawbar, H, is used; it may be provided with trace posts or whiffletrees may be used instead. When they are employed the jacks must be attached to the futchels by plates, bolted to the under-

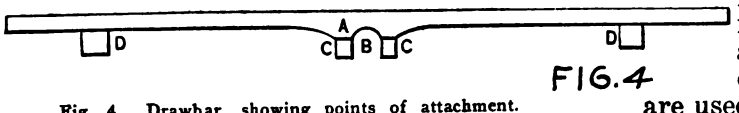


Fig. 4. Drawbar, showing points of attachment.

side. The kingbolt eye, M, is forged to the shape shown; the eye should take a 1-inch bolt. The block is bolted to the secondary futchel and the main bed. A secondary plate must be provided and secured to the main bed by bolts. This latter socket may be of malleable cast iron, or it may be forged. It should be of sufficient depth to provide a 3-inch socket for the kingbolt. As all the draft comes direct upon the kingbolt, it is important that the socket be extra strong. The principal ironwork, aside from the fifth wheel and the kingbolt socket, consists of truss braces under the hounds and under the futchels, and a plate on the underside of the main bed extending the full length so as to rest on the springs. The drawbar is secured to the futchels by clips, with bolts, the bolt heads resting upon the drawbar, and by bolts through the jaws of the hounds. The manner of securing the futchels to the main bar is shown by Fig. 2. A, the end of the bed; B, the futchel; C, the box clips around the bed with flanges extending along the futchel; D, a plate placed upon the futchel, the whole being secured by bolts as shown on Figs. 1 and 2. Fig. 3 shows a side view of the main bed A, Fig. 1, A, body of bed; B, fifth wheel bearings; C, cross sections of futchels; D, mortises for the hounds. The elliptic springs are secured to the ends of the bed in the usual manner. Fig. 4 shows the front of the draw-

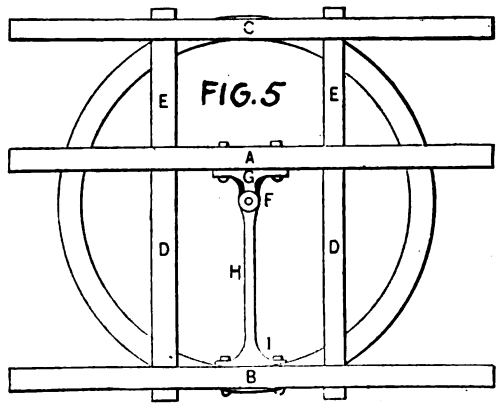


Fig. 5. Upper carriage, showing location of cross bars, parallel bars, and kingbolt.

bar; A, body of bar cut away over the jaw, B; the depth of the bar at the center is determined by the difference between the top of the hounds, C, and the top of the futchels, D, at which points the bar should be fully two inches deep. If trace knobs are used they provide step pads at the ends of the bar. When whiffletrees are used, square step pads can be secured to the ends of the bar. These may be malleable iron.

Fig. 5 shows the top carriage, A; the main bed set to ride directly over the main bed A Fig. 1, B, C, the front and rear cross bars, D, the nutter or parallel bars, which connect the three cross bars. The front ends are tenoned through the bar B, the bars being 1¾ inches deep between bars A and B, and ⅞ of an inch deep back of shoulder that rests against the face of the bar B, mortises being cut through bars B and C to take the tenon section E. The depth of the bars A, B and C should not be less than 3 inches at the fifth wheel bearings and cut away from the underside to 2 inches at the ends. The depth in excess of 3 inches is determined by the hang of the body and the difference between the height of the front and rear wheels, F, shows the kingbolt socket and the bearing upon which the head of the bolt rests, the head, G, that bears against the main cross bar. The brace H, and the forward head, I, which rest against the rear of the front cross bar are forged solid or are of a malleable iron casting. This brace is securely bolted to the two bars. The bar H, should not be less than 1 inch in diameter, if of wrought iron and heavier if of malleable, the other parts being proportioned as shown. The securing bolts should be ¾ inch. When kingbolts are used as here shown the lower end should be provided with a loose T to prevent the bolt jumping out. The T can be set into a split in the bottom end of the kingbolt; it need not be more than ⅛ of an inch thick and 2 inches long, as its only province is to prevent the kingbolt jumping out of its socket.

Fig. 6 shows an outline elevation plan of the complete carriage, with the hounds showing full length and the futchels removed, as the futchels if shown would completely hide the hound; A, hound; B, rear section cut down to the tenon thickness; C, main bed of the lower carriage; D, cross section of the hound, where it rests upon the hound; E, the segmental block that serves as a bearing for the front portion of the lower fifth wheel plate; F, the fifth wheel plates; G, the center on main bed of the front carriage; H, the rear cross bar; I, the front cross bar; K, the

FIG.6

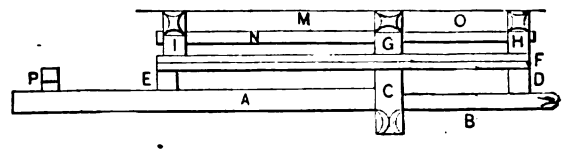


Fig. 6. Side elevation, showing side view of hounds, cross bars, and fifth wheel plates.

parallel bar; M, the bottom line of the body platform resting upon the cross bars, to which it is secured by strong bolts; N, the parallel bar showing full thickness between the bars G and I; O, the reduced thickness between the bars G and H; P, the draw bar. In making this platform, as with any other, care must be taken to secure a perfect bearing for the fifth wheel plates.

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CLASSIFIED BUYERS' GUIDE

BLACKSMITH AND WHEELWRIGHT

and TRACTOR REPAIR JOURNAL

Vol. LXXXIII. No. 7 JULY, 1921 TERMS ONE DOLLAR A YEAR

Practical Horseshoeing

Preparations Used for Treatment of the Hoof and Special Shoes

THESE yield, bend in. Lameness results. If now the bar shoe is employed, and the frog made to sustain some of the weight, the heels get a chance. The lameness may now be expected to disappear, unless the evil has gone too far.

And again. The bar shoe may be of service in connection with sand crack and in cracks in the bar itself. It gives support to the rear of the foot and thus affords relief. Then it promotes frog action, and this itself is good. In fact, if there is more than a single crack, further assistance may be gotten from the frog and assistance even from the sole may be secured by using a thick piece of leather and packing the space between it and the sole with tow.

"A bar shoe can always be applied, even when quarter or quarter and heel are much broken, provided the frog be sound and fairly developed. Should the frog be healthy but small, it may be built up by applying gutta-percha or the special cement" now to be described.

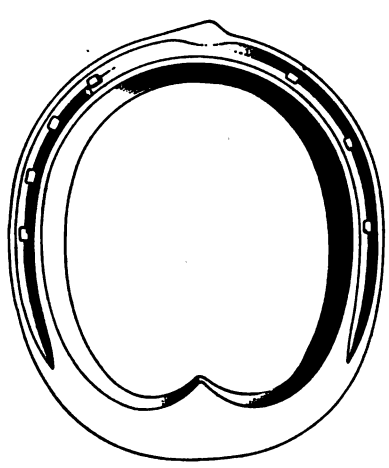


Fig. 1. Concave Bar Fore Shoe. Made in concave tool from three-eighths by five-eighths-inch iron

De Fay's Cement

This cement is a substitute for horn. It is prepared from purified gutta-percha and gum ammoniacum. First, one softens the gutta-percha in water, and then divides it into pieces of the size of a hazel nut. A quantity of these pieces is mingled with an equal quantity of the gum ammoniacum. The mixture is next melted over a slow fire. The vessel used may be of tinned iron—that is, of ordinary tin plate.

As the heating goes on, one uses a stirrer and slowly mixes the mass until the whole is thoroughly mixed together. When the mixture is right, it will resemble chocolate in appearance. It may be formed into sticks. The half-and-half mixture described is suited for ordinary summer use. For winter, a softer mixture is prepared by increasing the relative amount of gutta-percha. This cement is a kind of artificial horn. It is of about the same consistency as the natural article, and resembles it also in point of toughness. It may be softened. It does not dissolve in water. And it will stick to the hoof.

"It may be employed to build up too low a wall or to replace lost portions; to close sand-cracks and thus prevent entrance of dirt; in the various forms of dropped sole to raise the bearing surface of the wall in seedy toe, or, before applying a bar shoe, to build up the frog if atrophied and functionally inactive."

This preparation is, accordingly, suitable to build up a small, healthy frog. The bar shoe is then put on. The reader may wish to know exactly how to proceed in using De Fay's Cement. First, the hoof is to be thoroughly cleansed from dirt and grease at the point where the cement is to be applied. The place is then well dried and roughened a bit. The grease may ordinarily be gotten rid of by using a stick covered with tow, the tow then being moistened with a few drops of sulphuric ether or benzine.

The amount of cement required is now softened by heating it. Do not heat your whole stock, as a number of heatings seem to cause deterioration of the cement.

With navicular disease, the bar shoe is thought to be unsuitable. The same may also be said of double side bone, or picked up nail.

Bar shoes may be used on hunting horses, if desired; although there may be some who hesitate so to employ them. There are, however, some special points to be noted. "The shoe must be drawn from the center of the quarter towards the bar until the extreme posterior part is only about one eighth inch in thickness, and the bar must not project even a fraction of an inch behind the heels. To obtain the best results, the heels must be fitted 'full' on either side, and the upper outer edge hot-rasped to the dimensions of the root, so as to present an oblique, beveled margin about one-sixteenth or one-eighth inch wide. There is then no danger of the shoe being trodden off."

There is another special form of bar shoe which is provided with a thinned region on the inside of the toe. That is, along the inside of the toe, the metal is beaten down on the surface next to the hoof. This type of shoe is regarded as especially suitable for harness or riding horses that happen to have "dropped sole" in a hind foot. It is, naturally, formed to fit the affected hind foot of the horse in question.

The same style of shoe is thought to be useful for a horse which requires treatment for seedy toe. In this latter case, the thinned place in the rear of the toe of the shoe provides an opening through which the diseased toe of the hoof may be treated without removal of the shoe. Clips will be seen in the illustration.

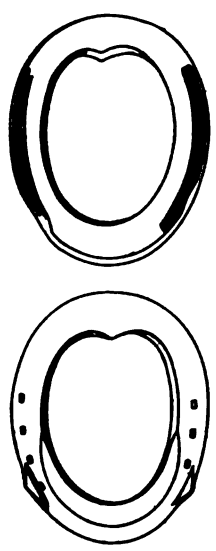


Fig. 2. Fullered Bar Hind Shoe (Seated Around Toe) Made from three-quarter by five-eighths-inch iron. Upper View shows Side of Shoe; Lower Picture Shows Hoof Surface of Shoe

These are useful in some cases where there is so little horn on the toe of the hoof that it is advisable to try a clip at the extreme toe of the shoe. Then, clips at the sides of the toe, as shown in the illustration, permit setting the shoe further back than usual. This setting toward the rear may seem proper in some cases. "The shoe is lightly cradled, *i. e.*, it is thinner at the toe and heel than at the quarter, a formation which enables the animal to place more weight on the back of the foot, thereby relieving the toe.

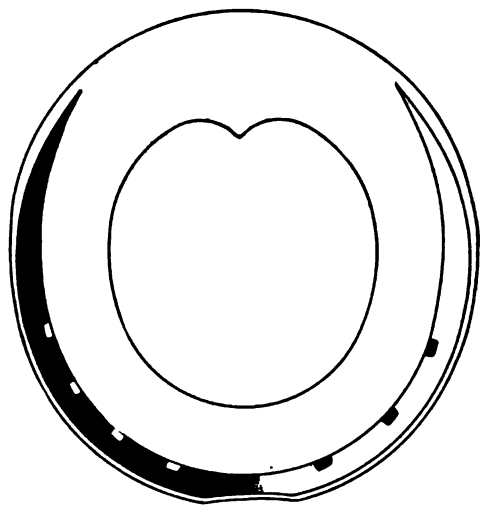


Fig. 3. Fullered Seated Bar Fore Shoe. Made from seven-eighths by one-half-inch iron

In many cases, this is a very important consideration. The toe of the shoe is widened as well as seated-out, so as to give ample 'cover' to the injured parts." The reader will perhaps remember the significance of the term 'cover' used here. It refers to the projection of the shoe on the inside edge beyond the inner margin of the horny wall. This projection serves to "cover" and protect and is useful sometimes.

The ordinary bar shoe for harness horses is represented in the accompanying illustration. The shoe here pictured is for a fore-foot and is practically circular.

This shoe may be made from bar iron seven-eighths by one-half inch in section.

When used in connection with *corns*, the bar shoe helps because it lessens the weight on the heels. It does this by mean of the bar, which bring the frog into service in the carrying of weight. "A bar shoe can also be fitted 'fuller' at the heels than an ordinary shoe, and hence is less likely to produce pressure less on the seat of corn than a narrow heeled shoe."

Flat or *dropped* sole resulting from laminitus may also often be cared for to advantage by the bar shoe. The heels of the bar shoe are to be thinned, or else the heels and toe both may be thinned, the quarters being left full thickness. This produces a cradling effect which is said to improve the gait of horses having dropped sole.

Flat foot with weak and low heels may be assisted by the use of a standard form of bar shoe, suitably modified in minor details. Thus, the shoe is to be widened at the bearing surfaces of the heels. This is of advantage by utilizing the bar to bring about a transfer of some part of the weight to the frog. Attrition in the heel regions between hoof and shoe is said to be reduced. The parts of the hoof in this section are given a chance to grow and to get strong.

Sand crack and seedy toe may, it is thought, be helped by the bar shoe. "It is possible that, in the case of sandcrack,

steady pressure on the posterior [rear] part of the foot lessens the chance of the crack opening, and by retaining the edges of the crack in apposition [position opposite each other], favors the growth of a (new) sound wall."

For such a trouble as any painful affection in the immediate neighborhood of the toe causing the horse to throw his weight on the heels as he moves, bar shoes are indicated as probably helpful. "They should be fitted 'full' at the heels and either 'boxed-up' or 'hot rasped' up to the heel of the foot. This is more important than fitting them so long at the heel, as is customary."

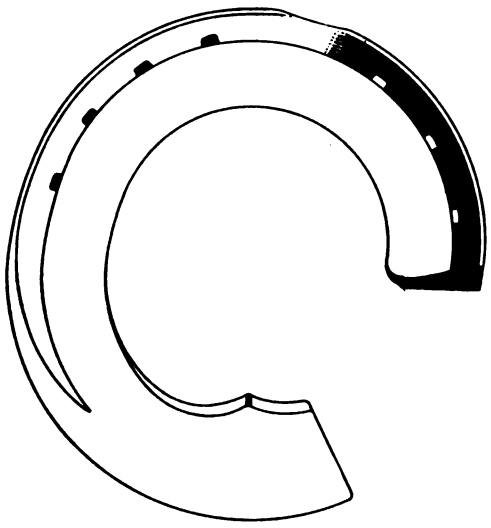


Fig. 4. Fullered Seated Three-Quarter Bar Shoe (For Harness Horse) Made from seven-eighths by one-half-inch iron

The three-quarter bar shoe shown in the accompanying illustration is intended for use on a fleshy, low-heeled, weak fore-foot or for a foot having dropped sole together with a corn in the inner heel. Where the corn is producing matter, the parts in this region may be thoroughly poulticed with this shoe. In *sandcrack*, this may turn out of considerable advantage, especially where the break in the circle of the shoe is where parts are located that should have no pressure upward against them. "The back part of the inside quarter of shoe must be fitted 'full'; otherwise, it is liable to cause the hoof to split away, as hoofs affected with sandcrack are usually very brittle. The clip may be at the toe or outer quarter, or a clip may be placed at both points. The outer quarter is recommended, however, as the preferable spot."

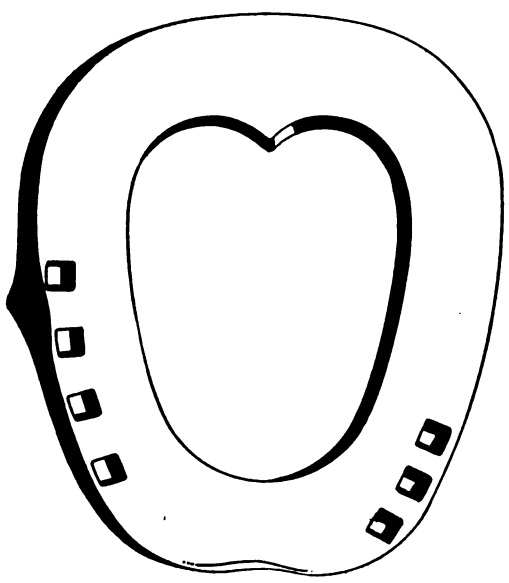


Fig. 5. Stamped Bar Hind Shoe (For cart horse) Made from one and one-quarter-inch by one-half-inch iron

This bar shoe for harness horses may be made from bar seven-eighths by one-half inch in section. It is a fore shoe.

Another modification of the bar shoe is shown in the accompanying illustration. This form is for the hind foot of a cart horse and may be made from rod one-half by one and one-quarter inches in section. "This shoe is intended for cases where the hoof shows a 'false quarter' inside, and where the horse has sustained an injury to the inner heel, which must be relieved of weight. The inside nail holes are therefore placed opposit the only sound part of the foot, viz., that close to the toe. The clips are at the toe and outer quarter."

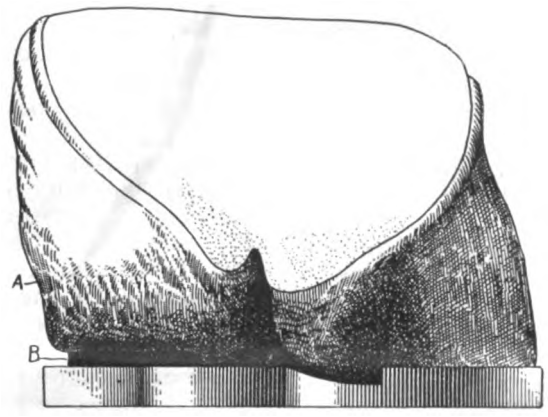
The Hoof Distorted Sideways

Sometimes, a hoof has one quarter and heel upright, while the other quarter and heel are oblique or slanted. The illustration shows what is meant. It is as if the right and left parts belong to different horses. The one half will be larger than the other. Now this condition of the foot may be due to some diseased condition; or it may be simply the natural thing for this particular horse.

If the one half of the hoof, when observed from behind, has its wall running down and in towards the frog and this half of the frog is smaller than the other half, then it is quite possible, not to say probable, that we have here a case of *one-sided contraction.* This kind of distortion may be the result of bad paring of the hoof. If the upright half of the wall is excessively pared, the weight of the horse may be thrown unequally on the two halves and one-sided contraction be caused or favored.

"One of the most fertile causes is neglect of the hoof during the first years of life." In some cases of one-sided contraction, the upright wall will be drawn inward and the near half of the frog may dwindle to little or nothing. In other cases, the wall that originally was all right will be affected, and will in fact be bent outwards.

It is important not to confuse cases of one-sided distortion due to the fact that limb and hoof are improperly formed naturally with other cases where disease is at the bottom of the trouble. If the limb itself is out of shape, a case of one-sided distortion may occur with a perfectly healthy foot. It



is simply out of shape. In such a case, the old shoe is more or less likely to show *even wear* over the wearing surface.

When such even wear is clear and the limb itself is known to be out of shape, and in addition there is no unhealthy condition apparent, about the best thing to do is to let well enough alone. On the other hand, if the hoof is very considerably out of shape, if the horny wall is weak, if the wall curves down and in, and if the limb itself be properly formed, there is likelihood that we have a real case of one-sided distortion due to disease. Corns and sandcrack are to be expected as quite possible.

The *bar shoe* is often of use in one-sided distortion due to disease. The hoof is to be trimmed with the view of getting a level tread. The bars and sole on the upright side of the hoof are to be left stronger than the opposite side. "A strong sole and well developed bar prevent contraction of the wall better than any special shoe. Shoes without heels are the thing, as they favor a level tread.

A GOOD PROVIDER

"Is your husband much of a provider, Malindy?"

"That's jes' what he ain't nothin' else but, ma'am. He gwine to git some new furniture providin' he gits de money; he gwine to git de money providin' he go to work; he go to work providin' de job suits him. I never see such a providin' man in all mah days."

PRICELESS HORSESHOES

Here are two really unusual pictures; pictures that came from 'way across the seas. They are worth while keeping in your scrap book for it is seldom that we find photographs quite as interesting as these.

The upper picture shows the gate of the Castle of Oakham in Rutland, England, and the lower one portrays one of the walls of this quaint old castle. It is claimed that in

The Gateway of the Castle

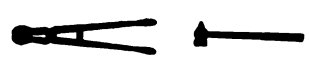
this ancient building the most complete collection of horseshoes can be found. If it is not the most complete collection, it is certainly the most valuable, if one considers that the donors of these horseshoes were all of the Royalty or Peers of the Realm

Nobody knows just when the custom originated, but from time immemorial it has been the habit of the members of Royalty or Peers to present to this Castle when entering it for the first time, a horseshoe bearing the giver's name.

Barons, Viscounts, Earls and Lords, dukes and marquises, princes and kings—all have given horseshoes with their names stamped on, and very often the coat of arms of the peer is wrought in the metal. Each shoe has been made by a master worker in order that it might nobly represent the giver.

A Wall of the Building

There is nothing like this in our country and this bit of the Old World will surely impress every smith who is interested in the history of the craft.



ANOTHER USE FOR THE ACETYLENE TORCH

BY JOE BELL

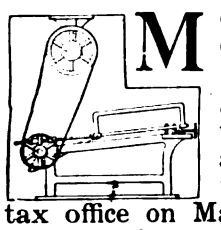
UP near Otisville is located the stone crusher used by the contractors who are building the new State road over the Shawangunk mountains. The rock is the hardest kind of trap and has been quarried and crushed for ballast and roads for many years but when a fellow accidentally dropped a twenty pound sledge in the crunching jaws of the crusher, the machine stopped dead as the belts came off. They thought they could pull the hammer out and start up again, but no—that hammer was as tightly held as the 150 H. P. engine could force the jaws together and no

amount of driving would loosen it. It looked like a case of move the platform so they could get at the machine and take it apart.

That required outside help and the boss was just dismissing the gang when along came Horace Patterson in his trusty kerosene burner (Ford, of course). Horace was naturally curious, as well as mechanically inclined. "How much will you give me if I get that out for you in an hour without moving anything else?" "Twenty-five dollars," said the boss. Well, Horace was back in half an hour with his small acetylene outfit in the car. This he transferred to the deck of the stone crusher, lighted the cutting torch, and proceeded to melt away enough of the sledge hammer to allow it to be picked out. Then Horace pocketed his twenty-five and rattled away in his Ford.

WE ARE publishing this article in the Blacksmith & Wheelwright for two reasons; first, because we feel that in many cases the smith can utilize his spare moments by washing automobiles and second, because we know that all our readers believe in the old saying that "A bit of nonsense now and then is relished by all kinds of men." It is true, too, that the washing of a carriage falls into the same class as the automobile. Having said this much we will visit our old friend O'Reilley.

* * *



MONDAY, in the life of the O'Reilley family, is always a blue affair; bluer than the sky after a storm; more troubled than the ocean after a hurricane and as full of work as a Federal income tax office on March 15. In plain English, Monday is washday in the life of the O'Reilleys.

At approximately four o'clock on Monday morning the O'Reilley alarm clock sounds its strident note and O'Reilley senior stops snoring and begins to kick. Wails from the youngest O'Reilley, yowls from the next youngest and miscellaneous grunts from the various other descendants announce the breaking of another day. Before the end of this day other things than the day itself will break. The O'Reilley family, as a unit, arise, for they know it is washday, and "blue Monday" is no day for dallying.

The business of breakfast finished, and let me tell you it is a business to be quickly finished on washday, the various units of the family go about their manifold tasks. Mr. O'Reilley draws the water in the big boilers and shortly the kitchen is white with steam. The water having asserted itself, a portion of it is used for cleansing the various faces of the family group.

Mrs. O'Reilley dumps the Wilkens' wash into one boiler, the Robbins' wash into another and the battle is on. One of the older girls, assisted by the lady of the house, scrubs the clothes, one of the boys twirls the wringer and by the time school begins, the back-yard is a waving mass of shirts, socks and other clothes. Mr. O'Reilley hies himself off to his work in the nearby garage where he washes an accumulation of Sunday mud from the cars of his patrons.

The day wears on, and a wearing one it is for the O'Reilleys. A cold lunch served in a hot, steam-filled kitchen separates the morning from the afternoon and the Wilkens'-Robbins' washes from those of Brown's-Harrison's. The wash for the O'Reilleys themselves rounds out the day and when Mr. O'Reilley returns at six o'clock, for nourishment, the last of the sundry washes has been gathered to the fold.

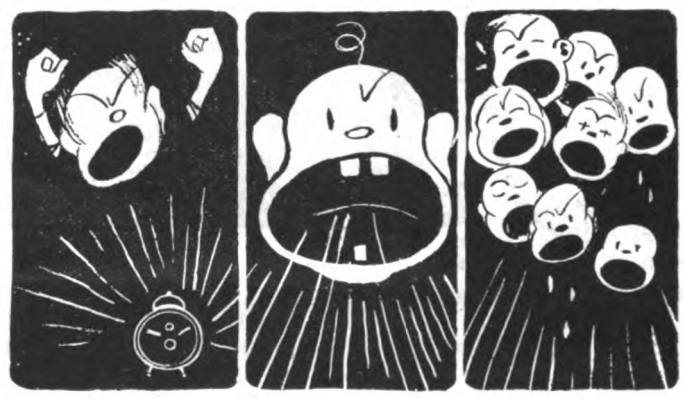
One by one the family passes through the tubs, starting with the youngest and ending with Mr. O'Reilley himself until finally the well-worn wash-water has done its bit and starts on its way toward the sea. Washday closes with the moment when Mr. O'Reilley tops kicking and starts to snore.

The O'Reilley family are a family of washers,—you can see it in their faces from the youngest shiny, pug nose to the be-whiskered visage of O'Reilley, the elder, and having followed this calling, which amounts almost to a profession with the family, few there are who can show any of them anything about washing.

Mrs. O'Reilley knows as much about the practical application of hot soap-suds, potash lye, washing soda, kerosene and blueing as the professor of chemistry at the village high school. You don't catch her rinsing out the clothes in ice water because, to use her expression, "Ye'd have the divil's own time a' gittin' out the grase onct 'tis set."

And it's the same way with O'Reilley the elder; perforce he knows much about clothes washing, but he knows more about washing cars because that happens to be his job. Since few or none of us are often called upon to wash clothes we are not quite as interested in the trials of Mrs. O'Reilley as her amiable husband and so we will follow Mr. O'Reilley about his daily tasks, watch him as he washes the cars and listen to what he may have to offer in the way of advice.

To save time we will walk to work with O'Reilley and hear what he has to say regarding automobiles and finish and water and so on. We cannot reproduce O'Reilley's dialect and so will not even try but will put his talk into ordinary, everyday American.



"The Breaking of Another Day as it is Announced at the O'Reilley Menage"

"Yes" says O'Reilley, but with a brogue, "Autos and clothes are much alike in many respects when you come to wash them. You can look upon a Ford car as like a pair of over-alls, it'll stand a lot of dirt and water and strong soap without really being spoiled for looks, but the bright newness will wear off after a time and you expect it to. But the finish on a really good car, like a Marmon or a Cadillac or a Pierce is somewhat like one of those thin silk things the lady wears, and calls them 'waists.' And when you wash them things (either the cars or the waists), you have to be mighty careful or they'll never look the same again."

"The first thing to look out for is the use of cold water and the second, hard water. Ice cold water will harden grease and oil and give it a surface which you can't get off unless you take a chance of removing the varnish and even the paint with it. Cold water on a warm car will often crack the varnish. And the same thing happens when you put hot water on a cold car.

"Hard water doesn't do any particular damage but it leaves a scum of lime on the surface and also hardens the grease. Perhaps you have often seen a new car, with varnish in perfect condition, but dull and without any gloss? It's the hard water that has done the trick and it will take a lot of polishing before the finish will shine again."

By this time we have arrived at the garage and while O'Reilley is getting into his rubber boots we will look over the washing equipment. O'Reilley sends us up to the top floor and suggests that we go out onto the roof of the garage as well to see what we can see. We find a big flat tank in one corner of the top floor, near to the steam pipes and likewise a tank on the roof. Both tanks are connected with the public water system through a float valve and also with the hose at the automobile wash stand. All of the water which runs through the hose must first run into one of these two tanks.

The Tanks

When we come down to the wash stand again O'Reilley tells us about the tanks. "In the Summer," says O'Reilley, "we use the tank on the roof and all of the water that goes onto the cars passes through the tank on the roof and the tank holds about enough water for three cars. Considering the time it takes to change from one car to another and the time I'm busy on odd jobs, the water has a chance to warm to about the temperature of the air and is never as cold as that from the public water system.

"'Tis the same way with the water in the winter time. Then we turn off the water from the roof tank and use the water from the tank on the top floor. We thought, at first, that it would be a good idea to run a steam coil right into the tank but later we found that this was unnecessary because the water remained fairly warm even on the coldest days. And then again, we don't wash as many cars in the winter anyway."

After this short lecture about tanks and water O'Reilley pushes over the first car to the wash stand. The car looks as though it might be an automobile if it didn't have quite so much mud on it. O'Reilley turns the hose on just enough to get a stream of water from it and starts to work. He starts at the top of the car and flushes off the dirt, that is as much of the dirt as will run off with the water. He gradually works downward until all of the loose mud and dirt has been driven off. He doesn't try to scrub off the dirt or scrape it, because, as he says, he just wants to see what he is going to work upon before he starts.

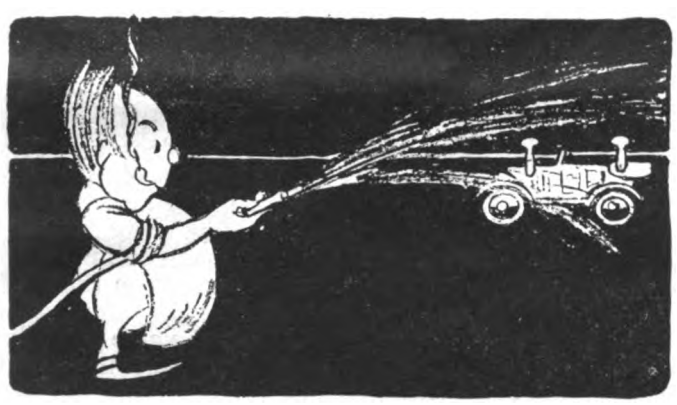
He asks us to feel of the water and see how warm it is and sure enough, it is warm enough to take a comfortable bath in. When asked what he would do if he wanted to wash a car at home and didn't have warm water to start with, O'Reilley says that he would warm about four pailsful of water to about 80 degrees and go over the car with a soft sponge wet in this water before doing anything else. "Never start with water straight

from the tap" says O'Reilley.

Then he turns the water on a little harder and goes over the whole car again from top to bottom, "just for luck" he says, "and to drive off more of the dirt which has been softened by the water first used." Still another part turn of the tap and with a strong stream of water O'Reilley flushes off the running gear.

Use a Gentle Stream

"You can use a fairly strong stream of water for washing off the running gear" says O'Reilley, "without damaging the paint surface. Have you ever seen a sand blast machine at work? Well the thing drives little hunks of sand against metal parts which are being cleaned. It beats a file or sand-paper all to pieces and gives the part a pretty slick cleaning, but it sure does a pile of scratching. A strong stream from the hose, beating against the dirt on the car, drives the dirt against and into the finish and spoils it, but the paint and varnish under the running gear is not so fine and is much harder than that on the body and so you can wash the running gear with a stronger stream of water than you would use on the open parts of the body."



"The First Step in Washing is to Rinse off the Car with Clean Water"

"You'll notice," says O'Reilley, "that I'm always careful, while I'm washing around the hood and radiator, not to drive the water into the engine. If I see that the hood doesn't fit against the cowl or the radiator I wash around it. You have to watch out when you're washing a Ford car or you'll get the whole darned ignition system so wet that it'll take a week of Sundays before the car will run on all four cylinders."

Having said this O'Reilley opened the hood and wiped off all of the surplus water he could find on the engine. Then he took the hose and placed it against the surface of the radiator on the inside so that a stream of water was forced through that unit.

The Dirt in the Radiator

"You'd be surprised at the amount of dirt there is in a radiator." he said. "When a man brings his car into the garage and says that the engine is running too hot, they always turn it over to me the first thing. I always give the radiator a good bath, from the inside, mind, never from the outside, and in nine cases out of ten the engine will run cool until the radiator gets dirty again.

"People seem to think that, if a radiator is clean inside, it is all right. But if the outside is caked with mud, then the air cannot circulate through it and it overheats."

By this time O'Reilley has flushed off practically all of the dirt. There are a few places where the mud is still caked on and he goes over these places again with the stream of water which he has turned almost off. He takes a few minutes to examine the spots still left and explains that he is looking for grease spots and mud which is caked on with grease and oil. The latter he leaves for the time being and returns to the caked dirt which he moistens again and again until it runs away with the water.

Only the Best of Soap

He then mixes up a pail of warm water and soap shavings until there is a thick lather. "I use only the best grade of soap, soap that doesn't have any chemical action on the finish" he says. "It never pays to use washing soda or potash or strong chemicals because these things always remove some or all of the finish."

With this soap mixture he washes the dull portions of the car, the places where there seems to be grease or oil present. He doesn't touch the soap to any of the clean parts because, as he says, it's only a waste of time and soap. "When a car is clean, it's clean and soap won't make it any cleaner." Good logic, we must admit.

Warm water and soap will remove all of the dirt and grease, except road tar. Asked what he does with spots of road tar, O'Reilley says that he depends upon a manufactured product for this purpose. "I took a chance the first time," he says, "with some of the stuff called 'tar remover' and it seemed to do the work without destroying the finish, so I use it now. One chance was enough and so long as I know that stuff will do the work, without damage, I don't need to take a chance with any other."

A final flushing all over with the hose and the car is ready to be dried which O'Reilley does with a clean, soft chamois. He keeps a chamois skin for the body and another for the running gear. He also keeps the sponges which he uses on the body and those on the running gear separate.

A final polish with a soft flannel cloth and the car does credit to the "Son of Erin" and O'Reilley calls it done.

"Now before you leave," says O'Reilley, "let me tell you something else which you can pass along for what it is worth. Sometime we garagemen are going to wake up and charge our patrons for washing cars and make that charge on a sliding scale. For washing a car twice in a lifetime we'll charge half the price of the car, and we'll earn our money. For washing it twice a year, five dollars each time. Twice a month half that figure; once a week, one dollar each time.

"I'd much rather wash a car once a week at half price than twice a month at double the figure because it is four times the work. It isn't the amount of dirt that counts anyway, it's the time the dirt is on the car and the way it is caked on that counts. I've had cars come into this shop that were covered with mud from radiator to tail light and have them washed clean inside of twenty minutes. I've had others come in with nothin' but a few cakes of hard mud on them and spend a good hour trying to get the dirt off without taking the varnish and paint with it.

"If the automobile owners knew how important it is to keep the dirt from hardening on the surface of the varnish, they'd often be willing to pay a little extra to get the car cleaned oftener.

"Just wait a minute and let me show you what I mean. Here is a car that happens to belong to one of those 'once a year bath fellows.' I'll give her the once over with the hose and then we'll examine some of the mud cakes and see what's beneath them."

The car O'Reilley has wheeled to the wash stand seems to be somewhat the worse for wear, the finish is dull and lusterless, though the paint is still in good condition. O'Reilley turns the hose on it and after getting off the latest accumulation of dust calls us over. He points to a cake of mud just in front of the rear fender on the running board apron. He turns the hose on the dirt and lets it run against it for several minutes. After a time the cake gradually softens and finally slips off. O'Reilley takes a soft sponge and dries the surface and we look it over.

Even a casual examination shows that the varnish surface has been wholly destroyed underneath the mud and we can see that nothing but a new coat of varnish will ever give this spot a shine again. O'Reilley explains.

"A cake of dirt on an automobile will always accumulate oil. It doesn't matter where that cake happens to be, oil will find it and soak into it. The oil will work through the cake and attack the varnish. If you wash the dirt off right away the oil won't really get the chance to damage the finish, much, but if you leave the dirt on the finish for a time, then the oil attacks the finish and exposes the paint. You will always be able to see a spot on the surface.

"And now I guess you'd better be leaving here. I've given you enough information for your story anyway and if I stand here talking I'll have to put in some overtime tonight and if I don't get home to help the old lady with the wash tonight I'll have to sleep in the garage, it'll be the only safe place for me in the world."

* * *

And so we leave O'Reilley to his work. We'll hope that he treats all of his cars in the same way that he has handled the demonstration for us. We won't go back to visit Mrs. O'Reilley because she is probably just hanging the Wilkins' wash on the line and "blue" Monday is no safe day for visitors at the O'Reilley home.

ACCOMMODATING

Hoggins was traveling at a fair rate of speed, but there would never have been a disaster had not some fool watered the road.

The natural thing happened. As he turned a corner the car turned turtle. Fortunately Hoggins landed in a wet but soft ditch.

A few minutes later, when he had scrambled out and was mournfully regarding the machine, a friend came along.

"Hello, Hoggins!" exclaimed the fool. What's the matter. Has your car turned tortle?"

"Oh, no!" Oh, n-n-n-n-no!" answered Hoggins sarcastically. "These children here wanted to see how the machinery worked, so I had the car turned upside down just to please them!"

CONSISTENT

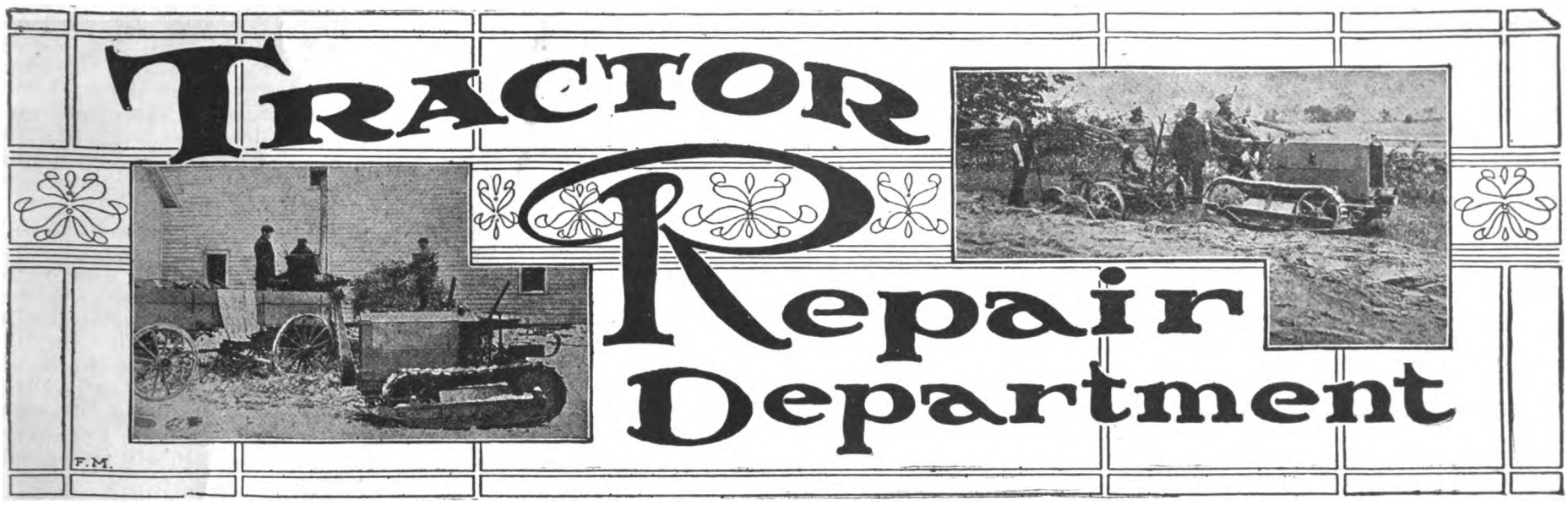
"How old are you?" asked the judge of a woman witness.

"Thirty," she replied.

"Thirty!" exclaimed the judge. "I've heard you give that same age in this court for three years."

"Yes," returned the witness, "I am not one of those persons who says one thing to-day and another thing to-morrow."

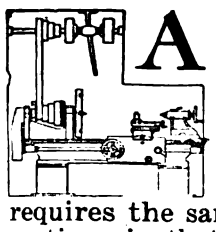
If you cannot accommodate the public cheerfully you might almost as well not do it at all. A favor grudgingly done will bring no thanks.



Welding a Steering Wheel

A Very Comprehensive Article Describing This Repair

DAVID BAXTER



AFTER the blacksmith has learned to operate his welding torch he will find that the actual welding of nearly all tractor castings is practically the same; that each class of the different metals requires the same treatment for the various castings in that class. That is, after he has learned the mechanism of his own particular kind of torch, and has learned to regulate its flame properly, he will find the manipulation of the flame is much the same on any one kind of metal regardless of the shape of the job in so far as the actual fusion is concerned.

For instance, on brass castings he will form a habit of handling the flame in one way, while for steel casting he will instinctively learn to handle it in a little different manner. For gray iron and aluminum castings he will apply the flame in still a different way. Each class will require a different flame application but all of the shapes and sizes of castings under one head will require the same treatment when it comes to the actual fusion and mixing of that class. The

Fig. 1. First Welding Position. Gas Burner Preheater Shut Off in order that Pictures May be Taken

welder should endeavor to let this part of the welding process become a sort of second nature to him; an instinct, so to speak. In other words, the fusion procession should become automatic.

However, the flame adjustment and manipulation are no doubt the easiest part of the welders' trade; including in this, of course, the melting of the various metals. A more difficult part of the trade is the problem of expansion and contraction. For, while the fusion of one class of metal is the same in all castings, the problem of expansion and contraction is different in almost every casting of different size and design. In other words, ten different castings of the same identical metal may furnish ten different problems in expansion and contraction. More strictly speaking, they would furnish ten different problems in contraction alone, since expansion scarcely ever breaks a casting. When a casting cracks it nearly always does so when the job is cooling and contracting.

Preventing Contraction

So—after the blacksmith has ground proficient in the handling of the welding flame he has still to learn how to prevent contraction from destroying the effects of clever welding. Fortunately the fundamentals of contraction as they apply to oxy-acetylene welding are practically the same on all cast jobs. Viz: the molten weld metal and near-molten metal adjoining the weld are approximately fully expanded when the weld is made; when they cool and shrink or contract they, particularly the weld metal, try to occupy a smaller space.

If the surrounding casting is so rigid that it cannot be pulled inward by the shrinkage, then the weld or some weak portion of the job must break or crack. It might be said that expansion is the cause, and contraction the effect, because, if the weld metal had not been expanded it would not have contracted.

Perhaps the easiest way to overcome the contraction, or rather, to circumvent its evil effects, is to pre-expand the job. In other words, to preheat it. At least this is one of the simplest ways to prevent contraction from cracking the weld or other weak portion of the casting. By heating the job previous to and during the welding, it is expanded enough so that when the expanded weld is ready to contract, both the casting and the weld will shrink in unison. The contraction of the casting follows the contraction of the weld inward; the shrinking weld metal does not pull upon the casting so there will be no cracks or strains when the job cools.

Localizing Preheating

To take the best advantage of pre-expanding, the blacksmith should also learn to localize or concentrate the preheating. Or—to put it differently, he should learn to confine the preheating to one or more smaller portions of the job, instead of heating it all, as was the custom on so many jobs when oxy-acetylene welding was young. In this he has only to study the location of the fracture to be welded, and find the direction of the pull of shrinkage. Then heat the casting where it will expand in such way that subsequent contraction will follow the shrinking weld inward when both cool.

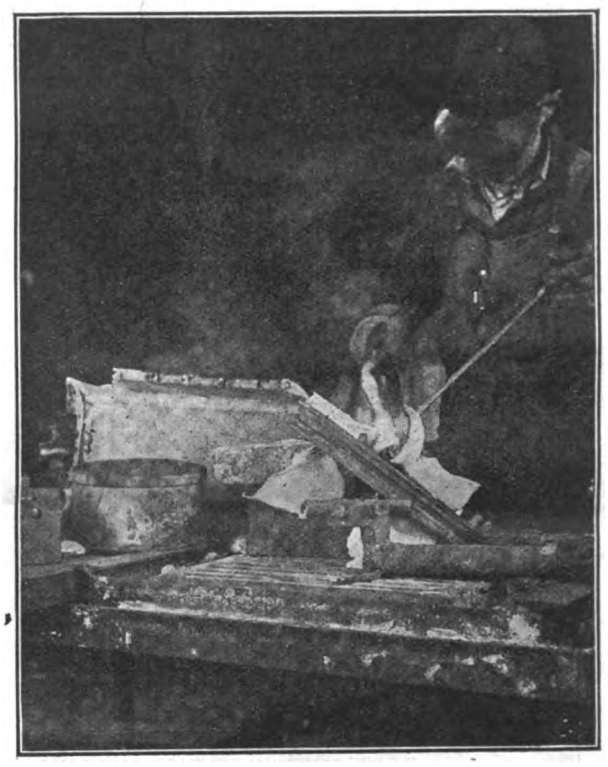


Fig. 2. Welding the Side of the Brace Rib on Broken Spoke

But there is not room here to go into all of the details of expansion and contraction in their many complexities; not to speak of the probability of becoming confusing. Therefore let us take up a specific example of the art of controlling contraction by pre-expanding. The idea is well illustrated in the tractor steering chain wheel shown in the accompanying photographs. This is an innocent appearing job, but is one with a spiteful "kick" if the welder does not know how to outwit the weld contraction.

The fracture was located in one of the four spokes close to or adjoining the hub. That is, the crack was in the corners formed by the spoke, brace rib and hub. The metal, which was gray cast iron, was approximately a quarter of an inch thick in the vicinity of the crack; this made in reality three welds, because the wheel had to be turned three times during the welding, on account of not being suited to grooving.

The location of the crack forbade the making of a groove with an emery grinder, due to the lack of working room. There was too much danger of breaking the wheel to risk cutting a groove with hammer and chisel. It were better to weld the whole crack on both sides of the casting. However, this

can be satisfactorily done on metal no thicker than a quarter of an inch.

Therefore, instead of grooving out the crack, which is usually the first step in most welding repairs, the fracture was merely cleaned, in preparation for the fusion. An inch or so of the surface of the spoke along the fracture was thoroughly cleaned of all grease, sand, scale, and paint. This was handily accomplished with a wire brush; after burning the grease slightly with the welding flame; this cindery deposit was then brushed off quite easily. The flame was not applied long enough to expand the metal to any degree worth mentioning.

After cleaning the next step was to arrange the job for pre-expanding; preheating it so that the wheel contraction would follow the weld contraction when the job cooled. It might be well to state here that there was some danger of expanding too much. If the crack was spread so wide that a large weld was made there was chance of the wheel being out of round when the weld was finished. The theory safest to follow probably is that cast iron shrinks approximately an eighth of an inch per foot. This is a trifle hard to follow. But if the welder measures the weld and not the wheel he can estimate closely. That is if the weld is about an inch wide then the fracture should be spread one twelfth of an eighth. This is very little; let us say then that the crack is spread so that we can just see daylight through, on a job like this chain wheel.

In arranging for pre-expanding, the wheel was blocked up above the welding table sufficiently to permit the placing of a portable gas burner beneath the rim. In fact the rim rested on the gas burner, in order to confine the heat closely to this portion of the casting.

Asbestos Paper Used

To further assist in confining the gas burner heat, two pieces of asbestos paper were arranged on the inside of the rim around the spoke that contained the fracture. This asbestos shield served to reflect the radiated

Fig. 3. The Welded Casting Showing the Location and Extent of the Weld

heat back to the rim and thus prevent it from spreading to other parts of the casting. This simple device was all that was used in pre-expanding the rim.

If the operator is exceptionally proficient in touch manipulation and fusing cast iron, a job like this can be preheated with the welding flame. But he should be a good judge of heated metal as he will have to change from the weld to the rim several times during the welding process in order to keep up the rim expansion until the weld is completed; using the welding flame to preheat instead of the gas. He must do this without losing the weld heat. So it is no doubt better to expand the casting with some agency besides the welding flame, particularly as it is better to keep the temperature of the heated portion of the rim constant. The gas flame is ideal for this. In the instance cited about six or seven inches of the rim were heated; three inches on each side of the fractured spoke. The heat caused the rim metal to expand, or endeavor to increase in length. This self stretching met with stubborn resistance by the balance of the wheel. The curved shape of the rim was the only relief. Therefore, as the rim could not stretch lengthwise it was forced outward in a greater circle. This outward movement pulled the spoke outward too; thus opening the crack. A crude way of expressing an explanation of the action and effect of expansion, perhaps, but if it conveys understanding to the novice it will accomplish its purpose.

After arranging the preheating device, the burner was lighted and permitted to burn until the crack opened about as stated above. In daylight it is difficult to judge the amount of expansion by the color of the heat, so that the opening crack is a better indicator. Therefore when the crack had opened sufficiently the first weld was started. This weld was made on the flat side of the spoke. The welding flame was played back and forth along the crack until the iron heated bright red. Then the flame was concentrated upon one spot at an end of the crack. Here it revolved until the metal melted in a fluid pool, probably three quarters of an inch long and a half inch wide. While this was being done a filler rod of soft gray cast iron was brought close to the flame. As the cracked spoke heated, the end of the rod became red hot.

When the first pool was fluid the filler rod was dipped into it with a twisting movement, the flame continuing to play upon the molten spot while the filler metal was fed into it. The flame was confined to this spot until the depth of the melting reached half way through the spoke, and the metal was thoroughly mixed. Then the flame was gradually worked to an adjoining portion of the crack, where the process was repeated. Thus the entire length of the crack was welded in a series of pools carefully run into each other.

Position of Wheel Changed

As soon as the flat side of the spoke was welded the position of the wheel was changed as indicated in Fig. 2. This brought one side of the brace rib and the short side of the spoke in position for welding. The gas burner was kept burning and the change was made rapidly in order not to lose any expansion. By having the crack in a nearly horizontal position, the operator was enabled to make the weld easier than if he tried to weld up the vertical side of the brace rib. The molten weld does not tend to overflow unfused portions of the crack. Then, too, the depth of the melting is more easily gauged.

In executing this weld the operator applied the flame to the corner of the brace rib. In fact the flame was bored into the corner metal as fast as it melted. This, in order to reach the heart of the spoke. At the same time the red hot filler rod was twisted and prodded in the deep melting metal.

When certain that the center was molten the flame was gradually retarded and slowly moved along the side of the rib. Here the same continuation of pools was melted as on the first weld. The depth of this melting was about half the thickness of the spoke metal.

When the rib crack was finished the flame was shifted to the spoke in the corner where the rib weld started. This portion of the weld was now fully congealed but still red hot. The flame was applied to the outer end of it, playing back and forth across the red hot metal until it melted; at the same time the filler rod was introduced. The end of the weld was thus re-melted and continued in a series of adjoining meltings and fillings. Each melting was deep enough to connect with the spoke weld on the opposite side of the wheel.

When making this weld and the weld on the strengthening rib a considerable amount of filler metal was piled above the surface of the casting. This was melted in the shape of a filet or reinforcement in the corner of the spoke hub. The idea of this was to add strength to the weld as well as to improve its appearance. A filet was also applied to the other side of the rib when this weld was made. The welder was careful that the filet metal was carefully soaked into the casting metal.

After the first side of the rib was welded the wheel was immediately tipped to bring the other side in a horizontal position after the manner of the first rib weld. No time was lost in making this change as it was necessary to prevent loss of heat and therefore loss of expansion. In tilting the wheel the heated portion of the rim was kept above the gas burner to further insure the retaining of expansion.

The second rib and spoke welds were made in practically the same manner as the first; twisting the metal into the corner with the filler rod while melting deep with the force of the welding flame. This weld was also made as rapidly as possible in order to keep the contraction of the whole thing as nearly equal as possible. When the last section was completed the weld and the heated portion of the rim were at approximately the same stage of heat.

It is probably safer to cover a job like this with a sheet of asbestos paper to cause it to cool slowly. But in this particular event the job was permitted to cool as it lay without any attempt to retard or regulate the radiation.

As the weld cooled and contracted the shrinkage of the heated rim section caused the spoke to move inward, or we might say, to relax. Fig. 3 shows the finished weld and filet of filler metal. This picture also indicates the location and extent of the welds.

BELIEVES SMITHS SHOULD WRITE MORE

From W. B. Fagg, Nebraska.—I do not believe that we smiths send in enough correspondence to the publishers of the BLACKSMITH & WHEELWRIGHT. Years ago, a copy of the BLACKSMITH & WHEELWRIGHT was sure to contain correspondence from East to West and North to South, but now it seems as if the smiths feel that they are graduated in the business and that they do not need any older heads to help them.

Although I am getting up in years, I have not learned it all, and I think if every smith who reads the BLACKSMITH & WHEELWRIGHT would only write a small article, it would help the brother smiths. Let one and all of us do our part to write letters, and ask questions.

For my own part, I do not expect to follow the trade more than fifty years longer, and I want to see some of the brother smiths say something. There are lots of fine openings here in Nebraska, and also in Colorado, and I could place two smiths right now, if they were here, and it would take very little capital.

I have kept posted on all of the shops in our territory, and I am happy to say that I have helped several get into business for themselves, and not work for the other fellow, because I believe now is the time to strike out on your own hook. Prices out here are good, and we do not work any longer just for fun. If there is any good up-to-date smith who wants to make a change and come West, have him write to me in care of the BLACKSMITH & WHEELWRIGHT.

I should like to say a great deal more in regard to our craft, but I have not the time right at present; however, I do wish to say that all those who are sticking to old prices will be better off if they raise them. They will have enough to take care of themselves and their families, and still have a surplus to fall back on. I should advise smiths to get out of the rut and stay out.

Small Florida Shops

By James F. Hobart

LAKELAND is a mighty pretty place and makes me think of England every time I visit that Florida tow—no! *City*, if you please! Reminds of England for the reason that a friend went over there to visit and after the first day could hardly be persuaded to go out of his friend's house. Pressed for a reason, he finally said:—"I don't like to go out for I'm afraid of falling off the edge of the Blasted Little Island! Same in Lakeland. You can hardly move around without running slap into one of the eighteen pretty lakes from which the place takes its name.

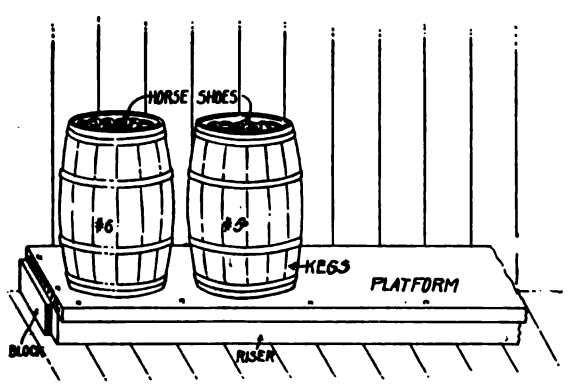
But Mr. Hileman managed to find room enough for a shop although it is crowded right down against a big lake with barely room enough for a boulevard between the water and the shop, just off Massachusetts Avenue in a most beautiful spot shaded by great oak trees nearly all day. Born a "Pennsylvania Dutchman," Mr. H. came to Lakeland eight years ago from Ohio after living eight years in Kansas.

"We had a bet here one day," he said, "and another blacksmith and myself worked against stop-watch time to see just what we could do. The stop-watch said that we drove a shoe each 3½ minutes and the time for putting on mule shoes—driving and fitting—per set, was just 21½ minutes! But I believe I could better that record a little right now:—Who won the stop-watch contests? Well, you just ask some of the customers who come in here—I can shoe horses easier than I can 'blow my own horn'!"

"Yes, we do all kinds of work here, shoeing, wagon repairing and wagon building too. Have put out about one wagon a month for commercial use, during the past two years. I keep that mechanic on wagon work nearly all the time except when my son isn't here and I get him to strike for me once in a while—no use trying to talk with him Mister—he can't hear you. Hasn't even heard it thunder for ten years he is so deaf. But he is a mighty good woodworker and can do anything in that line that comes into the shop."

"I suppose, Mr. Hileman, you will be retiring from blacksmithing as soon as your orange grove gets into full bearing, won't you?"

"Retire nothing! Why I never am going to retire. I just love the work and I shall come to the shop every morning as long as I am able to walk! I tell you, Sir, there is nothing else as good. I come down in the morning and feel that I can handle any job which may come in during the day, no matter what it may be from putting in a tire bolt to welding an automobile spring. And we weld lots of springs too. Not only weld but guarantee them and if one 'lets go,' we will weld it again without charge. But we haven't welded a spring the second time for a good many months. Yes, we use a welding compound—Climax, I believe it is—and have no trouble at all making the springs 'stick' at a yellow—never a white—heat. We never cool a spring. Each and every time a spring is heated, we hammer the spring until the red has all gone out of the heat, and then we stop. We never hammer a spring after it has turned black where it was heated."



Stock Storage Platform

Welding Vehicle Springs

"Just how do we weld springs? Well, the broken leaf is first laid edgewise on a strip of sheet iron and the broken place matched together so the leaf lies exactly as it should after welding. Then with a slate pencil or a bit of soapstone same as boiler-makers use for marking, a line is drawn along the side of the spring while the broken pieces are held accurately in line. Both ends of the spring and the holes if any are marked accurately on the sheet iron and after the leaf has been welded, it is forged to fit exactly along the line on the sheet iron."

"Both pieces of the spring are put into the fire together. If there are three or more pieces, two of them are welded together and then another piece is taken up with the welded piece. The first thing is to hammer down the edges of the spring a bit; the corners are driven down about a quarter of an inch at the end and back a half inch to the full width of the spring."

"Next, the ends of the pieces are upset until about one-half as thick again as when broken. The edges are kept well driven down for there is nothing in spring welding which will—or may—give as much trouble as a projecting corner. I want the corners all bevelled down two ways, and then they won't get burned or left unwelded, which is almost sure to cause the spring to break again and then the smith is bawled-out for poor workmanship and has to weld the spring again while the customer mentally promises himself to take his next spring-welding-job elsewhere."

Scarfing

"The upset ends are scarfed at an angle of about 45 degrees—never any flatter—then both pieces are returned to the fire and heated to a bright red, with the sides, which are to be united, down. As soon as they are evenly heated to a good red the pieces are scooped into a box of welding compound and a little ridge of the compound made to lie across the scarfed end of each piece. Then I put the pieces in the fire again but with very little coal over them. I let a little of the smaller pieces of hot coal lie on top of the steel, but never have the coal two pieces thick."

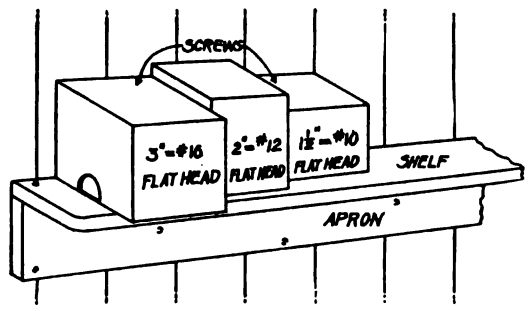
"I watch the compound and as it melts, I help it around a bit with a bit of steel rod and keep the heat as even as possible along the ends of both pieces of spring. By the time the compound fuses, the ends of the pieces are a bright yellow and ready to be stuck together. If I have a helper, he takes one piece to the back of the anvil in the usual way but I weld springs all alone as often as with a helper."

"When I weld springs alone, the shorter piece is placed lengthwise of the anvil, then I place the second piece on top and go for the weld with a short-handled sledge which weighs about eight pounds. I never use a light hammer for making a spring-weld. When I have a helper, I let him do all the hammering. But when I weld alone, I do all the work with a short handled sledge of same weight as the one used by the striker. As soon as the weld has "stuck" a flatter is used when there is a striker, but when alone, I do nearly all the work with the short handled sledge."

"Each time I heat a spring, I hammer it until every bit of the red has disappeared but I never strike a blow after the steel has become black hot. I believe here is where the secret—if it may be called a secret—lies of making a good spring weld. There is something about hammering steel after it has become black-cold which seems to destroy the strength and *vitality* (if I may call it so) of the steel very quickly. Hammering while red, however, toughens the steel and each time I heat a welded spring, I always hammer the weld as stated until all the red has disappeared. Then, I stop hammering instantly."

"A good deal of care is taken to avoid all thin, narrow or *lean* places at or on the weld. If it is noticed—and I watch that pretty sharp—that a corner of the spring is not going to quite fill out, then that spot is upset sidewise instantly and then carefully plated out again so as to build up the place where the metal was scarce or slack. In this way, I make every welded spring come from the anvil with full corners and without lean places anywhere."

"At this stage the spring is placed on the sheet metal pattern and inspected, as to length and curvature. These being found correct, the hole is marked through the next leaf. If the adjacent one be broken also, the pieces are laid in place and the bolt hole marked with a scriber through the broken leaf. The bolt hole is punched—I never drill them—then after punching the hole and bending the leaf to exact shape, I do a whole lot more hammering on the leaf and hammer it black-cold each time I take a heat upon it. The hammering takes a deal more time than all the rest of the welding but I am willing to spend the time in hammering for that is what makes it possible for me to guarantee every weld we make!"



Screw Storage Shelf

A young man came into the shop wheeling a very light collapsible cab for a baby. One wheel had a broken rim, the rest of the cab was pretty badly bent. Mr. Hileman laid down the horseshoe which he was shaping and straightened the worst bent parts with a few blows of his forging hammer and said:—"Yes, Sir, we have a welding outfit but I can't leave this shoeing job now to weld that rim for you. My son does most of the welding and he is home today—it is Saturday afternoon—putting out orange trees in his own little grove. Bring in that cab Monday morning and he will weld the rim and fix the cab all up for you in tip-top shape—but we can't get to it this afternoon." The would-be customer departed, sorry but pleased and will surely be back on Monday. How very far a little tact and good nature will go toward making satisfied patrons for a smith shop.

Keeping Supplies

Stock in this smith shop was kept in the "original package" as much as possible. A fine assortment of wood screws, both flat and round head was packed near the woodworking bench. A shelf, shoulder high, had been placed on the wall and boxes of screws were neatly arranged along this shelf—and nothing else was kept there. The engraving shows about how things were arranged. The wooden shelf was nailed on top of an "apron" which in turn was nailed to the wall, making brackets and other supports unnecessary. The shelf was only barely wide enough for the largest sizes of screw cartons.

The horseshoes, nails and some other supplies were kept in horseshoe kegs and nail-kegs which were all placed neatly on platforms built along the shop walls and made just wide enough for kegs to stand upon. The platform consisted of a twelve-inch board nailed to a three-inch riser back of which two and three-inch blocks were placed to receive the back of the platform board or tread. Horseshoe nails and toe calks were

(Continued on page 15)

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Our Editor's Letter

I SUPPOSE that most of the readers of this magazine have noticed the name of C. Smith of Pennsylvania. You couldn't have gone over many issues without seeing this man's name because he is one of our best and regular friends. I only hope that you will feel as indebted to him for his letters as we do.

Mr. Smith believes in helping his brothers and spends much time working out these letters which you so often read in the magazine. Personally I think that he is of more actual help to the world than our fistic friend Mr. Dempsey, despite the fact that the latter gentleman has his name in print so frequently of late. I feel certain that the world would be a darned pleasant place to live in, more peaceful than it is, were we to have more C. Smiths and fewer Dempseys.

But all of this is simply to introduce our friend, Mr. Smith, and to tell about the latest letter from him. In his last letter Mr. Smith says something which really is worth considerable thought and I'm going to put the matter before you in my own way, but the real credit should be given to Mr. Smith.

What is the value of your time? Some old sage once remarked that time was money and since that time people all over the world, I guess, have been quoting the phrase and trying to apply it to their own ends.

As a matter of fact time itself has no more value than a mess of rotten apples or a rusty horse-shoe nail. And the sooner all of us realize this fact, the sooner we will be happy. You can sit down on a stool in front of your shop for two weeks and store up a great big bunch of time, but it won't be worth a counterfeit nickel.

Time isn't worth anything, it is the way that you use it that makes it worth money. Suppose, for instance, that you had a half bushel basket full of pure, yellow gold and were marooned on a desert island. You couldn't eat the gold, you couldn't drink it, wouldn't keep you warm or help you build a hut to live in. Its value would be less than a glass of water or a hunk of stale bread.

Suppose, again, that you had a couple of thousand cubic feet of pure air in a bag and walked down Fifth avenue, New York City. Do you think that you could trade this big bag of air for anything but a smile? Well, time is like the gold on the desert island or the bag of air in New York City. If you are alone there is no one to sell it to and if you are in a crowd everyone else has just as much of it as you have. But—and here is the point. Time, like the gold on the desert island, is worth lots to some people if you can change it into something they want. If you could have changed your gold into food enough to last you a year, then it would have been invaluable.

Your bag of air on Fifth avenue might be worthless, but if you could change it to a bag of gold, then you could swing the world by its tail and sit on its neck.

And so it is with time; use it to make something else, and then, but only then, is it money.

But this is only a part of the secret. Schwab changed his time into steel; Rockefeller into Oil; and so on. They knew how to change their time into something necessary, something that everyone needed. The foreign laborer changes his time into ditches and ditches aren't worth as much as oil and steel.

Unfortunately we can't all change our time into gold, or silver, or diamonds, or steel, or oil but we can change our time into something. And here is the big point which I want to make. Don't change your time into a bag of wind. Don't waste two hours a day doing nothing, just because you can't seem to find a job which seems worth doing.

I think I can illustrate my point very well by telling about a blacksmith in my own home town. This blacksmith had a very peculiar job. He was employed in a large cotton mill from eight o'clock at night until six the next morning. His work varied because he was there simply in case an emergency came up. Some nights he had nothing much to do but sit and read. At other times the machinery would break down and he would be busy all night.

He didn't like to sit around and do nothing so one evening he walked around the yard and came across a big box of shuttle spindles which had been discarded because they had broken on the side. Ordinarily these spindles would have been thrown into the dump but our friend took the whole box over to his forge and spent the night brazing the breaks and putting them into commission again.

In the morning he had managed to fix up about 75 spindles. If new, these spindles would have been worth a total of about $3 that time. The company paid him $30 a week which meant that the cost of repairing the spindles was about $6 or twice the cost of new spindles. Now the question is how much did the company save on this work?

On the face of the matter, when one considers the actual figures, the company actually lost more than $3 because the repaired spindles were worth less than new ones. But this is a place where figures do not tell the truth.

Let us suppose that the workman had not repaired the spindles, but allowed them to have been thrown away. The company would have paid him for his time and he would have smoked his clay pipe and loafed. He didn't want to loaf and so would have been grouchy and ill tempered by morning. The company would have lost the spindles and would have had to have bought $3 worth of new ones. They would have lost $3 and the workman would have lost his good disposition.

Now can't you see that you who are in business for yourself occupy both the position of workman and employer at the same time? Every hour that you waste, waiting for a job which will bring big money, perhaps, is a loss. Spare time, worthless time, even if turned into a few cents is worth money.

I claim that time is worthless, itself. It is the man who can turn time into money, who is successful. Forget the old adage "Time is Money," forget to figure the actual value of the time you sell and utilize the waste product even if you sell it for a low figure.

You may be able to earn $5 an hour on a wagon job, but that doesn't mean that your time is worth $5 an hour. Don't get so puffed up that you will not work on a job that will bring $2 an hour. Simply sandwich that $2 hour between two other $5 hours and then your time is all sold and none wasted.

Sell your time for all that you can get, but keep it busy even if you don't get so much for some of it as you do for the rest.

The Blacksmith and the Motor

NOW that I happen to feel like it I'm going to take advantage of the readers and write a second "Editor's Letter." It is seldom that you will be inflicted with my letters twice or in double doses in the same issue. But I've something to say, and now is the time to say it.

Last week I had a heart to heart talk with one of my readers and because he said something which was not "hoss sense" I'm going to rake him over the coals.

My friend, in talking, quoted the old saying that "You can't teach an old dog new tricks." And the reason why he said this was because I was trying to suggest that he familiarize himself with automobile and tractor work.

I retaliated by telling him that one could lead a horse to water but couldn't make him drink, if the blamed fool horse didn't want to drink. I managed to get out of the way about that time but I didn't get very far ahead of a piece of blacksmith coal. I rather feel that perhaps the smith was a bit peeved at what I told him.

Despite the fact that the smith won the argument with the help of that piece of coal, I think I am right. Blacksmiths should try to do more automobile, tractor and truck repairing. There is much money in this work and the owner usually pays cash on the nail without waiting for the harvesting of his crops.

As time goes on the smith will find that his carriage, wagon and horse work is diminishing. In localities where there were, formerly, three or four smiths, all busy, there are now but two, perhaps there is but one, and he cannot fill all of his time working at the forge.

The smith must find something to do with his spare time, something which falls in with his equipment, something which he knows something about. And automobile work is right in his line.

The smith must realize, first, that automobile work falls into two classes. The first in which technical knowledge is necessary. In this class comes work upon the engine, adjustments of the mechanical parts and repairs to the electrical system. In the second class comes the repair work to the metal parts and I feel that the average smith is capable of doing this second clas of work satisfactorily.

Editing an automobile repair man's paper, as I do, it is my business to know about repair work in this line and so I feel that I speak with a certain amount of authority when I say that if the smith will set himself up as an "Automobile Smith" he will not need to worry about the work.

As I go about this section of the country I often note the fact that there are many smith shops located next door to garages.

Perhaps I have the cart before the horse and should say that the garages have been located near to the smith shops, but the result is the same. The smith who is in such a fortunate position is able to do the work which the garage man cannot do.

Although automobile wheels are far more solid than carriage and wagon wheels, still they often need attention. Frame members need repairs, engine parts need welding, gears require setting and so on. All of these things the smith can do if he but chooses. Get into the game, brother smiths, and show the world that "an old dog *can* learn a new trick if he wants to."

SMALL FLORIDA SHOPS

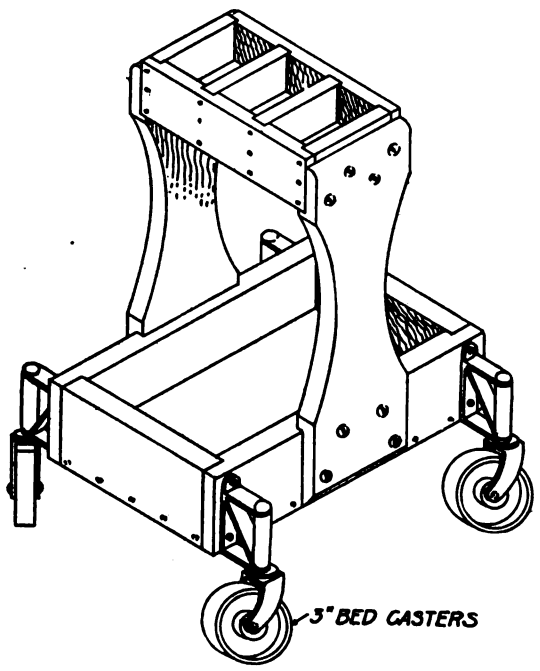
(Continued from page 13)

also stored along these platforms, the original packages being placed neatly side by side along the low platform which kept the kegs and boxes up from the floor, something greatly appreciated at sweeping time!

Windows and Electric Lamps

This blacksmith shop was one of the best —if not the very best lighted shop I ever saw. There were two big wagon doors, one in the east side and another in the south end of the shop and aside from the doors above mentioned, the rest of the side walls seem to be mostly made of windows. At any rate, there was no place in that shop, not even in the far corners, where one could not see to work comfortably. This was not much like another Florida shop which I visited in Tarpon Springs and in all the side walls and roof, I found just one glazed window. I will tell you the story of that shop some day, also about one of the workmen—I believe it was the Boss himself, who was using the gas-engine driven circular saw which was located in one corner of the shop where, Patsy Bolivar told me, it was so dark that the boss sawed nearly two feet past the end of a plank into shop darkness before he knew the saw had reached the end of the plank! Fact—so Patsy says—and he only stopped then because the belt ran off!

The Hileman Lakeland shop was well supplied with high power incandescent lamps placed near enough together that there were no poorly lighted places, high enough to be out of the way of men and horses and conveniently controlled by wall switches which had been carefully placed just where they ought to be.



Shoeing Box with Three-Inch Casters

Like nearly all Florida shops, the working room had two levels. The forge and shoeing space was about 20 inches lower than the rest of the shop and three steps led from the shoeing floor to the main body of the shop. Really this difference of level was caused by the floor of the carriage portion of the shop being placed on joists laid on the sills of the building, while the forges stood directly on the ground with no floor save some refuse phosphate rock which had been thrown down and packed hard into the sand. But as stated, nearly all Florida shops are built that way.

Speaking of dark smith shops and well lighted shops and a shop with only one window in it—the best lighted shop I ever was in—the one I told about in the May *Blacksmith and Wheelwright*, had no windows at all in either side walls or roof! But this shop which resembled a mushroom, had no side walls either any more than has the fungus mentioned!

A Shoeing Box on Wheels

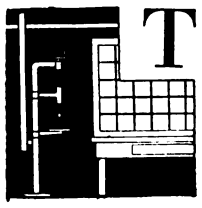
While I was in the shop, Mr. Hileman fitted shoes for one horse and drove them on two. He was in no hurry that day, but I could readily see how he had arranged things so he could drive a shoe in 3½ minutes and fit and drive a mule complete in 21½ minutes. Every thing was arranged very handy, that's how he did it, and of course he didn't loaf any on the job either. One little detail will show how time was saved in moving the shoeing box around. As shown by the engraving, four three-inch bed casters had been fastened to the four corners of the box and as Mr. Hileman finished with one foot of a horse he would give the tool box a little push and that article on its high casters, would scoot along to exactly the position it was required to be in for taking care of the next hoof to be shod.

Little things like this is what enabled Mr. Hileman to "speed-up" when he wanted to shoe a horse quickly. Each tool in the shoeing box had its own place and after being used, Mr. H. tossed the tool right into its own particular berth where the tool could be found instantly when wanted again. I noticed that when driving shoes, Mr. H. tossed each tool into one particular place in the shoeing box and also that when reaching for another tool from the box, he never even looked at the box to locate the tool he wanted but just reached out his hand and took that tool from its corner while his eyes were busy elsewhere with his work.

To be sure, these are little things—very little ones—but I want to know if any time was ever lost in any shop over doing the big things? Isn't it always the very smallest ones which get away with the most time—because there are more of them—and a man has only to save a minute on each of 100 little things each day and he has added 100 minutes, nearly an hour and three-quarters to his actual earning time each day? Never try to save an hour in your shop but go after the minutes and the half minutes and you will find every one you save roosting in the cash register at the end of your day's work!

Platform Gears

Improved Method of Making a Heavy Platform Gear



THE heavy platform gear is always in demand, and the more simple its construction, providing there is no sacrifice of strength, the better, as it is less likely to get out of order and require repairs. For this reason a heavy framework of wood properly secured is preferable to the lighter ironwork, both as regards durability and the ease with which it can be repaired when a break occurs. The opinion that platform gears are more expensive than perch gears is due in great measure to the general use of the complicated wood and iron gears upon light carriages. That they are is undoubtedly true as relates to these vehicles, but the conditions change when the heavy plain gears are considered. Even if the cost be greater the advantages more than counter-balance the expense. By the use of the platform half springs and a cross spring, or two elliptics, can be used giving greater supporting strength and more stability because of the springs being placed near the ends of the hubs and attached direct to the axle, instead of a single spring being placed upon a headblock which acts independent of the axles and has but a few inches of bearing space. To this advantage must be added the convenience of turning.

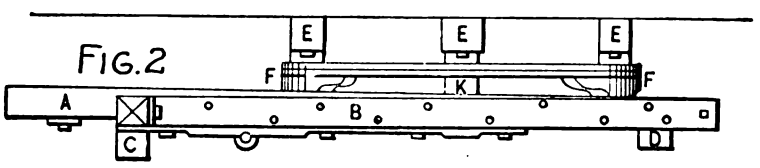


Fig. 2. Elevation plan, showing positions of hounds, futchels and fifth wheel

The aim in preparing this series of articles has been to impress upon the minds of the men who run small shops in other than thickly settled parts of this country that the platform gear is sufficiently simple in its construction to be put together by any carriage woodworker who has a right to claim the position of a journeyman. All that is required for such a man is to study the principle governing the construction of the platform gear. In no way can this be learned more quickly than by making a draft and putting up the gear in accordance therewith. Few realize how quickly an error is discovered by a draftsman who is combining drawing and construction, and a less number realize the advantages of making drawings even of the simplest character. If we can induce more study without adding to the labor of construction we will feel that our efforts are tending toward a betterment of the trade and lifting the burden of labor.

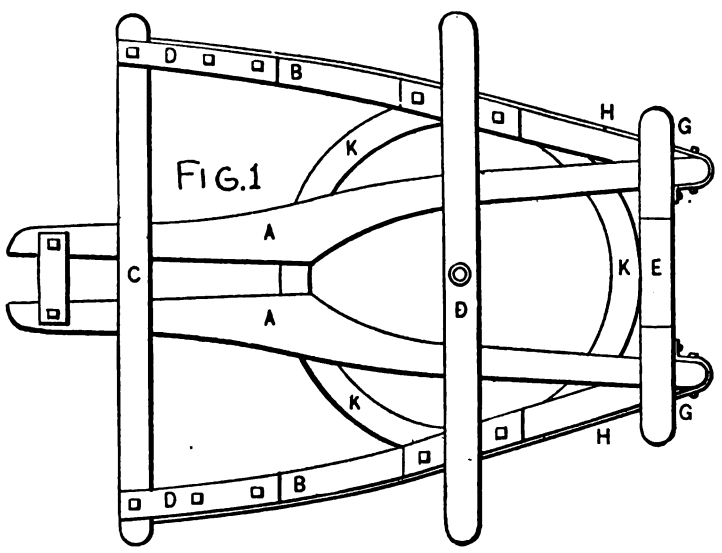


Fig. 1. Ground plan of the lower gear from the under side

The heavy carriage part shown this month serves well to illustrate our position and at the same time adds another to our list of plain practical gears that are needed for the heavier kinds of freight wagons and trucks.

Fig. 1 shows the lower carriage with the under side up, and in addition to the heavy wood the stays and plates are shown which serve to hold the parts in place and to give increased strength to the whole. The hounds A are very heavy, being two inches wide at

the rear ends and two and a half inches thick throughout. They are so heavy that no iron plates are required. The futchels B are two inches square and are plated on the sides the whole length, with a ¼-inch plate extending around the rear ends of the hounds to the spring block bar to which they are bolted. The forward ends of the

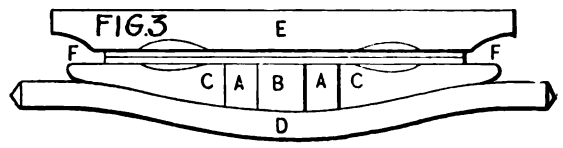


Fig. 3. Front elevation, showing the principal pieces separately

plates have a turned flange through which a bolt passes to the drawbar, thus binding the various pieces together in a manner that gives the greatest strength. The drawbar C is straight on its sides, but is thrown down enough in the center to pass under the hounds. The ends are of the same thickness as the futchels, the latter being stub-tenoned into the drawbar and strengthened by the plates

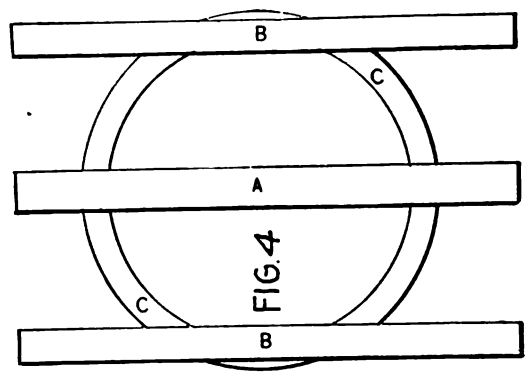


Fig. 4. Upper carriage part, fifth-wheel plate and cross bars

D. The fifth-wheel plate rests upon wood segments of the required thickness to level the plate when the platform is in its correct position. The spring block E is bolted to the hounds A and the futchels B, being lapped on the same enough to give stability to the frame. If simply bolted on, without supporting shoulders, there would be nothing to prevent the ends moving except the bolts, and these would wear away the holes and the whole would be loosened. The shoulders at

Fig. 5. Side view of center bar of upper carriage

the ends G must bear against the sides of the futchel plates H. These plates are very important parts of this platform, as they serve to bind the whole together, lugs being turned at the ends where they meet the drawbar. The rear ends pass around the ends of the futchels and hounds where they are jointed, and are then secured to the spring block by bolts which pass through the lugs. The fifth-wheel plate K rests upon the ends of the main bed D, and upon segments of the requisite depth to maintain its level.

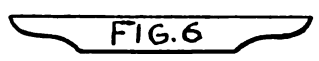


Fig. 6. Form of front segment fifth-wheel bearing

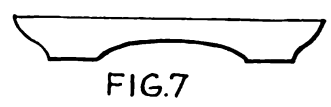


Fig. 7. Form of rear segment of fifth-wheel bearing

Fig. 2 shows the side elevation of the carriage. It will be seen by this that the futchels are on a level, while the hounds are elevated at the front ends; A, the hounds; B, the futchels, with side plates in place, showing the location of the securing bolts; K, the main bed as per D, Fig. 1; C, the drawbar; D, the spring block; E, the cross bars of the top platform; F, the wood segments that level up the fifth-wheel plate, the bearing surfaces of which rest at the front of the wheel upon hounds and at back upon the hounds and futchels. The forms of the two are shown by Figs. 6 and 7.

The front elevation is shown in Fig. 3; A, the hounds; B, the opening or jaw for the pole; C, the main bed as per D, Fig. 1; D, the drawbar; E, the center cross bar of the upper carriage; F, the fifth-wheel plates.

The upper carriage is shown by Fig. 4; bar A is the center or main bar; bars B the front and rear cross bars. These bars are bolted firmly to the sills of the body, and the top fifth-wheel plate C is secured by bolts at each bearing. It is important, therefore, that the utmost care be taken to have all the bearings level. This can be done only by first bolting the bars to the body, then leveling the plate upon its bearings; to do this turn the body bottom up. It is impossible to secure an easy turning vehicle if the fifth-wheel plates do not work true and smooth. The plates may be perfectly true, but in putting them on the tightening of the bolts may draw them down at one point, and as a result there will be a rise at another. It will require but little strain to throw the plate a sixteenth of an inch, which will be sufficient to reduce the wear of the plates twenty-five per cent and increase the friction double that amount.

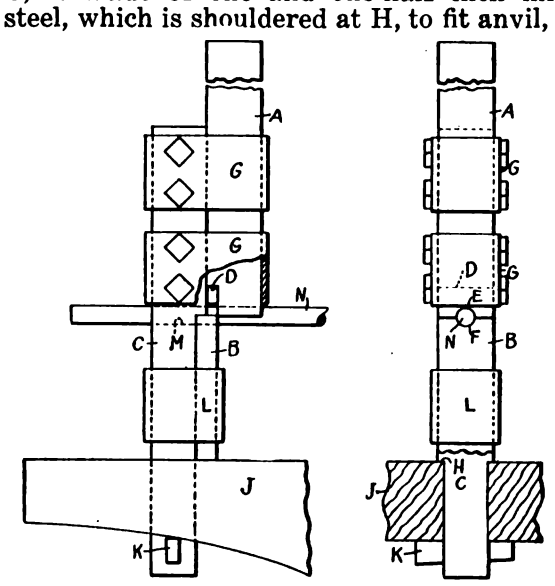
Fig. 5 shows the form of the center bar A, Fig. 4. The other bars differ in having no center depression, they being flat where they rest upon the plate, and having the ends lightened out from the outer line of the bearing.

The weight of timber used depends upon the weight of the body and the purpose to which it is to be put, as this pattern can be used to advantage on the lightest two-horse trucks and on the heaviest freight wagons. This pattern is very strong, and being simple in construction it can be made by any carriage part maker who has a general knowledge of gear construction.

A ROD CUTTER

From H. Redmon, Washington.—I am sending a sketch of a rod cutter, which I made from odds and ends. I had several hundred drift pins to cut and having no shears, I devised this tool. It is made of six pieces. The top tool A, is a piece of steel one and one-half inches square and ten inches long, shouldered at the lower end, D, with a half round cutting edge, E. The lower tool B, is five-eighths by one and one-half inches tool steel, four inches long with cutting edge, F, to match tool A. Tool A passes by tool B far enough to cut off the rod.

Tool A is held in place by two bands, G, which are attached to the holder C. Holder C, is made of one and one-half inch mild steel, which is shouldered at H, to fit anvil, J,



Mr. Redmon's Rod Cutter

with a slot to put a key, K, through to hold the tool in the anvil. Tool B is held in place by a solid hand, L, which slips over C, holder C having a hole M, for the rod N, to go through.

One whip of the sledge will cut a five-eighth inch rod or smaller. Any shop without a helper or shears will find this one of the handiest tools. I think that the BLACKSMITH & WHEELWRIGHT is the best trade paper that a blacksmith could read. Here are some of the prices that I charge:

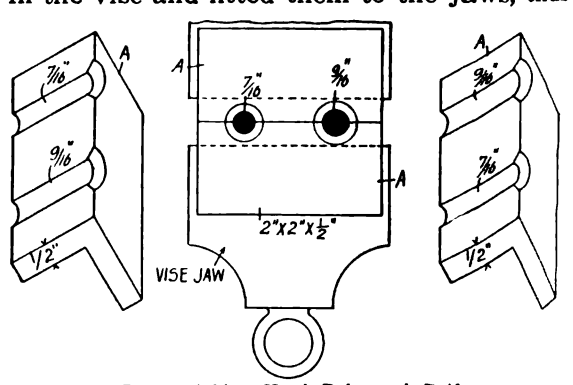
Shoeing 1 to 2 per team	$6.00
Shoeing 3 to 4 per team	6.50
Shoeing 5 to 6 per team	8.00
Shoeing 7 and larger per team	10.00
Sharpening picks 25 mattocks, 40 new points	1.25
Plow Points	1.50
Sharpening 12 inch cast or steel same price	.75
Sharpening 14 inch cast or steel, same price	1.00
Setting tires, per inch	.50
All small Welds	.50
All small Welds with fire	1.50

TWO FINE KINKS

From C. L. Shannon, Florida.—I began to read the BLACKSMITH & WHEELWRIGHT, more than thirty years ago, and have been reading it on and off ever since. I have tried to quit blacksmithing repeatedly, but have always gone back to it. I have been with a lumber corporation in this town for nearly two years now.

Sometime ago we had an order for several hundred counter-sunk head bolts and drifts. You have often heard that "Necessity is the Mother of invention" and knowing that, I set about to fix up a tool.

I took two pieces of two by one-half-inch angle iron, as shown at A, the length of the vise jaws, I clamped them together and drilled one nine-sixteenth inch hole and one seven-sixteenth inch hole, between the jaws so that half of each hole came in each side jaw, as shown in the sketch. I then heated the opposite edges of the iron, clamped them in the vise and fitted them to the jaws, thus

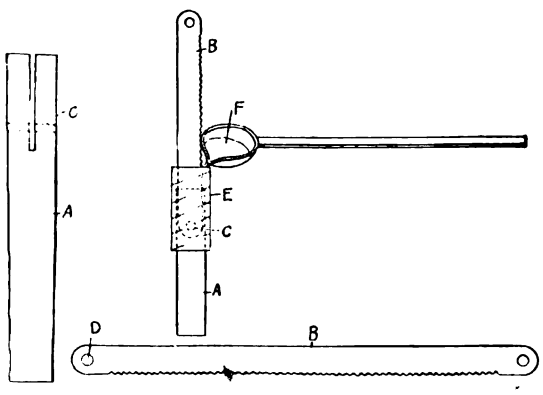


Countersinking Head Bolts and Drifts

forming false jaws with counter sunk holes between them.

By taking a good soft heat on the bolt ends I could catch them in the holes, leaving about three-quarters of an inch extending above and with one operation swage a nice countersunk head on it. For one-half inch bolts drill a seven-eighths inch hole, and for five-

ghths inch drill a nine-sixteenth hole.
Another thing I have put some time on is aking butcher knives out of hack-saw ades and running babbitt ferrules on them. rst saw a slot in the handle as shown at A r the end of the blade B, two and one-half ches, or three inches, burn a hole, C rough the handle to correspond to hole D, end of the blade, then burn out the slot in e centre, so that the babbitt will have an sy flow clear through to the holes. Cut

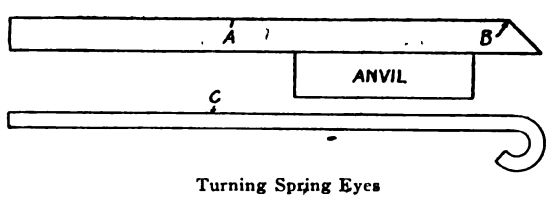


Making Butcher Knives from Hacksaw Blades

way the wood to allow a good ferrule, rub ie handle with smooth paper, E, well soaked nd pour babbitt, F, in at the knife end of ie handle. Break off the blade and grind) your fancy.
A coarse file or rasp readily cuts the babitt and with a little practice you can make fine knife. I have hammered them out of les, but I have found that heavy machine aw blades are the best.

TURNING SPRING EYES

From H. E. Risee, California.—I have ound, as I suppose that many of the readers iave, that the making of a perfect spring ye is a difficult matter. Unless the eye is



Turning Spring Eyes

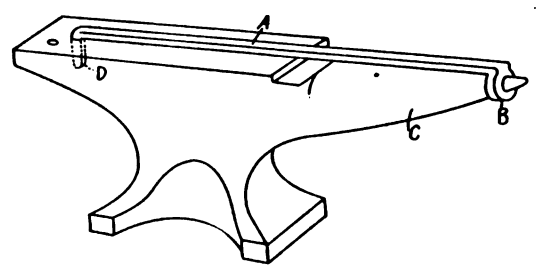
started correctly and turned properly it will never look right.
When I make or turn spring eyes I first scarf the end of the spring very short as shown at A in the drawing. Then I put the fuller at B, right on the corner and bend and work the thin end around as shown at C. It is then a fairly easy matter to bend the end all the way around the pin.

WHY SOME FORD CARS START HARD

From F. G. Hoskins, Texas.—In the March number of the BLACKSMITH AND WHEELWRIGHT I noticed a query from a brother smith in regard to his Ford car. He said that his car was difficult to start. I suppose that there are hundreds of reasons why a Ford car starts hard, but as a general rule anyone familiar with the machine can usually find the trouble unless the reason is a peculiar one. I rather think that in this case, where the owner has called upon so many experts, his trouble is not a common one; hence my suggestion.
I have found that one reason, seldom thought of by the repair man, is end play in the crank shaft. In such cases the rear main bearing becomes worn, probably due to the action of the clutch which tends to move the flywheel back and forth. When this happens the flywheel has a certain amount of play in its housing. The action of throwing out or holding out the clutch tends to throw the magnets on the flywheel away from those on the housing, thus increasing the air gap between the magnets and causing a big decrease of current.
Now if our friend will jack up one of the rear wheels and let the high speed clutch into gear he will probably find that the engine will start easily. This is due to the fact that the pressure of the spring in the clutch brings the magnets close together again. Be sure to put a block in front of the wheel so that the car won't jump forward. After the engine has been started he can throw out the clutch and when the free wheel has stopped, push the car off the jack and everything will be all right.
As a remedy for the end play a new crankshaft bearing may be fitted. After this is done, and there is no end play, the distance between the electro and permanent magnets may be adjusted to the thickness of a business card. The adjustment is made by removing the necessary number of steel shims from the field magnet assembly.

PRESERVING THE FACE OF THE ANVIL

From F. G. Hoskins, Texas.—In order to keep the hot cutter from the face of my anvil I have adopted a scheme which I think might interest your readers. I obtained a flat slab

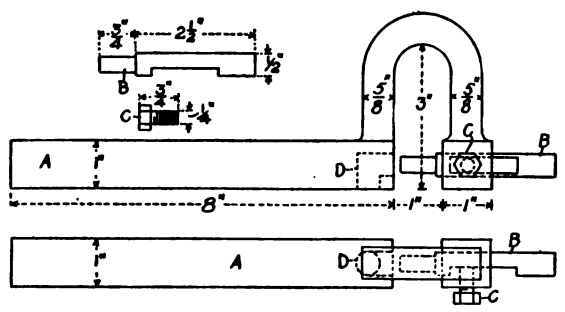


Protecting the Anvil

of iron (A) and punched a hole in one end as shown at B. I then turned it down so that it would hook over the horn of the anvil as at C. The other end of the iron I bent and fitted to the hardy hole.
With this iron in place the face of the anvil is protected and there is no chance of dulling the cutting edge of the hot cutter.

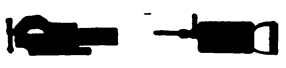
BOW SOCKET RIVET PUNCH

From L. B. Nichols, Missouri.—I give herewith a drawing of a Bow Socket Rivet Punch, which I find very handy. It is made from an old one-inch axle. I believe that the sketch is self-explanatory. I have been a reader of the BLACKSMITH & WHEELWRIGHT



Mr. Nichols' Bow Socket Rivet Punch

for several years and have found it very helpful. I believe that we ought to write more and give each other ideas.
Although I am only thirty years old, I have been in the blacksmith line for thirteen years. I certainly trust that the brother smiths will write more often, as I intend to do.

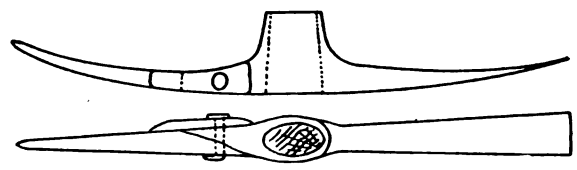


A TIRE HEATER

From G. E. Hildebrand, Colorado.—I noticed in the April issue of the BLACKSMITH & WHEELWRIGHT, Mr. Morcombe of Canada, asks about a tire heater. I have one and would not think of running a shop without it. It is built of cement, six feet high and five and one-half feet long, and three feet eight inches wide. Outside measurements, the walls are ten inches thick. The opening for the smoke stack is eight by eighteen inches, and the door locks about three inches from the bottom so as to allow good draft.
There are two pieces of railroad irons bedded in the cement walls about eighteen inches apart and about six inches high for the tires to rest on. During the heating I shift the tires about three times, in this way giving uniform heat. Fuel is cheap as scrap wood of any description answers nicely. It is not necessary to stand and watch the fire, and you can go on with your work while the tires are heating. I should not like to be without one of these devices.

WELDING A BROKEN PICK

From C. J. Smith, Pennsylvania.—In this town many of the streets are covered with crushed stone which, after usage packs down extremely hard. When it is necessary to remove portions of the surface with picks, these tools wear down and dull very rapidly.
Not long ago someone brought me a pick which had broken about 1½ inch from the eye and although I repaired the pick, I'll admit that a new one might have been more suitable and perhaps would have cost less than what the repair job was worth. However, it isn't always the cost that counts because sometimes the job is wanted in a big hurry and the part cannot be replaced immediately.
Before I started work on the pick I made a 5/16 inch pin from horse-shoe iron long enough to go entirely through the broken part of the pick. Then I scarfed off both of the broken ends of the pick, ready for welding. Next I took a piece of horse-shoe iron, 2 inches long by ¼ inch thick and scarfed it at both ends. Through this pad, at the center, I bored a 5/16 inch hole for the above pin.
I next fitted the two pieces of the pick together where they belonged, punched a hole for the 5/16 inch pin, or "nail" as I call it and covered the broken, scarfed ends, the


How the Broken Pick Was Welded

nail and the pad with flux. The flux which I used for this job is made from borax and carbonate of iron mixed, it is applied to the iron while the iron is hot and immediately melts. As soon as this melts I apply Climax welding flux which I like especially.
After the parts are well coated with flux and the fire is ready, I nail the parts together and bring the whole to a medium red heat. The nail holds the parts together while I am welding it and I have found by experience that I can often save time by "nailing" parts, which are to be welded, together. I got this idea when I visited some of the New York ship building plants.

SOME AUTOMOBILE REPAIR TIPS

From F. G. Hoskins, Texas.—To remove a rear wheel from the shaft of an automobile jack up the car by placing the jack under the housing on the opposite end from the wheel to be removed. Then strike the end of the shaft with a heavy sledge. To prevent the sledge from marring or damaging the threads on the end of the axle use an old coupling which is poured full of lead or babbitt between the hammer and the axle.
I have found that radiator leaks can be

stopped, temporarily, by plugging the leaks with a mixture of litharge and glycerine made in a putty. This mixture requires about an hour to set. Do not use melted sulphur as the sulphur will corrode the radiator and soon spoil it.

CARRIAGE BUILDERS' NATIONAL CONVENTION

The 49th annual convention and exhibition of the Carriage Builders' National Association will be held at the Hotel Gibson, Cincinnati, Ohio on September 20, 21, 22 and 23 of this year.

In the August number of this magazine we will give full details concerning the exhibition. Our readers who are interested and wish immediate information should write the Secretary, Mr. G. W. Huston, in care of the Carriage Builders' National Association, Cincinnati, Ohio.

Making Money with Miracle Flame

New and Profitable Fields Opened Up to Blacksmith Who Knows Oxy-Acetylene Welding

By C. E. Young

The Imperial Brass Mfg. Co.

There is a whole lot of romance and interesting work for the man who can handle the "miracle flame" of an oxy-acetylene torch. Like a magician who pulls rabbits, flower pots and a whole wardrobe from the derby of the bald-headed man in the front row, the oxy-acetylene welder achieves the impossible.

Broken castings which ordinarily would be consigned to the scrap pile and replaced with new and expensive parts, are made as good and sometimes even better than new with the white hot flame which results from the mixture of oxygen and acetylene gas.

Likewise time-consuming jobs which take hours and even days, a whole lot of mechanical ingenuity and are sometime unsatisfactory when finished, can be completed in minutes with an Oxy-Acetylene Welding Outfit.

Small wonder that the man who has provided himself with Oxy-Acetylene Welding Equipment and learned to use it finds new fields of work opening up, and most profitable work waiting for him. When an expensive casting has broken and the owner is faced with the necessity of paying anywhere from $25 to $100 to replace it, the welder who can make it good as new has every justification for charging a handsome price to save a portion of the expense.

Blacksmiths and mechanics in constantly increasing numbers are turning to oxy-acetylene welding as a help to their regular work and a means of securing new work when times get dull. In the neighborhood of every shop there are numberless jobs which he can pick up. Other shops, learning of his equipment and ability, turn work over to him. It is a new and yet a related field.

Probably one of the greatest reasons why blacksmiths who take up oxy-acetylene welding are so successful is that they usually have a basic understanding of the action of metals under heat. Only a little time and practice is necessary to make them proficient, whereas the ordinary man without such previous training may need to spend months to become equally expert.

Practically all metals encountered in ordinary practice may be welded with oxy-acetylene apparatus. Broken parts of iron, steel, brass, bronze or aluminum are made good as new through the fusion of new metal with old under the 6300° F. flame.

Further, with the same apparatus and only a change of torch, metals can be cut with speed which approaches the miraculous. In a boiler shop, our Imperial Equipment made a cut 19 feet 6 inches long through ⅜ inch boiler plate in 20 minutes that would have taken two days by hand. Motor frames, man holes, handholes, defective plates, rivet heads, welding flues, cracker plates, patches, structural steel,—everything made of wrought iron or steel—can be cut as easily as a hot knife goes through butter. Bolt and rivet heads, can be whipped off as though they were paper.

The popular idea is that the hot flame of the torch simply melts the metal away. That is not so, however. In making a weld, particular care must always be taken to guard against oxidation, because the oxygen gas from the torch easily unites with the molten metal. Cutting is simply the rapid oxidation or burning of the metal and the flame is used merely to get the metal hot enough so that it will oxidize quickly.

Since all metals are subject to oxidation in welding, it is natural to assume that all metals could be cut by means of oxygen from the cutting torch; but this is not so. We are limited to those metals where the oxide is of a lower melting point than the metal itself, this being the case in wrought iron and steel. Other metals, such as cast iron, aluminum, copper, brass, etc., cannot be cut.

In the comparatively short time that oxy-acetylene welding has been commercially possible, great strides have been taken in the perfection of equipment. Acetylene gas, one of the most expensive parts of the equipment constantly necessary, formerly was melted in acetone and shipped in cylinders. This bulky and clumsy method of furnishing supplies is now being supplanted by generators within the welder's own shop.

In the case of our own Imperial Acetylene Generator the only supplies necessary to operate it is a supply of calcium carbide which is occasionally emptied into a hopper. Otherwise, the welder simply lights his torch and the gas automatically begins to flow. Small pieces of the carbide are dropped into the water in direct ratio to the volume of gas being used, so that there is a constant and never-failing supply, with uniform pressure. The economy is so considerable that the generator soon returns handsome dividends in savings. With such a generator, the welder saves from 2 to 4 cents on each cubic foot of gas.

Oxygen gas may usually be obtained readily from nearby points so that it does not offe the same difficulty. One of the most inte esting features of the Imperial Generator i the care taken to make it absolutely "fo proof." Through a most ingenious syste of safety locks, it is impossible for anyon to open any part of the generator witho having previously protected himself from a explosion by having turned certain leve Neither is it possible for the generator t make more gas than will be needed for ord nary operations.

One caution only would we give the blac smith who plans to enter the oxy-acetylen welding field. Do not begin to solicit wor before or as soon as you get your outfi There is no quicker way of hurting your ow reputation and of giving oxy-acetylene wel ing, in general, a black eye than to fall dow on a job for a customer.

In several instances which we have learne about, novices have solicited work befor their apparatus arrived. Others, witho even connecting the equipment, announc that they are ready for the welding of an metal—and into the shop come malleable iro aluminum, bronze and cast iron—metals wit which the newly enlisted operator is often u familiar, to be welded by a process totally di ferent from any method he has been acquain ed with.

Now the oxy-acetylene flame will certainl join all these metals, but, given the prope equipment, it is essential that some judgmen and some practice be added. To practic on a customer's job means the enmity of tha customer. So, before tackling oxy-acetylen on a commercial scale, put the apparatus i the back of the shop or in a separate roo master all of the principles, and practice o scrap material.

One cannot become a welder by readin alone—it is necessary to do actual wor When possible to get practical training fo a week or two in a repair shop, it is advis able. In any event, practice on junk materi until you are competent to operate the oxy acetylene equipment.

Any man who now has oxy-acetylene equip ment or who contemplates entering into th business will find all manufacturers ready t explain the character of the work which ca be accomplished, how to get started, wha character of equipment is best for the volum and kind of work contemplated, etc. Thoroug instruction guides are furnished withou charge, and questions are cheerfully an swered.

Surely, oxy-acetylene welding with it good profits and increasing range of busi ness is sure to grow in favor and importanc among the blacksmiths and wheelwrights o the country.

QUESTIONS FOR OUR READERS

WELDING FORD SPRINGS

From F. G. Hoskins, Texas.—Will some o my brother smiths tell me what they kno about welding Ford springs? My own ex perience is that Ford springs are more diffi cult to weld, than other kinds, I have a idea that the difficulty is caused by the vana dium in the steel. What kind of flux i best for this kind of welding?

(Editor's Note:—We would advise ou reader to try some of the fluxes advertised i this magazine.)

SPARKS AND SHAVINGS

Sweet's Toe Calks

In these days of improved roads the matter of shoe calks is an important one. The calks must be sharp enough to hold on the road and yet not so sharp that they will cut into the road-bed and stick. The wear on a calk, driven on a hard road is many times greater than a few years ago when the horse traveled over dirt roads.

Not only is the shape of the calk important, but the strength, temper, or toughness vital. A calk which will wear down too rapidly, or pull off from the shoe is worse than none at all.

The making of calks is a matter which requires experience and scientific planning. The Franklin Steel Works, with offices at Joliet, Illinois and Cambridge, Mass., can qualify both as to experience and ability in the making of calks.

Their product, Sweet's Toe Calks, are made to stand the strain of modern driving. These calks are made of the best quality of steel. It has taken years of experimentation to find the grade of steel which will give the best results and The Franklin Steel Works claim that the steel which they use is high enough in carbon to give hardness and endurance without removing the welding quality.

Sweet's Toe calks are tough and may be hardened easily. They are of a grade of steel which can be successfully welded. The calk is shaped for speed and the nib is shaped so that it can be driven into the shoe and will hold.

Tire Repairing

The Blacksmith who is wise enough to go into the tire repairing business can be sure of keeping busy during the dull times because the repairing of tires is a year-around job. Vulcanizing is an ar which is learned easily and though som kinds of work require experience, th smith need not undertake anything bu the simple jobs at first.

A complete vulcanizing equipment with which repairs to tubes and tire may be made can be obtained at so lo a price that it can be paid for out of th profits in but a short time. We woul advise our readers to enter this field an so keep their shop full of work all th year around.

If our readers will write to Chas. E Miller, (Sales Dept.) 1420 Meridian St. Anderson, Ind., they can obtain all o the information necessary.

WANT ADVERTISEMENTS

ADVERTISEMENTS of SHOPS FOR SALE or TO RENT, SHOPS WANTED or SITUATIONS or HELP WANTED,

will be inserted under this head at 3 cents a word, including the address, for each insertion, payable in advance; but no advertisement will be accepted for less than 60 cents, however small.

Remittances may be made in postage stamps where the amount to be sent is less than $1.00. Address

M. T. RICHARDSON CO., Advertising Department,

71-73 Murray St., New York. Publishers of the Blacksmith and Wheelwright

For Sale

BLACKSMITH SHOP FOR SALE.

Shop 22 x 54 ft., two-story brick building. Only shop in town. Best location in Pike County, Illinois. If interested write to Harry Kendall, Box 82, Detroit, Ill.

Blacksmith shop for sale; well equipped with machinery and electric power, in live country town, good farming district. For information write John Sefcik, Cuba, Kansas.

FOR SALE

Best small-town blacksmith business in Okla. Plenty of auto work if desired; good location for grist mill. Only shop in town. Reason for selling, other business. Address J. W. Johnson, Williams, Okla.

WILL SELL L. S. P. Calking Machine; latest model, 1919. Good as new; price $50.00. For further particulars address Joe Finn, 206 Main St., Streator, Ill.

FOR SALE OR RENT—First class electric power blacksmith shop, also horseshoeing and and woodworking department. Will sell lot, building, machinery and material or rent building and sell machinery and material. $2000.00 will handle this. Good place for live wire. Ill health reason for selling. Write J. W. Shuler, Holtville, Cal., Imperial Valley.

Patents

PATENTS FOR INVENTIONS.

H. W. T. JENNER, patent attorney and mechanical expert, 622 F Street, Washington, D. C. Established 1883. I make an examination and report if a patent can be had and the exact cost. Send for full information. Inventors assisted in developing ideas and inventions. Trademarks registered.

For Blacksmiths

BLACKSMITHS, LISTEN!

Any handy man can make more money doing hard jobs easily. Forging and solid welding with Toy's modern methods of blacksmithing, hardening and tempering to a standard with collard tempering charts. All for one dollar. Samples free. 52 years a machine blacksmith. W. M. Toy, Sidney, Ohio.

"Sample received and it is all you claim for it. For amount enclosed please send by express 25 lbs. Uniflux." A. Barton of Kosse, Texas writes us the above. You also need Uniflux "Master of Service" Welding Compound for forge welding. Request Circular or send 10c for Sample. Goruse Company, Elmira, N. Y.

Printing

100 Envelopes, 100 Statements and 100 Note Heads $3.00. S. L. Printing Co., Warren, Ill.

Contemplating disposing things of Interest to the blacksmiths? Try our Classified ads. They pull.

Special Bargains in Lathes

During the war the J. A. Fay & Egan Company of 400 West Front Streets, Cincinnati, Ohio, specialized in building 16 and 18-inch swing, eight foot bed lathes for the Ordnance Department of our government. The lathes were necessarily of high quality and the best workmanship in order to pass the rigid examination given by the government inspectors. At present this firm has a few of these lathes on hand and are offering them to the trade direct which means a saving of 12½% on the agent's discount.

Since the number on hand is limited and since the company, for advertising purposes, desires to make as wide a distribution as posible, only one lathe will be sold to each customer.

The lathes offer a wide range of speeds for turning and will cut a wide range of pitches.

B-N Announcement

The B-N line, consisting of B-N Piston Pins and automobile accessories, and Bur-Nor Hardware Specialties will be sold to the jobbing trade in Minnesota, Missouri, Iowa, Kansas and Nebraska by Mr. H. F. Libby of Kansas City. Mr. Libby is very well known to the buyers in that section of the country, and has had years of experience in the automotive line.

Index to Advertisers

CLASSIFIED BUYERS' GUIDE

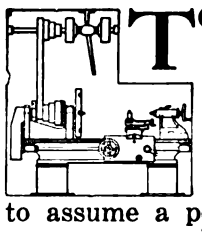
BLACKSMITH AND WHEELWRIGHT

and TRACTOR REPAIR JOURNAL

Vol. LXXXIV. No. 2 AUGUST, 1921 TERMS ONE DOLLAR A YEAR

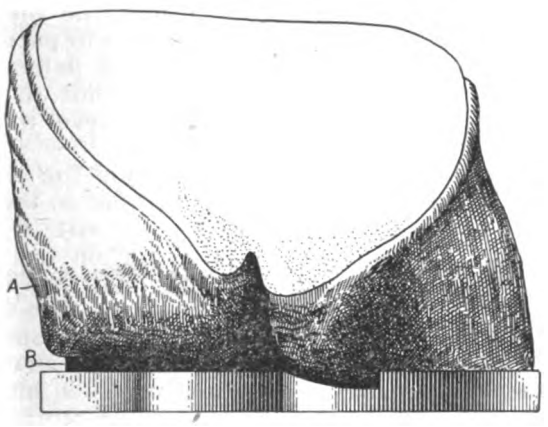
Practical Horseshoeing

Special Forms of Shoes for Horses, Donkeys, Mules and Oxen



TOO much weight may be thrown on the upright wall, as happens when, during the extension of the fetlock joint, the fetlock, instead of remaining behind the middle line of the hoof, tends to assume a position above the contracted coronary margin of the heel. In such case, an attempt should be made to relieve the contracted wall of weight.

The hoof is, therefore, trimmed so that the upright wall comes in contact with the ground before its fellow, when the animal is walked. Unless striking is to be feared, the limb of the shoe covering the upright wall should be fitted as full as possible, the extreme edge being perpendicularly beneath the coronary margin of the contracted wall,



Contracted Wall, A, with Displaced Frogs as Shod with Bar Shoe, B.

while that on the sound side should exactly fit the wall. A bar shoe is even more useful, especially where the bulbs of the frog are displaced; the shoe, however, should be fitted as described and the bar should take a bearing on the outer limb of the frog."

Another shoe that may be used for one-sided distortion due to disease is the one known as "Hartmann's expanding shoe," which has already been mentioned. However, this shoe is narrow and is cut at various points on the inner margin. The object is to make the shoe less rigid. When the shoe is used for the case now under consideration, the cuts on the inside margin are to be located on the half of the shoe corresponding to the hoof wal that is out of shape.

Sometimes the farrier will have to deal with a case where the hoof walls of the two sides have already been pared down differently; where there has been more taken off on one side of the hoof than on the other. It may also be the fact, that this unevenness of trimming has gone so far that it is impossible to produce an even tread because no more horn can be taken off the high side. It is possible here to turn to some kind of horn composition—as gutta percha composition—and use it to build up the one side, and thus produce the evenness desired.

When treatment is being pursued, and it is noted that the upright wall has attained the same direction as the limb itself and that the rear parts of the hoof have nearly the right width, the treatment is to be stopped, as it is possible to get too much of a good thing.

Sometimes with young horses running barefoot, it will not be possible to correct distortion simply by paring and rasping the hoof. The help of a special shoe may, in fact, be necessary in order to get the best results. A special shoe, or part shoe, has been designed and is shown in the accompanying illustration. The one and only heel of the shoe is made rather thick and is located on the same side as the contracted wall. The shoe is thinned from this thick heel on round to the end. This terminal point is located according to the conditions. "In severe cases, the shoe need only extend as far as the center of the quarter (three-quarter shoe)."

We have, in this shoe, gotten somewhat away from the bar shoe; but it will nevertheless be appropriate to consider by way of emphasis some of the purposes of the bar shoe.

General Remarks on Bar Shoes

The bar has primarily the duty of putting some of the rear weight onto the rear part of the frog. This has the effect of lightening the pressure on the heels of the hoof. The frog is well able to take a share of the weight, as it requires a good deal of exercise under any circumstances. Because there is a bar, it is possible to leave another section of the shoe open. This may prove very advantageous, especially in the heel region on one side. The shoe is, even with a piece gone at this point, still very much the same as an ordinary horseshoe. The open place is off at one side, instead of being exactly at the rear.

Shoeing of Mules, Oxen, Etc.

The donkey finds no very extended field of service open to him in the United States. Still, there are quantities in some parts of the country, and it is well for the horse-shoer to be informed in regard to their shoeing. Naturally, the owner takes him to the same shop in which his horses are shod.

In general, the bones and their disposition and also other parts of the foot of the donkey are very similar to the same parts and arrangements in the foot of the horse. However, there are minor differences. The form and size will frequently differ. In the accompanying figure, we have the under surfaces of the unshod fore-hoofs of the two animals. Let it be noted, first of all, how nearly circular the horse hoof is. Even the frog conforms more or less to the circle.

But in the donkey hoof, it is only a half circle that is tolerably good. The toe and the regions on both sides for a little distance constitute a good semi-circle. Back of this, the circle is given up, and the form greatly lengthened. It is as if the frog had been pushed back. In the horse hoof the point or tip of the frog is less than a radius from the toe; while in the donkey hoof, the tip of the frog is set back from the toe considerably more than a radius.

As to the *size* of the frog in the donkey hoof, it would appear as if it might be wider, relatively, at the rear, than is the case with the horse's frog. The bearing surface of the donkey hoof is decidedly broader, particularly at the toe. In fact, the horny wall is relatively thicker in the donkey than in the horse.

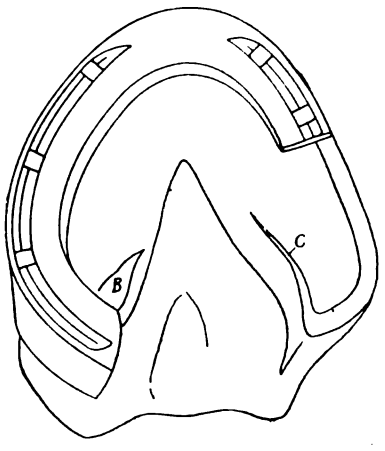
Again, in the figure where hind hoofs are compared, one notes the pushed-back frog of the donkey, just as before. Only now, the horny wall at the heels seems to afford more protection to the rear end of the frog than is the case with the front hoof. The two hind hoofs are somewhat alike in the position of the frog, especially at the rear of the frog. However, at the tip of the frog, the same difference noted before is to be observed. That is, the tip of the frog in the horse hoof is less than a radius from the toe, while the tip of the frog in the donkey hoof is further back than a radius. As to thickness of horny wall, it is evident from the figure that the donkey hind hoof has an extraordinarily broad front wall.

The thick horny wall of the donkey hoof is shown by the fact that it varies from five-sixteenth to one-half at the toe; at the quarters from three-sixteenths to three-eighths inch; and at the heels, from three-sixteenths to one-quarter inch. The average thickness of the hoof at the toe,front and hind feet, of the medium sized well-bred horse is one-half inch; and the thickness at the juction of the quarter with the heel is a strong one-quarter inch.

In order to make the comparison fair, we must take account of the smallness of the donkey as compared with the horse of medium size. Altogether, then, the hoof of the donkey is narrow and long and the horny wall thick, when comparison is made with the average horse. As between the front and rear hoof of the donkey, the frog of the front hoof is decidedly more developed.

As is well known, the mule is the offspring of the male donkey and the female horse. One need not be surprised then to find in the mule hoof a mingling of the characteristics of the hoofs of horse and donkey. The hoof of the mule is long and narrow. The frog is relatively large. Its tip is just about a radius distant from the toe of the hoof. The thickness of the horny wall seems to be perhaps a trifle more than one would expect, upon comparing with a horse and making allowance for difference in weight.

Further, the sole is well arched, and the



Special Shoe for Young Horses with Distorted Hoofs.

side walls of the hoof rather steep. The arched sole means that the shoe need not be especially wide relative to the metal strip that forms it. In the horse, a certain amount of extra width, or "cover," is often necessary in order to protect the sole from the road. But, an arched sole takes care of this matter in a different way. A mule's shoe may, accordingly be but very little wider than the horny wall.

The material of the wall is quite tough, both in the mule hoof and the donkey hoof. Five or six nail holes are all that are really necessary for holding the mule shoe and four for the donkey shoe. The fact that the wall is tough—and hard too—guides us to the selection of nails that are strong in the shank. They should generally be short as

well. The shoe itself is lighter in weight than that used for the horse.

The shape of the modern, up-to-date mule shoe differs markedly from the horse shoe. The ends, at the heels, reverse the curve and turn slightly outwards. This is the case both with front and hind shoes. Eight nail holes are provided. From the last hole at the rear to the end of that half of the shoe is a longer distance, relatively, in a mule shoe than in the ordinary shoe for the horse.

Mule shoes, shaped, provided with holes

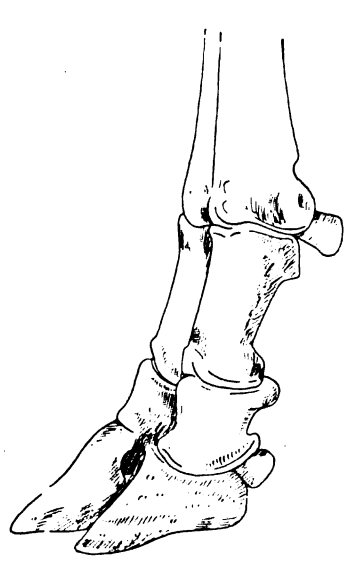
Unshod Hoofs of Horse and Donkey. At Left Is Horse's Hoof; at Right Are Donkey's, Fore and Hind.

for calks, and generally ready to use after a little shaping, may be obtained in half a dozen sizes. Drop forged steel is an obtainable material. The holes for the calks may be had threaded or smooth to suit the type of calk it is proposed to use. Four holes are proper—one at each end of the loop of steel and two others near the toe, a short distance apart.

Thus, the Diamond Calk Horseshoe Co., Duluth, Minn., makes a mule shoe of one pattern in six sizes. The holes are smooth tapers to fit the tapered calks made by the same concern.

Similarly, the Giant Grip Horse Shoe Co., Oshkosh, Wis., makes a mule shoe in five sizes, the weights running from 13 ounces to 32 ounces, which also have smooth tapered holes adapted to receive the shanks of the calks made by this company. This concern claims that the mule shoe made by it had the approval, with respect to design and pattern, of more than five hundred horse-shoers before it was put on the market. Both concerns make their shoes in the form of steel drop forgings.

The Neverslip Works of the Manufacturers' Iron and Steel Co., New Brunswick, N. J., supplies a steel drop forged mule shoe in five sizes. The calks in contemplation



Bones of an Ox's Foot and Leg. Note the Fact That Bones of Both Halves Are Practically the Same Shape.

with *this* shoe is the calk with a threaded shank made by the same concern. Other manufacturers of mule shoes are: Bryden Horse Shoe Works, Catasauqua, Pa.; Phoenix Horse Shoe Co., Chicago, Ill.; American Horse Shoe Co., Phillipsburg, N. J.

The ox is much used in certain districts of the United States in work suited to his characteristics. Thus, in the logging operations carried on in certain parts of the forest regions, the ox has been found to be very serviceable indeed. A bigger team can ordinarily be handled by a single driver. The food may be rough and the treatment also. They are strong—probably stronger per unit than the average horse or mule—willing, and obedient. There are a couple of disadvantages. They are very slow, going, say, one and three-quarter miles per hour; and in hot weather, oxen may easily be seriously injured, or even killed, by overdriving.

In addition to the advantages already enumerated, one may call attention to the better behavior of oxen in emergencies. They do not get so excited.

The first cost is probably much less, in general, than for other animals in the same class that can be compared to them in strength. Altogether, the ox is popular in some regions; so that some horse-shoers are fairly certain of a percentage of their shoeing to be done for oxen.

The ox's foot differs notably from the horse's in that the hoof is divided. That is, there are, as it were, two hoofs. Above the two hoof bones, the bones occur in pairs, until one comes to the lower end of the metacarpal bone. That is, just beneath the metacarpal bone are two pastern bones; next below these are two coronet bones. The two bones corresponding to the hoof, pedal or coffin bone of the horse are called claw bones. In addition, there are sesamoid and navicular bones. The former form part of the fetlock joint; the latter part of the coronary joint. All this may be made clearer by noting the details of the figure. There are two fetlock joints, and *two* coronary joints.

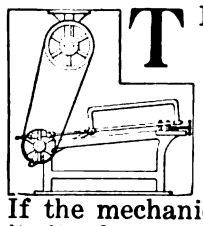
The two claw bones are quite different from the horse's single pedal bone in his hoof.

The normal position of the bones of the ox foot gives an assemblage somewhat resembling a doubling of the foot bones of the horse. However, the axis of the pastern bone and of the coronary bone—which are in line with each other—do not make so flat an angle with the earth as the same lines in the horse's foot. That is, the axis of the ox's foot, as determined by the pastern and the coronary bones, makes a very steep angle with the surface of the ground. It is not vertical; but, at the same time, it does not make, as with the horse, an angle of something like forty or fifty degrees. Further, in the case of the horse, the front line of the hoof is fairly in line with the front.

Silver Soldering Band Saws

If Care Is Taken and Directions Followed a Good Job Will Result

BY DAVID BAXTER



THE wood-working portion of any blacksmith shop has to contend with broken band saws now and then. Sometimes there is only one blade, and this always breaks just when it is needed the most. If the mechanic doesn't know how to mend it, it often means a loss of time as well as temper.

The devices and process employed in repairing broken band saws are simple indeed, so that every worker need lose but a few minutes to do the mending himself, instead of sending the saw to some other shop; perhaps out of town. If the shop has an oxy-acetylene welding plant in connection with other equipment, the matter is still simple. In fact the welding torch is the logical tool for repairing broken band saws. The process is handier and more easily executed with the welding torch than with ordinary brazing burners because the welding flame is always under absolute control. The narrowest of band saws may be mended without danger of injury to the finest of steel. By using a larger flame the large saws can be handled just as readily.

The old style method of repairing these saws was by brazing with brass filings. The modern method is by what is known as silver soldering. The former is no doubt a good way in its place but the silver solder process is more certain and is a simpler operation. If the operator is at all careful he can make the broken ends of the blade adhere at the first trial.

All that is needed besides a welding torch, or else a brazing torch, is some borax flux, the silver solder, a pair of strong pliers, and a device similar to that shown in the photographs accompanying this text. Ordinary borax powder may be used, or the mechanic may purchase it in the form of patented soldering flux. The silver solder for the purpose of saw mending is manufactured in very thin sheets or strips. It is quite expensive and should not be wasted.

Best Grade Silver Solder Essential

However, only a small piece is required to mend an ordinary saw, so it does not cost much in the long run. It should be purchased from a responsible manufacturer in order to be certain of getting the right metal.

The pliers used in this process must have wide flat jaws and be heavy enough to create considerable pressure.

The other tool needed is a device for holding the broken ends of the saw blades together as shown in Fig. 1. This device is easily made in any machine shop. It may be of either cast iron or steel. with a smooth level surface and overhanging ledges through which is inserted a pair of common set screws. These set screws are for the purpose of holding the saw blade rigidly upon the level surface. A square of the metal between the set screws is removed to permit a free manipulation of the welding flame on both sides of the saw. The lower side of the device is machined so it will rest level upon a work bench.

When repairing a broken blade the first thing to do is to stretch the saw out so there will be no danger of getting a twist in it. Then place the broken ends one on top of the other so that two or three teeth will lap about that distance, or rather, so that the ends of the blade will lap about the space of three teeth. These teeth should match one on top of the other exactly. Then mark

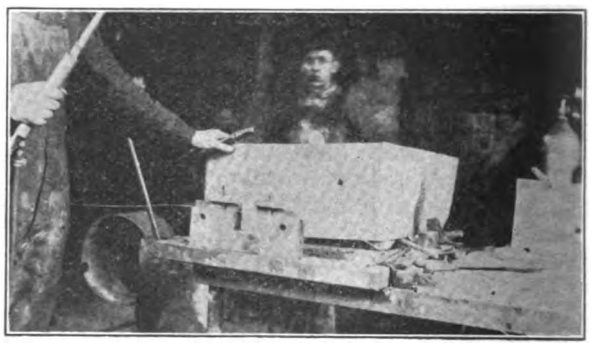


Fig. 1. The Band Saw Fastened in the Holding Device.

each blade exactly at the ends of the break. These marks will then be on one side of one blade and the other or opposite side of the other. This marking prevents making a mistake when grinding the broken ends; and also furnishes a guide for the grinding.

After marking, the saw is taken to the emery wheel where each broken end is ground to a thin wedge. That is, each broken end is beveled from the mark to the fracture. This wedge is ground very thin at the broken edge and slopes gradually back to the guide mark. The teeth are also ground with the same slope as the rest of the blade. One broken end is ground on one side and the other on the opposite side, according to the markings.

If the grinding is properly executed the broken ends should fit one over the other without causing a thick place in the saw. The edges of the teeth should match exactly one on top of the other. It is well to fit the wedges together several times during the grinding to insure a good job. The grinding should be done gradually to prevent overheating the saw metal. The face of the emery wheel ought to be flat and true. A

fine grained carborundum wheel is probably the best for the purpose.

A good way to make the wedges accurate is to press the broken ends of the saw flat upon the emery wheel with a smooth block of wood. But the pressure should not be too heavy.

When the grinding is correct the next thing to do is to fasten the bevels together in the set screws as shown in Fig. 1, being careful not to get a twist in the saw. First one set screw is loosened and one end of the saw is inserted so that the sharp end of the wedge is somewhere near the center of the large opening. This screw is then turned down to hold the blade firmly in place. The broken end with the ground portion on top should be fastened first.

Then the other end of the saw blade is

Fig. 2. Heat Both Sides of the Joint Alike

inserted beneath the other set screw and adjusted so the teeth of both parts fit exactly one over the other. The two ground sides should now be in contact. That is, the grinding should be on the lower side of the upper one and on the upper side of the other. The set screws are then tightened so that they will not slip. The joint is now about half way between the set screws or near the middle of the open space.

When tightening the set screws the worker should be very careful to preserve the alignment of the saw blade endwise or lengthwise of the saw. If it is off the least bit at the joint the saw will not travel on the machine but will tend to jump off its wheel. To assist in keeping the blade true it is pushed back firmly against the back of the holding device when the screws are tightened. The teeth side of the blade should be outward leaving the smooth side at the back. The blade should hang free on each end so it will not get in a cramped position.

Next, the sheet of silver solder is measured on the saw blade to be sure that only enough will be used. As stated above, this material is expensive so there is no use to waste it by cutting more than is actually needed. A piece of the sheet is cut the proper size with a pair of shears or tin snips, being sure that it is wide enough to include the beveled teeth. In other words the piece of silver solder should be cut the length of the beveled portions of the saw blade and as wide, including the teeth. It is not necessary to cut teeth in the solder, however, unless the saw is a large one, as very little of the solder would be saved thereby.

This small piece of solder is now moistened and dipped in the flux powder. With the thumb and finger the borax is rubbed on both sides of the solder. The solder is dipped again in the flux and rubbed to be sure an even coat is spread over the surface of both sides. Then the piece of solder is placed between the beveled ends of the broken saw. This is done by prying them apart with a sharp tool such as a thin screw driver. The screw driver is inserted and turned edgewise a trifle to permit the silver solder to be slipped between the bevels. The screw driver is carefully removed as the piece of solder is worked into place.

This should fit the beveled portion exactly. The mechanic must be careful not to disturb the alignment of the saw while inserting the silver solder.

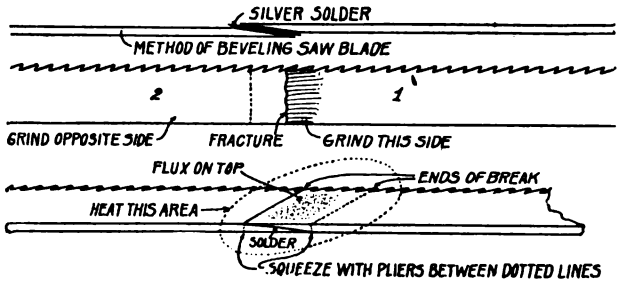
A pinch of borax is then placed on top of the joint to further insure a perfect adhesion of the broken parts. This powder melts and creeps into any unfluxed crevice when the solder is melted; the next step in the process.

After looking over the job again to be sure everything is correct the welding torch is lighted and its flame adjusted. It is not essential to regulate the flame to a neutral welding condition but it should be small and have but little blowing force. That is, the flame should be regulated so it will be mild, or have but little pressure. A small size welding tip and the regulators of the tank screwed down to two or three pounds pressure will produce a flame that is about correct for mending the saw. A large powerful flame is hard to control and therefore hard to concentrate, while a small mild flame may be confined closely to that part of the saw which encloses the silver solder.

When the flame is ready the operator takes the torch in one hand and the pair or pliers in the other because the pliers must be in readiness for instant use before the flame is applied. Then with a wary eye upon the soldered joint the operator applies the flame to the blade. He must watch closely, for the moment the solder melts between the beveled parts of the blade he must squeeze them together with the pliers.

Thus he applies the torch flame to first one side and then the other of the point. Switching from one side to the other in an effort to bring both up to the same stage of heat. When both sides are red hot the solder between them melts. Then the operator swings the flame quickly out of the way and pinches the soldered joint between the jaws of the pliers. Holding the plier jaws flat and level he grips the joint tightly and holds it thus for several moments while the silver solder congeals and cools. The grip of the pliers is not relaxed until the operator is certain that the solder is no longer in a molten state; until the saw cools below the melting point of the metal.

To make this doubly sure the saw is allowed to remain in the holding device until fairly cool. Then the set screws are released enough to permit the saw to be slipped out sidewise. If the adhesion is correct the sides of the saw will now be so closely knitted together it is not possible to pull the joint apart. Sometimes it is necessary to clean



Preparing and Soldering the Saw

the teeth and polish the sides of the blade but usually the saw is ready for use the moment it is taken out of the set screws.

A plumbers' common blow torch may be used instead of the welding torch but it takes a little longer and the work is not so neat. The flame is not so accurately controlled but the theory is the same. In fact the theory is the same whatever method is employed to heat the saw. Both ends of the break must be hot enough to melt the solder between and cause it to adhere to all parts of both.

Cleanliness Necessary

The ground portions of each part of the blade not only make the lap the same thickness as the rest of the saw but they furnish a clean bright surface to which the solder will adhere better than to rusty or pitted metal. In fact cleanliness is very essential in the silver soldering process of mending broken band saws.

The sheet of silver solder is very thin but it is best to make some allowance for it when beveling the broken ends of the blade as the soldered joint should be the same thickness as the balance of the saw, blade teeth and all.

The drawings which accompany this text graphically illustrate the extent and location of the grinding. They also show the location of the piece of silver solder, so that the novice should now be able, after a little practice, to mend any of the broken band saw blades in his shop or any of his neighbors if they do not know how to do the work.

A soldered band saw blade is an awkward thing to handle or carry around but there are several tricks that eliminate much of this trouble. One of these is to hold the band saw in a large circle straight in front of the body at arms length with one side of the circle in each hand. Then bend forward bringing top half of the circle downward and outward. As the saw descends it will cross and form two concentric loops. When the top of the circle touches the floor the whole saw blade is released and dropped backward. As it falls it will coil into a number of small rings that are convenient for carrying. Thus it may be taken from the metal to the woodworking portion of the shop without scratched hands.

This silver soldering process may be employed for mending other articles similar to band saw blades, by the application of the same principles. The blacksmith or wheelwright may find it useful even though he doesn't have many saws to mend.

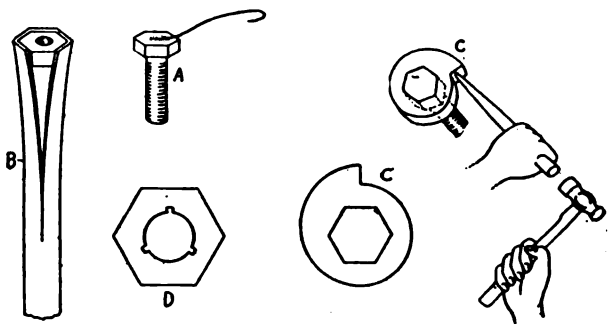
Getting the Best of a Stubbon Bolt

BY F. H. SWEET

RECENTLY while working on an automobile it was found difficult to get a bolt started in its place, and when I had about decided to remove other parts to enter the bolt, the following scheme of overcoming the difficulty was tried.

A piece of wire was procured and one end lightly soldered to the bolt head. This served as a handle for placing the bolt and was easily removed by giving the wire a few turns. The same means can be used to enter bolts and pins in places not easily accessible, the time of preparation being small as compared with the practical value of the device. (See Fig. 1-A.) A simple method of starting a nut is shown at Fig. 1-B. The holder is made of sheet metal, rolled into a tube.

A nut is then inserted in one end and the metal hammered to the shape of the nut.



Any length of metal can be used, as desired. In use, the shaped end of the metal is slipped over a nut and a slight pressure suffices to screw it down over the bolt. For starting nuts on the end of a bolt in a location not easily reached with a wrench the simple tool shown at Fig. 1-C, will be found valuable.

This is made of steel and has a projecting lip against which a drift may be placed, as shown. The nut may be started by hammer blows without damage. Burred threads on a bolt may be cleaned up by usinng an extemporized die made from a nut of the proper size, at Fig. 1-D by cutting a series of three grooves in the threads with a three-cornered file to provide cutting clearance, and then case-hardening the nut interior.

While a stubborn stud or sheared bolt is difficult to remove, one can usually unscrew a nut without much trouble, even if it has become more or less rusted in place. A good method to take off a nut that seems to resist being parted from its stud or bolt more than usual is to heat an open spanner that fits the nut and let it rest against the nut for a few minutes. The heat will soon expand the nut without producing corresponding expansion of the bolt, and it may be unscrewed.

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Our Editor's Letter

LAST week I had a friendly chat with one of my fellow writers who happens to be editor of an automobile magazine. And of all the puffed up guys in the country he was the biggest. Why he tried to tell me that his work required more brains and more knowledge of science than any other! But it didn't take me long to tell him that the editor of a blacksmith magazine really needed more knowledge than anyone else—and now that poor demented idiot is telling all of my friends that I'm a puffed up guy! Just imagine!

He told a story about an automobilist who foolishly drove his car over a rusty nail and punctured a tire. "And now," said he: "just consider the amount of knowledge necessary for me to tell him how to repair that tire. First, I must know all about rubber, how it is grown and how it is cured, second, I must know something of chemistry, in order to know what kind of cement to use and third, I must know something about heat treatment, in order to tell him how to vulcanize the patch."

Now, personally, I think that the fellow who drove his car over a rusty nail was rather crazy or darned selfish. Why in the dickens didn't he drive his car to the other side of the road and not try to hog that particular spot where the nail rested? I'm sure that he would have saved himself and us a lot of trouble.

But that isn't the point I want to make; anyway it was probably a blacksmith who was responsible for the nail itself because he probably made it in the first place.

The blacksmith, if he really wants to keep informed about his particular kind of work has more to learn than any other worker in the world, and I make no exceptions. The working of metal requires not merely skill, but all kinds of knowledge.

Just consider, if you never have, the making and fitting of a horse shoe. First, you must know horses. Next to lion taming there is no more dangerous trade than working on the kicking end of a cranky work horse; an animal strong enough to kick you into the hospital or the hereafter, without even half trying.

Second, you must know something of anatomy; you must know just how that shoe should be shaped to carry the leg in the correct position; you must know how to shape a shoe to correct faulty gait, and so on.

Third, you must know how to bend and shape the iron, just how much to heat it without destroying it and how to give it a tough wearing surface.

Fourth, you must know how to weld bars and toe clips to the iron.

Fifth, you must know how to temper the calks and finally how to clinch the shoe by nailing it to the hoof.

This is all, necessary knowledge but if you are a good smith, you will have made your own tools and since various kinds of tools are used in shoeing, you must know a great deal about metal working. You must also know how to forge and grind the tools and what kinds of steel are best for each kind of tool.

If a blacksmith did nothing but shoe horses he could get along fairly well with a knowledge of metal working and anatomy such as we have outlined. But few of the smiths in the country specialize in horse shoeing. If every smith did nothing but shoe horses many of them would not earn enough to pay for the food to support the muscle necessary for the work.

And so it happens that there are many blacksmiths who work on wagons and carriages, many who build such vehicles and therefore a knowledge of woodworking is necessary. The fitting of a tire to a wheel and the repairing of the woodwork in that wheel all call for a great deal of knowledge, which the average workman seldom uses.

And now comes the point of all my remarks—"Do you have the necessary knowledge for your work?" I suppose that the majority of my readers will smile at this question and remark that a person can't do a job without knowing how to do it. But I say that a person can often do a piece of work without knowing how. Let me illustrate this with a story.

A railroad president was traveling over his road and stopped for a talk with the section foreman of a small branch line. In the course of the conversation the subject turned to that of loyalty on the part of the workman. As they talked, an old man, in frayed overalls went past and started to tap, with his small hammer, the wheels of the president's private car. "Right there," said the foreman, "is an example of intense loyalty. That old fellow has been with us for over thirty years and has been absent from duty but once, and that on account of sickness."

Such a spirit of loyalty affected the president very favorably, and wishing to reward the conscientious old man he walked up to him and started a talk. He found out that the old fellow was interested in "his road" as he called it and seemed to know nearly every car and engine on the line. Just as he was about to leave, and in order to check up on a few details, the president asked, and how long is it that you've been tapping wheels?" "Goin' on to my fortieth year," was the reply. "But what do you tap wheels for?" asked the president. The old man removed his cap and scratched his head, replaced the cap and looked up at the top of the car, looked down at one of the wheels and thought the matter over before he finally said, "Well I'm blamed if I know."

There was a man who had been on a job for nearly forty years, doing the work regularly day in and day out without knowing what he was doing.

I contend that there are many workmen in the country to-day who do many jobs which they don't know how to do, strange as it may seem. Are you one of these men?

Do you know how to harden a cold chisel? "Sure," I can hear you say: "Heat the steel up to a light red; dip it in water; heat it again to draw the temper to a deep blue and the thing is done." But perhaps you have a helper whom you have tried to tell the same thing. Probably he has watched you a hundred times while you made a good chisel but every times he makes one it is a "lemon." He does not know how to do the job when he does it He heats the metal too hot, does not hammer it enough or is color blind. Possibly, if the thing goes properly through the process to the final temper, he botches it by drawing the temper to a blue on one side and a straw or yellow on the other. He may, if you don't watch him, drop the chisel into the cooling water on the side rather than end upward, or he may stick it into the water half way, then hesitate a few seconds before plunging it thoroughly.

Before you or the helper can produce a good chisel you or he must understand, thoroughly every step of the process. And I ask you again, do you know your business thoroughly, every step of it?

It was only a few years ago that heat treatment was largely a matter of guess. If a certain man could produce good tools he was "lucky." Now, however, there is little guess work about the handling of steel. We can be reasonably sure about every job we turn out, if we are well informed as to metal working.

There is no such thing as knowing too much and the more we can learn about our business the more success we will have. The smith, who has the reputation of always making good tools, of making shoes which fit and wear, of building wheels that stay round and solid, and of making rock drills that finish to the end can always be sure of a day's work. But to make such a reputation he must have the requisite knowledge. Such knowledge he can buy in the form of books and if he is diligent he can soon acquire it.

And so I tell you, brother smith, that you must study hard if you want to keep abreast of the times for there is much to be learned. The science of metal working is advancing in great strides.

The cost of raw material is small as compared with the value of the finished product. It costs you just as much to produce a poor tool as a good one; you use up just as much coal and energy in doing poor work as you do in producing a good job then why not make every job a good one? Why not make sure of your work, all of it, by obtaining the necessary "know exactly why and how" of all the work which you do?

When your day's work is done visit your local library and take out a book and study it. Make a practice of spending at least an hour a day learning about metals and heat treatment and you will soon find that the knowledge, thus gained, is earning its "double pay for overtime."

An Important Article

IN this issue you will find an article relative to surface, or case hardening, written by one of our regular contributors, David Baxter. This article was written primarily for those who have occasion to make automobile parts where the part must not only carry a torque or strain, but is also subject to frictional wear.

However, the article is of interest to every blacksmith because he comes in contact, daily with many jobs which could be made better by case hardening. By ordinary methods of hardening, where the steel is heated and quenched, then re-heated to draw the temper, the steel has usually a core of brittle steel with a surface of tempered metal. By the case hardening method, however, the core is tough and elastic, while the surface is extremely hard.

Blacksmithing as Practiced in the Sixteenth Century

By H. H. Manchester

SOON after 1500 A. D. a number of manuscripts were written and several books produced by the new method of printing, which gives us some insight into the methods used by the smiths four centuries ago.

The drawings made by the great artist Leonardo di Vinci, whom we mentioned in our last article, were continued in the first part of the 16th Century. One of these which was for a water turbine to give power for the rolling of rods and drawing of wire is here reproduced.

An Armorer's Shop of About 1520. Note the Women Workers as Well as the Form of the Forge.

About 1505 Bem produced a picture codex of the crafts at Cracow, one of the chief cities of Poland. Among these are represented a horse shoer, a sword maker, and a nailor. Bem had illustrated the interior of the blacksmith shop, but in the case of the nailor shows how a die in the anvil was employed to make it easier to head the nails.

Paintings of a number of the early members of a home for aged hand workers at Nurenberg includes an augur maker and a wire drawer. The drawing of the wire was accomplished by rolling the wire of one drum to another through a steel draw plate. The draw plate had been in use for several centuries, but the employment of the rollers seems to have come in more recently.

Although there were nail makers, augur makers, ironsmiths, and horse shoers, the work of the sword smith and armorer was still considered the most important. They worked for the king or the nobility, because it was still customary for the knights to be clad in full armor. Moreover, certain pieces of armor were in use by foot soldiers, which was of course supplied by the government. In this way armorers occasionally received rush consignments for large quantities.

In the 15th century, for example, the armorers of Milan after the battle of Macalo pledged themselves to furnish arms for 4,000 knights and half that many infantry in a few days time.

An illustration which we give of an armorer's shop dating from about 1520 shows several women assistants. This suggest that in war time, in those days as well as now, women turned their hands to whatever was needed most.

The days of the armorer, however, were numbered. Cannons had already been in use for almost a century, and hand guns for about half that long, though the wheel lock was not invented until 1517. From this date on, however, the improvement in the hand gun was so fast that armorers could not keep up with it,—in other words, they eventually found it impossible to produce armor which would be at the same time light enough to be worn and strong enough to resist a bullet.

Lunch Hour in a Metal Working Shop of About 1500 A. D.

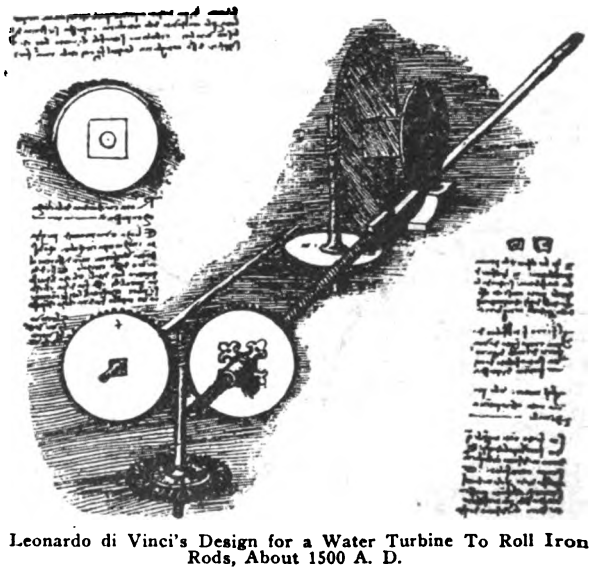
As has always been the case more inventiveness was applied to producing weapons for war than instruments of peace. Leonardo di Vinci's design to apply water power to rolling iron rods, for example, was no doubt due to the fact that many of the cannon of that time were produced by putting iron rods together in the form of a cylinder and banding them with rope, leather, or other materials. The inside of the cannon was bored out by horse power, or water power, while to bore out the barrel of the hand gun the smith had to depend upon his own strength.

About 1540 Bheren Gauchi published his "Pirotechna" or book on metal working. This illustrates the use of water power in blowing the bellows, and also proves that water power was employed for practical purposes in rolling iron rods for cannon, and drawing water.

Other illustrations in the work of Aggricola published in 1556 show that water power was already employed to work a tilt hammer.

While it is surprising to note the many attempts at applying power and machinery in the metal working shops at that time, these shops, small as they were, should be compared with the mills and factories of today, rather than with the present day blacksmith shop. The use of armor then made the employment of power of the greatest benefit. Possibly when the wearing of armor ceased, need for power in the shops was not so much felt, and the smiths ceased to develop in this respect as they might have done.

Industry at the time was dominated by the guild system. This was essentially a craft system where the apprentice worked seven years before becoming a journeyman, and the journeyman three years before becoming a master. The workmanship and sale were both rather closely governed by the officers of the guild. As a consequence, the whole tendency of this system was toward a high grade of hand work rather than quantity production.



Leonardo di Vinci's Design for a Water Turbine To Roll Iron Rods, About 1500 A. D.

Surface Hardening

By David Baxter

THE following discussion should be of interest to all automobile repair men since most of them think the process of hardening the wearing surface of different articles, "case hardening" as it is often called, is a complex, scientific matter; and because of this belief they make no attempt to do a class of work that is very profitable if properly executed. Many auto mechanics think the process entails a lot of technical knowledge and considerable experience.

To do this work along strictly scientific lines probably does require considerable technical experience and accurate instruments. But for the common run of work in every-day practice it does not demand such modern equipment or such a lot of scientific knowledge. In fact the average mechanic can produce good results with a few simple tools, after a little practical experimenting. That is he can harden the surface of different small articles so they will possess greater wearing quality. As he

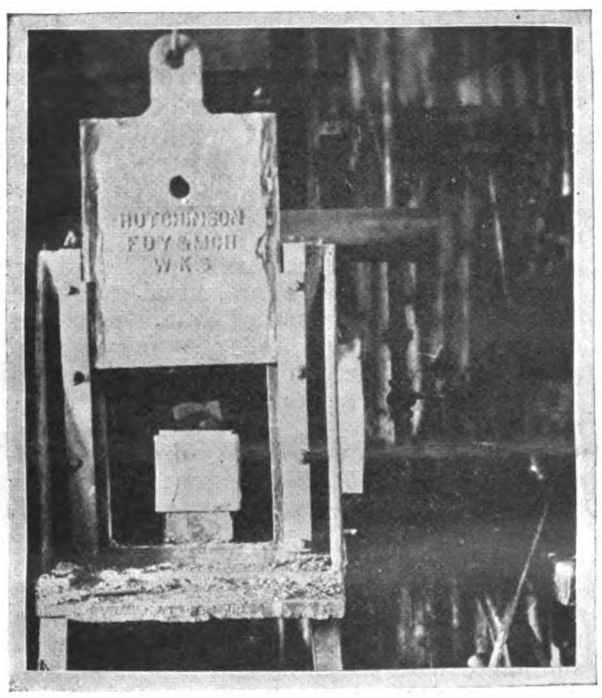


Fig. 2. Front View, Annealing Pot in Position.

gains experience he can learn to gauge the depth of the hardening to a fairly accurate degree without expensive heating devices.

It is the purpose of this article to tell in a non-technical way just how to do the surface hardening without the use of pyrometers, retorts, and other scientific devices, and it is the intention to go far enough into details so that the average mechanic can do the work with little or no previous experience.

First, he must have a furnace or annealing oven. This is easily constructed of odds and ends that he may pick up here and there. Or he may purchase the various parts and assemble them himself. The photographs accompanying the text of this discussion show two views of a furnace that is readily made and which may be built as follows: First, the legs are constructed of pieces of angle iron high enough to make the operation of the furnace convenient to the average man. To these legs are bolted a slab of metal which forms the bottom plate preferably of cast iron about an inch thick. Next is the door frame, which is bolted to the bottom plate. Enough of the bottom plate extends out in front of the door to form a shelf upon which the annealing pot rests while being emptied of the hardened parts.

The frame is made of slanting iron braces and door way with strips of iron bolted to it to form grooves or guides for the sliding door.

The door is made of cast iron about three-quarters of an inch thick with a frame at its back to be lined with fire brick. A balance weight moves it up and down in the guides. A peep hole is left in the door for the purpose of watching the annealing fire.

The furnace proper is constructed back of the door frame after that is bolted in place. First a layer of fire brick is laid flat upon the bottom plate with fire clay mortar. Then the walls, which should be a good grade fire brick, are laid with clay mortar to the top of the door frame as indicated in the pictures, the walls being only one brick in thickness.

The back wall is made solid, but the top of the furnace, which is also of fire brick, has an opening the full length of it. This opening is the width of a brick and made by omitting one row of bricks. It is for the purpose of furnishing ventilation for the hardening fire.

This furnace is fired with natural gas through an opening in one side-wall as shown in one of the pictures. The gas burner enters the furnace level with the floor and is so arranged that its flame may be regulated accurately.

Where there is no gas available the furnace can be fired with an oil burner, preferably of the air-pressure type. Like the gas burner, only the outlet of the oil burner extends into the oven. Thus the flame spreads to all parts of the enclosure. However, the oil burner should be one that can be adjusted to give an even regular heat.

The matter of the size of the furnace is not arbitrary but it should not be too large as this is a waste of heat: about eighteen or twenty inches square by two feet long is a convenient size for the average garage.

The annealing pot or box is the next important part of this equipment. A handy one is made of cast iron about an inch thick. The inside measurements are five by five by ten inches. The open side is offset to receive the lid which is also made of cast iron half an inch thick. A handle is situated near the center for convenience in handling when the lid is red hot.

This box when in service rests upon a piece of fire brick, near the center of the furnace. The brick elevates the box enough so that the heat may envelop all of it, heat-all sides alike.

Next comes the hardening element. This should be a material rich in carbon such as bones, leather, or horse hoofs. However, none of these are recommended in a green state although they may be used thus. Better results are obtained from dry products as the green stuff contains too much moisture to do good work quickly. Prepared bone charcoal is probably the best and simplest all around hardener. This may be purchased from nearly any blacksmith supply house in granules the right size.

Then the mechanic should have a tub of strong salt brine in which to quench the hardened articles to lend them a glass-hard surface if desirable. This brine is easily made of common salt by dissolving as much of it in water as the water will contain. The salt water need not be cold when the hardened articles are immersed.

We now have the necessary equipment for surface hardening small articles such as automobile gears, pistons and rings, chain links, and so forth. Let us endeavor to see how the work is accomplished: First, put a quantity of bone charcoal in the annealing box, say about a third full. In this the articles to be hardened are bedded, making certain to entirely surround each article with the charcoal; one of the pictures shows how the box is packed. On top of the small articles is placed enough charcoal to fill the box. This is pressed down firmly with the hands, jarring the box to settle the grains around the articles. Then the lid is fitted in place and the box is ready for heating. In packing, however, the box should not be overcrowded since there would not then be enough carbon in one charge of charcoal to harden any of the contents properly.

Next the box is placed inside the furnace ready for the annealing. This is done before lighting the gas flame, so that the gas flame may have access to all sides of it as nearly as possible. That is, the box should be heated alike on all sides and ends. To assist in this, the box is placed in about the center of the furnace, a little toward the back of the furnace if anything as the heat is probably more regular there than it is nearer the door. However, the position of the box may be adjusted a little either way after the furnace starts to heat.

When the loaded box is properly set inside the furnace door the gas is lighted, and when burning steadily the door is lowered into place. The gas flame should then be increased and allowed to burn half an hour or more, or until the inside of the furnace, annealing box and all, becomes bright orange in color. Its condition is ascertained by keeping close watch through the peep hole in the door. After the bright orange stage of heat is attained the mechanic should then endeavor to make it permanent until the box has been annealed the desired length of time. This is done by adjusting the gas burner whichever way is required, or by holding the flame steady after once reaching the proper stage.

Fig. 3. Details of Hardening Box, with Articles in Place.

By using heat measuring devices the mechanic could know exactly where to hold the heat but in "home made practice" he must depend upon his eye. He will soon learn to judge the color, however.

To the gas burner shown in the picture is connected a pipe leading to a small fan blower. In the air pipe is incorporated a valve or damper by which the amount of air supplied to the burner is regulated. The damper is opened or closed according to whether the temperature is to be raised or lowered. Thus by regulating the gas and air supply the operator can obtain the correct temperature inside the furnace. He opens and closes the valves until the whole inside of the furnace and the annealing pot are red hot. Then the valves remain unchanged throughout the entire hardening process, unless the heat fluctuates.

Heat Must Be Constant

If the bright orange fades, or whitens, the gas should be changed immediately, as it is essential for the heat to be constant. Once the pressures have been adjusted properly, however, it will scarcely be necessary to change the valves until the job is finished. After the first job the mechanic will know just about where to set the regulators for subsequent hardenings.

When the annealing box attains the bright orange color the piston pins, or gears, or whatever is being hardened, commence to absorb the carbon of the bone charcoal, and so long as this heat is maintained the carbon will "soak" into the surface of the metal. The effect of this process is the hardening

of the metal on the surface first, with increasing penetration as the heat is maintained; as the carbon soaks into the metal the depth of the hardening increases. For the first hour of heating the hardening is merely a very thin skin of whitish metal. The second and third hours double and triple the depth of hardening. Then the amount of hardening diminishes with the lengthening time. In other words the penetration of the carbon is not so rapid after the first three hours.

For the usual run of work the hardening heat is maintained five hours. That is, the bright orange color of the box is kept constant for a period of five hours, after the box has first reached this stage. This length of time no doubt gives the best results for all-round practice but the time may be cut to three hours in instances where only superficial hardening is needed.

The last stage of surface hardening process consists of quenching the heated articles; in other words, plunging them in salt brine. As soon as the allotted period of heating has passed, the gas fire is shut off and the furnace is opened. Then after the intense heat has subsided a little the annealing pot is pulled out on the shelf in front of the door. Its lid is pried loose and lifted off. This is a hot job that should be accomplished with thick gloves and long tongs.

When the lid has been removed from the box the annealed articles are dug out of the bone charcoal one at a time and dropped into the brine tank to cool. The tank should be conveniently located so that there will be no loss of time.

Adding to the Hardness

If the heating has been properly attended to this plunging in brine will increase the surface hardness a great deal. In fact it is done to add a glass-hard finish to the surface of the metal. The brine closes the structure of the metal very quickly, thus increasing its wearing quality. It is practically a chilling effect.

Perhaps it is unnecessary but it probably is best to state that this surface hardening process is not intended for cast iron, bronze or aluminum work, but only for mild steel or low carbon steel, such as small automobile gears or auto piston pins.

The articles to be treated should be machined to correct sizes before heating as it is almost impossible to cut them after hardening and quenching. If properly managed the hardening will not change their sizes enough to be detrimental. The treated articles may be taken out of the brine immediately and polished on a buffer or wire wheel; after which they are ready for service. It is not necessary to leave them in the brine any certain length of time.

A record of the time when the pot reached the correct stage should be marked on the furnace door with chalk; then the mechanic is not liable to forget when to take the box out of the furnace. If he is certain about his furnace he may leave it until the time is up without worrying.

The man who will get down on his knees is entitled to some credit, even if he does not pray in a foghorn voice.

No matter whether you need the goods or not, do not buy more of them than you can pay for. Because there is a long dating on a bill is no sign that it will not come due just the same and have to be paid.

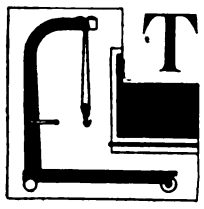
Some men will over-exert themselves to dodge their creditors and run headlong into other kinds of trouble.

A satisfied customer is one who will tell his friends what a good place your shop is to trade.

Small Florida Smith Shops

Our Correspondent Visits One of the Darkest Shops in the State

BY JAMES F. HOBART



THERE are two Blacksmith shops in Tarpon Springs where there is need only of one shop and there are one or two other places—machines shops and garages—where they have blacksmithing outfits. I surely was surprised when I stepped into the Cope shop for at first I thought it was a store. A fine sidewalk laid right past the door and each vehicle which went into or out of the shop had to bump upon and over that concrete sidewalk. The office, in a lean-to built out from the north side of the shop didn't look as if it belonged to a smith shop at all. There was a good built-in desk in the little office, also a fine roll top desk and an adding machine. I looked around for a stenographer, but evidently she was out and had taken the typewriter with her!

The shop stood end to the street and had a very flat steel roof of the corrugated, galvanized type which pitched back from the street the whole length of the shop. This made the pitch of the roof so very flat that evidently rain would drive in as evidenced by streaks of cement along the joints on the underside of the roof where attempts had been made to stop driving rain from coming into the shop between the sheets of steel!

Figure I shows how this convenient but horribly dark smithshop was arranged. The fire and anvil were in the rear, out of the shop entirely; a shed having been placed above the forge and later, the sides of the shed built in. A dirt floor was under this part of the shop while a plank floor, well laid and tight covered the shop proper.

Just inside the front of the shop, opposite the office I saw a long wide bench well littered with bicycle parts and unfinished work while adjacent were stock racks well filled with bike parts and repairs. It appears that Mr. Harper who now runs the shop is somewhat of a bicycle expert, more so in fact than his is blacksmith, and handles all the bicycle work which comes along, his helper being a smith and horse shoer and handling that part of the work.

A Fine Iron Work-Bench

Directly across the shop, opposite the bike-stock storage was a fine, wide and long work-bench with a husky parallel-jaw vise near one end. This bench was devoted to iron work almost entirely and taps, dies, hack saw, cold chisels, hammers and files were handily disposed on and back of the bench. Nuts, washers and "findings" were placed on handy wall shelves within convenient reach. At the east end of this bench, there was a shutter hinged to open outward, set in a hole in the wall about 30 inches square. This shutter, when open as it was when I saw it, admitted every bit of light which got into the shop save that which entered when the doors were open!

Dark? It was the darkest shop I ever saw in my life, not even excepting some of the Philadelphia Filbert street shops, located in basements where it is so dark that one needs a flashlight in order to find the 16-c. p. incandescents which they used when I saw those shops last! Just imagine working in a shop at least 60 feet long without a single window in it, with doors at either end and only one shutter halfway down on the north side! I surely would batter some holes in the side walls of that shop had I to work there!

As shown in Fig I, the iron-work bench extends nearly to the wall shutter and light hole. Directly on the other side of that light opening is one end of the wood-work bench, which is also long and wide and a fine bench. The vise is located near the wall-opening and this bench is not so badly off for light as the rest of the shop. Right opposite the vise end of the wood-work bench the wheel stand is located and a bit farther west, directly opposite the wall-opening was a big tire shrinking machine, a tool which was scarcely expected to be found in this little country shop.

Near the tire shrinker and directly in the middle of the shop floor, I found a solid and heavy post extending from floor to roof and well fastened it was too. On the west side of this post was affixed a post drill, a heavy, well built machine, capable of carrying the largest drill needed in a smith shop. On the opposite or east side of the post was another big drill mounted so high up on the post that the workman had to stand on a box or trestle to change the drill or to turn the handle which drove the tool.

The chuck of the tool was all of five feet from the shop floor in which I saw the plank cover of a trap through which very large wheels could be dropped in order to drill the tire when in place upon the rim. Un-

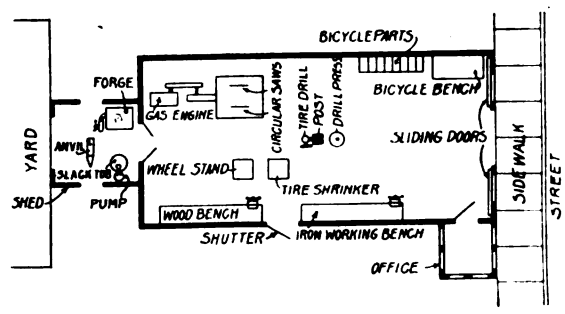


Fig. 1. The Floor Plan of the "Windowless" Shop.

derneath the floor was a pit all of two feet deep! That they needed such a high drill and deep pit was certain as I saw in the yard behind the shop, some wheels at least seven feet high. These wheels are used for hauling logs of the yellow, or long-leaf pine for which Florida used to be famous. I have seen larger wheels for this purpose. Eight feet in diameter were common and wheels ten feet high were occasionally used before the biggest trees were cut down. They needed such large wheels when they had to sling clear under the axle, logs of 48 or more inches in diameter!

It is something of a job to "set" one of these wheel tires. Perhaps later. I will tell you of work I saw done on one of the seven-foot wheels. They don't weld these tires. They lap one end over the other, drill holes through and drive some heavy rivets which hold the lap together without welding. Sometimes they vary things a little by butting the ends of the tire together and then riveting a strap over both the ends. This may be done when a tire is too short to lap but the plain lap is more often used as it is quicker done and cheaper. The worst thing about the operation being the hammering in of the outer end of the tire so at the joint it will be smooth inside.

Gasoline Driven Circular Saw

The shop here described was fitted with a power driven circular saw which contained about as many things which should *not* be done as I ever saw assembled together in the same machine drive. To begin with, the saw-bench was located in a dark place where it was impossible to see what the saw was doing. Next, the saw was crowded into a corner where there was not room enough for a long board to pass over the saw. Just bear in mind when settinng up a circular saw that if you desire to rip boards or planks sixteen feet long that a space more than thirty-two feet long will be needed and that the saw must be placed exactly in the middle

of that long space which must be clear, at bench-top height at least, of all obstacles of whatever kind and offending articles usually will be found to be posts, other machines, belts, piles of stock and sometimes water pipes or electric light wires.

The saw above described was so located that a plank scarcely twelve feet long could be ripped without first knocking a hole through the outer wall of the shop! But the worst about this saw rig was the belt drive. A counter shaft was used to obtain the proper saw speed and that counter was set up on the floor less than *four feet* from the gas-engine pulley. A further error was the size of the counter-shaft which was only one inch in diameter and entirely too light for the purpose.

A Bad Belt Drive

The belt from gas engine pulley to counter was only *two inches wide* while the belt from counter to saw pulley was *four inches* in width. Both belts were far too short to allow the natural elasticity and weight thereof to give much pulling power, thereby making it necessary to stretch the belt very tightly over its pulleys to get appreciable pull. The first belt, from gas engine to counter ran at far less speed than the other belt from counter to saw. Why, may be seen by looking at Figure 2 in which the size of the pulleys shows that the belt velocity more than doubles between engine to counter and counter to saw.

Doubling the speed of the saw belt makes that belt carry double the amount of power each minute, with the same pull; than can be carried by the engine belt. Thus, if the two-inch belt be sufficient to carry the required power from engine to counter, then the belt to the saw pulley needs be only one-half the width of the engine pulley belt. But, on the other hand, if the four-inch belt be only large or strong enough to carry the power from counter shaft to saw, then the engine belt is woefully weak, for, on account of its slow speed, that belt can carry less than half the power which can be delivered by the four-inch belt.

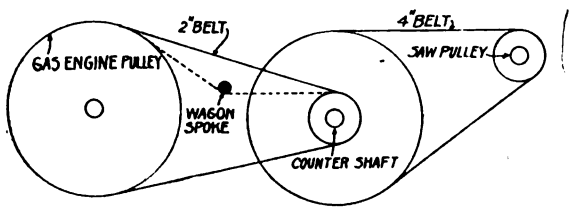


Fig. 2. The Belt Drive Arrangement from the Engine to the Saw.

The smith started the saw to get out a new bed-piece of a big axle and then the light belt behaved exactly as I supposed it would—too narrow to deliver the required amount of power, consequently the belt was overloaded and began to slip as soon as the saw hit the four-inch plank. The smith would push the plank against the saw which would slow down as the belt slipped, then he would ease upon on the plank, the saw would groan, whine and finally come up to speed again and another quarter-inch of kerf could be cut before the speed went down again and the saw would stop if the operator did not ease up on the feed pressure.

Wagon-Spoke Belt Tightener

I picked up a wagon spoke which laid on the floor and applied it as a belt tightener as shown in Fig. 2, by the dotted lines. This gave the belt more tension and the saw cut readily for two inches into the hard plank. Then I felt the belt gradually yield and knew something was "letting go." I eased up on the spoke-pressure and the saw would no longer even run up to speed. The smith stopped the engine and found that the belt lacing was pulling out.

Then the smith was told that he needed a wider belt in place of the two inch affair and he was shown how the saw would run far better if the two belts were made to change places. But the four-inch belt would not reach from engine to counter so they could not be changed. There was nothing at hand from which to make a wider belt, but there was some more of the two-inch belt so the smith made another narrow belt and placed on the engine pulley beside of the old one which was repaired.

One Belt and Two Belts

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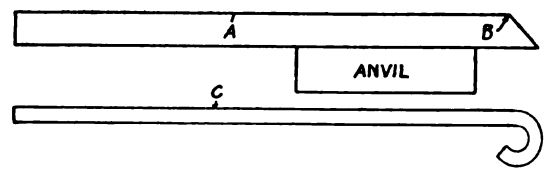

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of that long space which must be clear, at bench-top height at least, of all obstacles of whatever kind and offending articles usually will be found to be posts, other machines, belts, piles of stock and sometimes water pipes or electric light wires.

The saw above described was so located that a plank scarcely twelve feet long could be ripped without first knocking a hole through the outer wall of the shop! But the worst about this saw rig was the belt drive. A counter shaft was used to obtain the proper saw speed and that counter was set up on the floor less than *four feet* from the gas-engine pulley. A further error was the size of the counter-shaft which was only one inch in diameter and entirely too light for the purpose.

A Bad Belt Drive

The belt from gas engine pulley to counter was only *two inches wide* while the belt from counter to saw pulley was *four inches* in width. Both belts were far too short to allow the natural elasticity and weight thereof to give much pulling power, thereby making it necessary to stretch the belt very tightly over its pulleys to get appreciable pull. The first belt, from gas engine to counter ran at far less speed than the other belt from counter to saw. Why, may be seen by looking at Figure 2 in which the size of the pulleys shows that the belt velocity more than doubles between engine to counter and counter to saw.

Doubling the speed of the saw belt makes that belt carry double the amount of power each minute, with the same pull; than can be carried by the engine belt. Thus, if the two-inch belt be sufficient to carry the required power from engine to counter, then the belt to the saw pulley needs be only one-half the width of the engine pulley belt. But, on the other hand, if the four-inch belt be only large or strong enough to carry the power from counter shaft to saw, then the engine belt is woefully weak, for, on account of its slow speed, that belt can carry less than half the power which can be delivered by the four-inch belt.

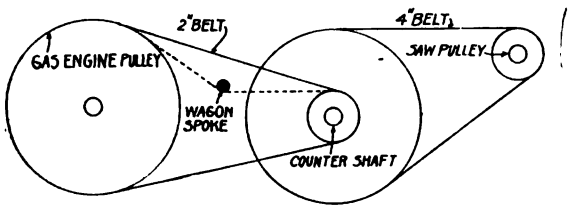

Fig. 2. The Belt Drive Arrangement from the Engine to the Saw.

The smith started the saw to get out a new bed-piece of a big axle and then the light belt behaved exactly as I supposed it would—too narrow to deliver the required amount of power, consequently the belt was overloaded and began to slip as soon as the saw hit the four-inch plank. The smith would push the plank against the saw which would slow down as the belt slipped, then he would ease upon on the plank, the saw would groan, whine and finally come up to speed again and another quarter-inch of kerf could be cut before the speed went down again and the saw would stop if the operator did not ease up on the feed pressure.

Wagon-Spoke Belt Tightener

I picked up a wagon spoke which laid on the floor and applied it as a belt tightener as shown in Fig. 2, by the dotted lines. This gave the belt more tension and the saw cut readily for two inches into the hard plank. Then I felt the belt gradually yield and knew something was "letting go." I eased up on the spoke-pressure and the saw would no longer even run up to speed. The smith stopped the engine and found that the belt lacing was pulling out.

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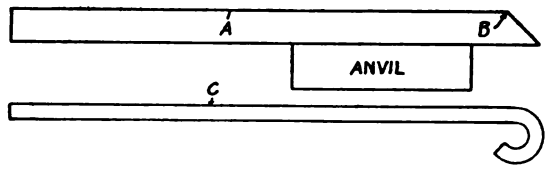

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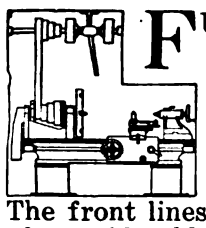


FURTHER, in the case of the horse, the front line of the hoof is fairly in line with the front lines of the pastern and coronary bones; but this is by no means the case with the front line of the ox claw. The front lines of the claws make an angle of considerable flatness—say 30 degrees—with the road. In short, the foot of the ox—from the fetlock down—resembles in general appearance the human leg and foot from the knee down, the claws corresponding to the foot. The joints, ligaments and tendons, however, are to be taken, *broadly*, as similar to the corresponding parts of the horse.

The movements of the ox's foot are brought about in a similar manner to those of the horse's foot. That is, the muscles lie up the leg above the knee. The movements are effected by contractions which exert pulls, now on forward-lying tendons, now on rearward-lying tendons. However, there are two things to move in the several cases—two pasterns, two coronary bones, two claws. There are three muscles and their tendons which effect the extension of the claws. One muscle and its tendons operates the pair of claws together. Then there is a muscle and tendon for the independent extension of each claw. In the case of the flexing movements, there are flexor perforatus and flexor perforans, the latter passing through the former, as in the case of the horse. There are no lateral cartilages and plantar cushion in the case of the ox.

Formation of Horny Matter

The horny matter necessary for the sheath of the claw is, as with the horse, formed by a modified skin. There are perioplic band, coronary band, sensitive wall and sensitive sole. But there is no sensitive frog. The perioplic band lies in between the skin above and the coronary band below. It encircles each toe. In front, the perioplic band is rather broad and there are slight bulbs. The bulbs of the adjacent claws may be connected "by a more or less well marked bridge."

The coronary band lies between the perioplic band and the sensitive wall. It is broad and flat. At the point of maximum width, it may, in a big ox, be as much as one and one-quarter inches wide. There is a sensitive wall which covers the sides and front edge of the claw bone. There are parallel laminae numbering upwards of a thousand. Then, beneath the bone is a sensitive sole. Altogether, the claw is not unlike a half of the hoof of the horse. Among the differences,

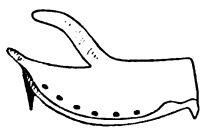


Fig. 1. Voigtland Shoe for Oxen

however, one notes the absence of a frog. The claw has a horny wall in the cleft. This may be slightly concave. The horny wall, on the side away from the cleft, is convex and it curves inward in the region of the toe. At the toe, the two side walls unite. The horny sole is, of course, underneath, where it constitutes Nature's surface of contact with the ground. The sensitive sole lies between it and the bone of the claw.

The horny sole extends towards the rear where it joins and becomes part of the horny bulb. As there are two claws, so there are two horny bulbs. These are sometimes united by a bridge of soft horn. I now come to what is in the equine hoof a most important thing—the white line. In the ox claw, the junction of horny wall and horny sole is marked by a white line of the same general characteristics as the analogue found in the hoof of the horse; but the bars are wanting in the ox claw. As between front and hind feet, the claws of the latter are slenderer and longer.

The ox shoe is quite different from the shoe of the horse. There is no loop of steel. In fact, the absence of the frog permits a radical change to be made, if indeed it does not actually require a change. Then it is doubtful

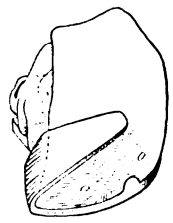


Fig. 2. Ox's Claw with Shoe Attached

whether nail holes and nails could be tolerated along the margin of the sole next to the cleft. One might think that a single shoe could be used for the pair of claws. But Nature has declared against this by the fact that bones and muscles and tendons occur, in part, in pairs. There are muscles and tendons capable of some independence of use. In short, it would seem as if Nature had already indicated pretty clearly that the cleft is not a mere crack but a dividing line between two things. Two shoes for each foot is the rule. Probably, it is the only rule possible.

The ox shoe is something of the nature of a sandal. There is a sole corresponding in form and size to the general outline of the sole of the claw. This sole is held to the claw in part by nails and in part by one or two clips. The nails may be six in number, and are arranged in a single curved row from a point in front not far from the cleft. Naturally, they follow the white line.

There is more than one variety of ox shoe. One variety which may be regarded as representative, has a thin metal sole whose outer margin is flush with the horny wall. The inner margin follows the curve of the horny sole; but in the region of the toe a broad clip is provided. That is, the metal sole is extended on the inner side at the toe and this extension used as a clip. When on the ox, the clip is bent up and then made to lie on the convexity of the horny wall. This is the main clip. It performs the service of nails. An ox fully shod would disclose on the front of each foot a pair of clips, one bent to the right and the other to the left. The general appearance would be not unlike the two wings of a butterfly. Or perhaps, some might be reminded of the ribbon loops on the tie of the slipper.

As the horny wall is thin, a second clip, one of small size, may be used to assist the nails. That is, a small clip is permissible at about the region between the second and third nails, counting from the toe. This may be simply a little semi-circle of metal left integral with the metal sole and the bent up vertical from the sole.

The Saxon Voigtland Shoe

There is another variety which has been praised as the very best of all, when properly made. This is the Saxon Voigtland shoe. The clip which is united with the inner margin of the shoe sole has its junction not at the toe but well back in the cleft. This junction may be just about opposite the fourth and fifth nail holes. The clip is not especially broad, but is rather long for its breadth. When the ox is shod, it is bent upward and made to bend around on the convexity of the claw. The length of the clip and the inclination at which it extends from the metal sole are controlled by the size of the claw, etc. There is a second clip at the very toe. This is narrow and short. It is simply bent up and against the horny toe surface. It does not lie in the cleft, but is located alongside.

The practical shoer will do well to study the problem itself as a preparation for actual shoeing. Thus, it is well to grasp firmly the idea that only one row of nails is to be used. At the same time, the shoe is to be held in place, just as if there were the second row. The clip in the cleft has this service to perform. The great trouble about a good many clips is that they resist movement in only one direction. Thus, a clip in the cleft, if it simply ran upward, would resist a movement of the shoe away from the cleft towards the outer margin of the claw, but it would not properly resist a movement in the opposite direction.

Now a nail resists movements in all sorts of directions. However, if the clip in the cleft extends upwards and around the convexity of the toe, a certain amount of resistance is introduced that is needed. The little clip at about the second or third nail hole performs this service better. Both clips, if the one from the cleft is bent round far enough, will tend to hold the shoe from moving towards the other claw. The cleft clip also performs the service of resisting a shift of the shoe backwards. The idea of the clips is to provide resistances of the foregoing kind

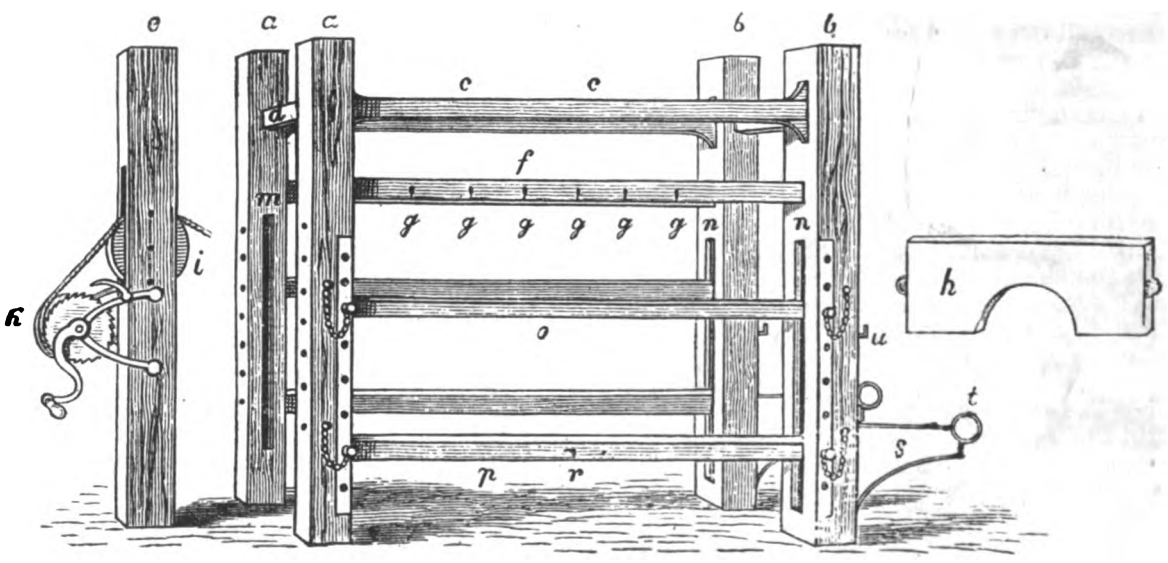


Fig. 3. Travis for Cattle. (This travis is used for horses also).

and thus to aid in holding the shoe in place in ways the one row of nails cannot, or ought not, be forced to do. It should be remembered that there is but one row of nails, although six nails may be used, and that the horny wall is thin. When all the points like the foregoing are thoroughly grasped, the workman will understand the regulation shoes already in use and will also perceive better just what to do in particular cases to improve things.

The ox is not like the horse in that he is responsive to the business of shoeing. Of course, there are some horses that don't respond either and make all kinds of trouble. But, speaking broadly, the great majority of horses may be shod with little or no preparation on the part of the horse-shoer. The animal understands enough to stand still and suffer his legs and feet to be handled and bent and hammered or else he is content to let things take their course. The ox seems to have some objection.

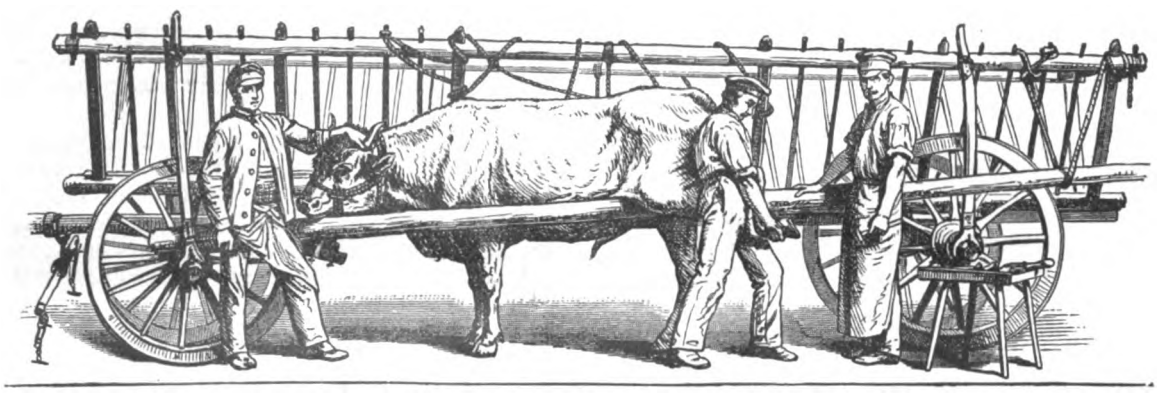


Fig. 4. An Improvised Travis

Preparing to Shoe the Ox

The head of the ox is to be secured by some suitable and convenient means to a tree, a post or a wall. To get a fore-foot in position, a broad piece of webbing may be used. A loop is made so as to include the foot and the two free ends are passed over the withers and [illegible] on the side opposite the foot which has [illegible] secured. The foot is, naturally, to be [illegible] up to the point desired. A hind-foot may be lifted by means of a short length of round wood. It is slipped in between the two hind legs in such way as to be in front of one hock and above the other. Two men hold onto the stick of wood. Or, if it is simply a matter of maintaining the bent condition, a leg twitch may be applied above the hock.

Construction of Travis

Or, if the amount of work in sight justifies, the shoer may prepare for it by constructing a travis. There will be a grooved arm of wood and in this the foot will be retained. The ox will meanwhile have his body supported in a suitable sling. A travis may be a kind of skeleton stall, fitted with a winch and tackle and so made that certain parts are adjustable.

On the other hand, a kind of travis may be rigged alongside of a wall, a fence or a crib wagon body.

One of the illustrations, taken from Dollar, shows an improvised travis where a wagon and a long pole provide important essentials. One end of the pole may be tied to the forward end of the wagon or otherwise held in place. With this end resting on the hub or other support, one has only to let the other end near the rear of the wagon rest on the ground in suitable position, drive the ox alongside the wagon, head to the front, so as to have him straddle with his hind legs the long pole, and then lift the free end of the pole and secure it. The pole may be drawn up so as nearly to lift the rear of the animal. The hind leg away from the wagon may now be lifted and held by one man while another does the shoeing.

A more elaborate travis is shown in another illustration from Dollar. The same travis may be used for troublesome horses as well. The four parts, *a a b b*, are 11 feet high. They are quite substantial, being eight by eight inches in section. The posts stand each in a hole three feet deep which has been filled and packed. There is thus a usable height of eight feet. Longitudinal pieces, *c c*, and transverse ones, *d*, hold the tops of the posts in position. There is a fifth post, *e*, of the same description as the others, located in front of the two forward posts of the quartet and midway between them. A slot is cut in this at a point 5 feet above the ground. This slot may be four by twenty inches in size. In it is rigged the pulley wheel *i*.

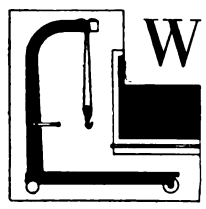
A winch or winder is supported a short distance below by a suitable bracket secured to the post. A ratchet and pawl are provided, so that the windlass may be automatically prevented from unwinding. It is desired to arrange two longitudinal rails, *o* and *p*, on each side of the "stall," which may be set at various levels. Accordingly, suitable slots are provided in the four posts. Holes are pierced in the sides of the slots and in the ends of the rails, so that pins may be used to hold the rails at the levels of the corresponding holes.

The rails should be substantial in cross-section. By using slots three inches wide, good heavy rails may be employed. Slots are arranged in the two forward posts on the faces towards each other. In these slots, a neck piece *h* and a breast piece (not shown) may be slid up and down and, by means of pins, secured in desired positions. Two of the side posts have fixed between them the longitudinal piece *f*. At a corresponding height back of this is a wooden axle set in bearings in the remaining pair of posts.

Small Florida Smith Shops

The Small Amount of Space in this Shop is Well Used

BY JAMES F. HOBART



WHAT would you do or think in case you should look out of the shop and see a man driving in with a pair of moth-eaten mules dragging a ten-foot chain to the far end of which was hitched the forward end of a cart pole twelve or more feet long, made of a rough sapling, perhaps with most of the bark still on—the forward end of the pole perhaps riding upon a rough wooden shoe, split from a four-foot log and looking very much like the plow-shoes upon which New England farmers often drag plows a quarter of a mile or more to or from the field where the work is done?

Probably you wouldn't wonder very much about the above described outfit even should it wend its meandering way into your shop yard, but take a look at the far end of that rough stout pole and you will see something perhaps worth wondering about! The far end of that pole will be found rough-fastened to an axle nearly as thick as a barrel and at either end of that rough-hewed axle there is a wheel seven or eight feet in diameter with a hub big enough for a slack-tub.

As the outfit stops before your shop door you almost jump backwards for fear one of the wheels will fall upon you for the top of that wheel waves sidewise, one way and the other for nearly two feet! What is the matter? The box is loose in that big hub and it will be your job, if you are a Florida blacksmith, to reset the cast iron affair which looks as much like a young cannon (after it has been driven out of the hub) as it does like an axle-box!

Extracting a Lynch-Pin

The particular Florida smith who drew the job above described, had a little shop at Tarpon Springs and the smith almost had to go out of his shop when he wanted to turn around! For all of that, his shop was nearly sixty feet long but its width was less than eight feet! The smith found that the box had worked back so far that the lynch-pin with its full two inches of width, could not be driven out and the axle could not be started forward with a sledge hammer!

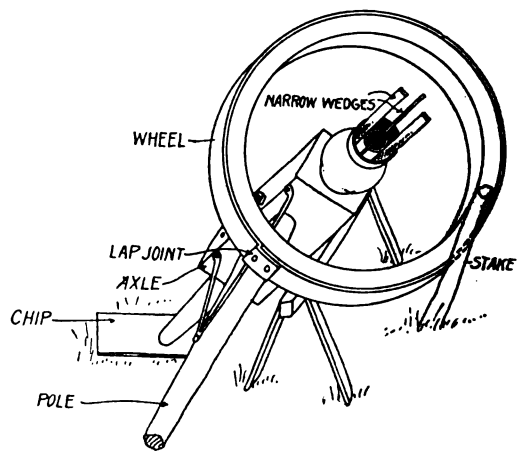
This didn't worry the colored smith a bit and he rummaged around behind his shop and dragged out a piece of 2 15/16-inch shafting nearly eight feet long. This bit of iron, together with a piece of stout rope was thrown on top of the axle and the wheels and pole dragged to the nearest tree. The rope was thrown over a limb, the shaft made fast to the rope and dragged up as high as the hub of the wheel.

Then the rope was made fast and the wheel rolled into position so that the shaft could be swung back and forth and made to act as a battering ram to drive the hub back far enough so the lynch-pin could be removed. Half a dozen of his friends were called by the colored smith to engineer this job and they did it in good shape, too, singing as they swung the heavy shaft back and forth until it had acquired a good momentum and then deftly deflecting one end of the shaft so that it hit the hub in exactly the right place. They only hit the hub three times before it had been driven back into place and the lynch-pin could be driven out.

Setting The Axle-B

When the "lynching-party" got back from tree to shop with rope and wheels, the axle was removed from both wheels, the box pushed out of its hub and the interior carefully cleaned out and freed from every bit of loose wood from the previous wedging of the box. The smith then centered the box as carefully as possible with the eye and drove eight narrow wedges to hold the box in place. Four of the wedges were driven from one side of the wheel and four the other.

The four wedges from the inside of the wheel were cut off flush with end of the box



Truing the Wheel

so that the wheel could be slipped upon its axle. The other four wedges, driven from the front side of wheel were made short enough at their thin ends so that they didn't extend past the inner end of the box. These wedges projected nearly a foot on the outer side of the wheel. Then the wheel was slipped upon the axle again, the axle raised to an horizontal position and a high trestle or "horse" slipped underneath the axle close to the wheel. Then the free end of the axle was lowered to the ground and there the wheel hung upon its axle, free from the ground and the darky smith turned the wheel and loosened and tightened wedges until the wheel ran very true when revolved.

The engraving shows how the wheel was hung up over the high trestle. The smith

drove a stake in the ground to steady his hand against when he applied chalk to the wheel to mark the highest "out" place preparatory to adjusting the narrow wedges, which were only temporary ones and were not allowed to remain in the hub permanently. Thick, wide and heavy wedges were put in between the narrow temporary wedges which were later removed and other and thicker pieces of hard wood driven in place of the narrow wedges until every particle of space around the iron box had been filled with well-driven wedges, and driven hard and tight too!

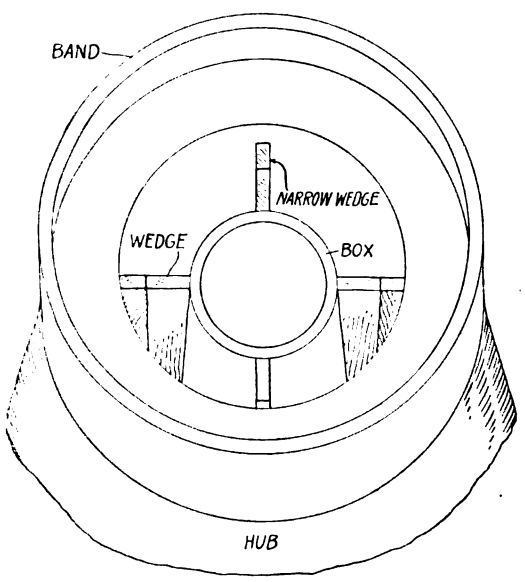
"Truing" The Wheel

It was twice found necessary, to raise the axle from the ground, draw it backward out of the wheel box several inches, then adjust the wedges on the inner side of the wheel—those next to the axle—in order to make the wheel-rim run true. It was founnd impossible to do all the adjusting with the wedges on the outside of the wheel, hence the necessity for changing the thin temporary wedges on the axle side of the wheel.

The manner in which the temporary wedges were arranged on the axle side of the wheel is shown by the engraving. The purpose of the thin temporary wedges is to allow of holding the box in place and of moving it as required to bring it central and then to permit stout permanent wedges to be driven between the temporary ones which are then knocked out and the remaining cavities completely filled as stated, with well driven and carefully fitted wedges until not even a nail could be thrust between the various shaped wedges, some of which were flat, others rectangular in cross-section, while other and the smaller ones were triangular.

The engraving shows that the temporary wedges have been carefully cut back a fraction of an inch farther than the end of the box. This is necessary to prevent future trouble by the axle working hard against the box. If the wedges, the permanent particular, are not thus cut back, the axle or a portion of it may bear against the ends of the wedges and in addition to causing undue friction there, will be very likely to loosen some of the wedges by the occasional rubbing against their ends. Therefore, the smith was very careful to cut the wedges back nearly a half inch, using a chisel and mallet for that work and taking great pains that the ends were all cut smooth and true and none left projecting too far.

The smith gave frequent spinning trials as the work proceeded and it seemed that a considerable portion of the time spent in



Centering the Box

placing the big axle in position and raising the wheel from the ground by a pry over the trestle-top. But the smith said it paid to take plenty of time that way, because to remove wedges which had been wrongly driven so as to throw a portion of the wheel-rim "out" required far more time than it did to test the wheel frequently by spinning it upon the axle. One look at that seven-foot rim and eighteen-inch hub was proof enough that plenty of time should be given for testing before the wedges were driven home for good!

A Queerly Shaped Shop

As stated in an early paragraph, this shop was very small. Indeed it was impossible to get the seven-foot wheels into the shop and the work thereupon, and on most other things, was done outside the little structure which once was the busy cook and bunk room of a still busier Greek restaurant and saloon in the times when John Barleycorn used to levy his toll upon the people of the country.

But that saloon has vanished so completely that not even a vestige of the building remains save a very few patches of the heavy mosaic concrete floor, most of which has been removed and laid for sidewalk surface along the adjacent streets. The shop, as shown by the engraving, was apparently about eight feet by sixty. The forge, blower and slack tub occupied one end so completely that the colored smith while in position at the blower could easily lean against two side walls at once without moving from his tracks!

A pretty good anvil stood squarely in the middle of the shop and double swing doors close by afforded room to handle long work from forge to anvil as required. A bench about 24 feet long occupied part of one side of the shop and extended through a partition which separated the wood working from the smithing portions of the little shop. Close to the partition, a sort of drilling machine had been erected. The device was evidently home made from scraps and parts of several defunct machines but it would actually drill holes fairly well and the smith felt very proud of the machine!

An Unusual Water-Trough

Just outside of the back door of this little shop, I saw something which "kept me guessing" for a few minutes. It looked like an Indiana hog-wallow on a small scale, only it was not deep or dirty enough! Finally I got it through my head that the thing was a water-trough for cooling tires after they had been set upon wheels. The "trough" was nothing but a long narrow scratch in the sand. Probably it had been formed by the heel of the smith. When a tire was to be set, it was heated on the forge, being kept in almost continuous rotation with a strong fire underneath.

When hot enough, the smith threw a scantling upon the ground a couple of feet from the sill of the back door and parallel to the sill and these two bits of wood formed the "wheel-stone" upon which all tires were set! There was a plank affair leaning beside the shop but when the smith set a four-foot, two-inch tire while I was in the shop, he didn't take the trouble to place the plank wheel-block in position, but used the bit of scantling as described above.

Just as the tire got hot enough, the smith's helper (one of his friends temporarily recquisitioned from an adjacent "loafingfest"), drew two buckets of water from the slack tub and poured the water into the crack in the ground. Then, the tire was slipped over the wheel-rim and placed in the puddle of water and there cooled by turning the wheel around, during which time, both smith and helper were very busy, each with a hammer in either hand, driving the felloes flush with the tire, while they held the wheel upright with their wrists and knees!

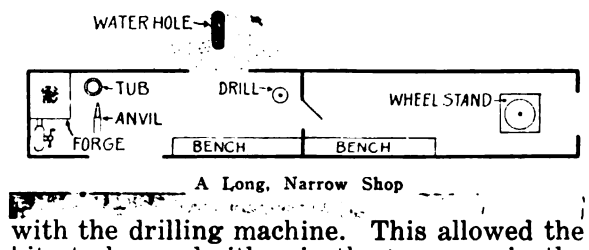
They did the work quickly and well too, and seemingly went only once around that wheel before it was well trued up with every portion of its felloe true and even with the steel tire. The tire, standing in the puddle of water, did not have a chance to cool too quickly for the reason that with a man working on either side of the wheel which stood upright between them, only a half revolution had to be made before each and every portion of the rim had been knocked back into place. As only one-half the tire had been dragged through the water-puddle, the tire had not been unduly cooled before the rim could all be hammered into place, even with it.

The Wood Shop

The right hand portion of this long narrow shop was devoted to wood work, both wheels and bodies being attended to as occasion required. Besides the bench on one hand, there was nothing whatever in the wood shop save a wheel stand, also home made, evidently from such scraps of lumber as the smith had been able to lay hands upon.

A neat "kink" in wood boring was in evidence in this little shop. The drilling machine was located as shown by the engraving, just outside the wood shop, and stuck in holes in a small shelf close by the drilling machine I saw a number of drills for metal, also several bits for wood boring. The smith had cut the shanks from ordinary bits and welded in place thereof some heavier steel which would fit the chuck of the drilling machine. In this way he was able to make holes in both wood and metal and he remarked that he was never troubled by people borrowing the bits in question which could not be used in an ordinary bit-brace.

To enable the big-shanked bits to be used in his own brace, the smith had removed the chuck which came with the brace and substituted a regular drill chuck the same as used



A Long, Narrow Shop

with the drilling machine. This allowed the bits to be used either in the brace or in the post drill end entirely discouraged any desire of his neighbors to borrow a single bit! There was another good point about this business too, for, having a drill-chuck on the bit-brace, enabled the smith to slip one of the drills into the brace and bore right through any nail or other bit of metal which might come in the way of a hole while making wagon repairs.

"Keeping" A Forge Fire

Nearly every smith finds it occasionally desirable to keep the forge fire alight nearly all day in order to save the time and trouble of lighting the fire each time it is required for repair work. The scheme of burying a bit of wood in the coal, is as old as smithing itself, and the wood will surely keep the fire alive for a long time. But a chip or a block will slowly burn out after a time and then the fire will go out.

This colored Florida Smith, in his little "two by two" shop, had a fire-keeping scheme worth knowing. When he removed old wagon spokes during wheel-repairs, he cut them into lengths about six inches long and kept a lot of the small straight pieces of wood in a horse-shoe keg under the bench. When it was desired to keep the fire for some time, the smith would place one of these bits of wood in a vertical position right in the middle of the fire and then put coal around the wood so that it stood upright.

The smith took care not to let the wood lean one way or another but made it stand exactly vertical. Then, as the end of the wood smouldered away, it would slide down farther and keep the fire alive all day. Too long pieces of wood seemed to tip sidewise, bind and would not slide down into the fire as well as shorter pieces.

PAT SCORES AGAIN

An Irishman and an Englishman were waiting for a train, and the Irishman said:

"I will ask you a question and if I cannot answer my own question I will buy the tickets. Then you ask a question and if you cannot answer your own you buy the tickets."

The Englishman agreed to this.

"Well," the Irishman said, "you see those rabbit holes? How do they dig those holes without leaving any dirt around them?"

The Englishman confessed, "I don't know. That's your question, so answer it yourself."

The Irishman winked and replied:

"They begin at the bottom and dig up!"

"But," said the Englishman, "how do they get at the bottom to begin?"

"That's your question," was Pat's rejoinder. "Answer it yourself."

The Englishman bought the tickets.—*London Tit-Bits.*

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Our Editor's Letter

DO you know, sometimes I become discouraged and feel that all the suggestions and advice I give in these letters to you, are not considered, and that my brother smiths go on doing all their work in the old fashioned way, and transact all their business in a sort of, "I wish you'd pay me," manner?

Here of late, however, I have seen many little evidences of the fact that perhaps all my urging is not for naught. Needless to say this is encouraging. It shows that many of these ideas can be worked out practically, and that they are not merely theoretical meanderings.

I want to bring to your attention in particular, the following letter which Bennett & Co., Jr., of Beaver Dam, Kentucky, sent out to their customers at the beginning of this year:

"Beaver Dam, Ky., Jan. 1st, 1921.

"TO OUR FRIENDS AND CUSTOMERS AND THE PUBLIC, GREETING:

"After 16 years' experience and after giving the subject careful thought and study, we have decided that the credit system as applied to the blacksmith business is a relic of by-gone days and imposes a burden on the blacksmith that is borne by no other class of labor, and we have decided to abandon it regardless of the consequence.

"After this date we will do a strictly cash business. Do not ask for credit for we can not do it.

"All bills due and not paid by Jan. 15th, 1912, interest will be charged.

"Thanking you for past favors, and hoping for a continuance of same with good will and good luck.

"We remain respectfully,
BENNETT & CO., Jr."

Nothing very meek about that, is there? And yet, we don't believe that Bennett & Company's customers took offense at it. On the contrary, we believe that by the fifteenth of the month there was a nice little sum of money which their customers owed that came into the blacksmiths' hands.

And why not? Do the manufacturers from whom Bennett & Co. purchase their goods allow them to pay when they like, or not at all, if they choose? It is not probable.

Therefore, it is quite natural, and quite fair, that they should expect their customers to pay cash. A workman who works on such a small margin of profit as the blacksmith does, must demand prompt payment for his work. For a customer to ask for credit of a blacksmith is just the same as if the blacksmith, at the end of the week, told his helper that he wouldn't pay him his salary that week, but would wait another week or two. It just isn't done.

Now if all the smiths make up their minds to put an end to this credit system, people will think the idea of charging just as unusual as they now think it is to pay cash.

If some smiths had the money which they have lost through bad debts during the time they have had their shop, many of them would be able to retire.

We have been hammering away at this idea of "no credit" for a long while, and we shall continue to hammer away, until we find that the smiths are falling in line to follow out this plan.

You may lose one or two customers, but those customers are the sort that you should not want; the sort that will do you no good.

The attitude that Bennett Bros. adopt; that is, whatever the consequences are, they are going to insist on receiving cash with each job, is the right one. They are certain of success, and increased respect from their customers.

Try this cash method, and half your worries will be over. You'll not have to humble yourself asking for payment of bills each month, and you'll know exactly where you stand. Then too, the blacksmith was never a good bookkeeper and this obviates the necessity of keeping books.

Have you the courage to insist on "no credit"? Write in and tell us your views on the matter.

C. B. N. A. Convention

WE have received the official announcement of the forty-ninth annual meeting of the Carriage Builders' National Association. This convention will be held in the Hotel Gibson, Cincinnati, Ohio, September 20, 21, and 22, 1921.

The announcement is an attractive one, and it is plain that a very interesting program is planned.

Full details of this program, with reports of the general ideas expressed at the meeting will be printed in the October issue of the B. & W. which will be the C. B. N. A. number.

What Next?

One of our weekly, suburban papers issued in the town where our editor makes his headquarters 50 weeks of the year, is famed for its "classified want advertisements." Not long ago there appeared an "ad." which read: "Wanted man to milk and run Ford car." Last week's paper produced the following little gem—

FOR SALE—Chickens, ducks and pigeons for roasting also fine driving horse.

A good chance here for some western newspaper to run an article relative to the shortage of food in New York.

Camp Blacksmithing in Wisconsin

From John A. Lee, Wisconsin: I wonder if it would be of interest to the blacksmiths to read about camp blacksmithing in a Wisconsin logging camp? If so, I will send in a letter about it.

It is hard for some people to believe that they use sleds with 12 foot bunks, 6½ and 7 foot rolls, runners 9 feet long and four inches thick and only one team. Yet this is done in this part of the country.

(EDITOR'S NOTE: Go right ahead Mr. Lee, and write that letter. We know of nothing more interesting to the readers of the B. & W. than a story on this particular branch of smithing.)

News from Michigan

From Adam Roe, Michigan: I think that the journal is almost complete, and would not care to be without it. I think that the Editor's letter published in each issue has good ideas in it. I especially liked the one on lost motion in the shop. I should like to see more letters on acetylene welding and cutting.

I bought a Bermo welding apparatus about a year ago and am getting along fine with welding, and am going to tackle a weld which is eight by four inches; the cutting jaw of my punch and shear, #15 Badger.

I have a most complete, handy shop, and think it is the best in this part of the country. It has a 54-foot front, the shoeing side is 50 feet long and the repairing side 68 feet long. That is ample room for rigs and machinery which consists of an 8 H. P. I. H. C. engine, jointer, rip saw table and band saw, wood lathe, and hub boring machine.

There are two forges in the center of the shop blown by an electric blower. There is also a 2 H. P. motor to drive the drill wood lathe and emery grinder. We get fairly good prices in this part of the country and following are a few samples:

New shoes, each, set, #1 to 6	.75
" " " " #7 & 8	.85
Resetting, each	.50
Bar shoes	1.25 to 1.50 each

Last winter I had a very good shoeing trade.

More Horses

THAT the horseless age is receding into uncertainty, is shown by the U. S. Census figures, which give a grand total of 27,676,939 horses and mules on January 1, 1920,—an increase of nearly a million in the last decade. Of the total, 20,667,319 horses and mules were of working age,—coming 4 years and over. Approximately 17,000,000 were in harness doing farm work, and 2,000,000, in round numbers, actually at work in cities, towns and villages. These 19,000,000 horses and mules in service, require 9,500,000 sets of harness of equivalent.

The investigations of the Horse Association of America show that the average harness lasts 12 years. Wagons last 15 years. Both harness and wagons can be patched up to last a year or two longer, if necessary, but the figures given are a fair average for ordinary conditions. This means that approximately 800,000 sets of harness are needed every year to take the place of that worn out and discarded. Exports of harness and saddlery reached their high point in 1915, when $18,237,604 worth of equipment left the country. The amount fell off in subsequent years, but increased again in 1919 and 1920, when the figure rose to $2,273,234,—three times as much as in 1913.

The average working period of horses on farms is twelve years; in cities, it is eight. With harness giving service for 12 years and wagons 15 years, the rate of depreciation for horse-drawn equipment is very low. This, with cheaper feeding costs, has been the reason for considerable horse return in cities during the latter part of 1920 and thus far in 1921.—*Horse Association of America.*

Welding Tractor Cylinder Block

A Ticklish Welding Job Fully Illustrated and Explained

By David Baxter

OF all tractor repairing jobs the cracked cylinder block is probably the worst. Or, perhaps I should say, *was* the worst, because many blacksmith torch operators have now learned to weld any and all of them without the sign of a leak or "crack-back." Before they were "wise" to the causes and their prevention, the cracked cylinders used to crack again about as fast as they could be welded, or if they didn't crack back they would develop leaks through pin holes or porous spots in the weld metal.

However, with improved welding apparatus and a clearer understanding of the process, together with more knowledge of the nature of cast iron, the oxy-acetylene torch welder is now able to guarantee all cracked cylinder jobs.

The process of welding these cylinders is quite simple and depends mainly on the proper heating and cooling of the casting, the proper expanding and contracting, to put it in other words.

There are several other important factors, but the heating, or preheating as it is termed, in welder vernacular, and cooling, or strictly speaking, slow cooling, are the fundamentals of the art of successfully repairing cracked tractor cylinders with the oxy-acetylene flame.

Proper Heating Necessary

The welder might be letter perfect in the other details and still spoil the job by not heating it properly previous to applying the welding flame. Or, on the other hand he might do a careless job of welding and it would hold too, because the preheating was right. Again he might lose in both instances because the cooling was incorrect.

To the welder, heating means expanding, and cooling spells contraction. So we say that the essentials of welding cracked cylinder blocks are correct expanding and contracting. Probably this is true only because the instructor merely shows the student how to adjust the flame and melt the metals. At least this is the usual case.

But, perhaps the best way to instruct in the art of welding cracked cylinder blocks, is to take a specific example and follow it through the details of the mending process. In this, let us hold to one variation of the method, so that the individual blacksmith can arrange the same job to suit his own shop equipment. Let us see how one job was done rather than to tell how to do it.

This cylinder block weighed about two hundred pounds, which made it rather awkward to handle when hot. The crack was located as indicated in the photographs, extending through metal approximately three-eighths of an inch thick, starting at the edge of the machined surface where the head was attached and reaching to the hole in the center of one side. The metal was the average grade of gray cast iron; difficult to weld clean, especially where thin portions join thicker portions, on account of a tendency to be porous or slag-filled in corners formed by unequal sections, such as square corners.

Hard spots, which are troublesome to so many welders, are best eliminated by using a strictly neutral flame and soft, high silicon cast iron filler metal. The worst harm they do in cracked cylinder welding is to make it easier for the weld to re-crack, on account of the weak brittleness of such metal. Otherwise the operator need not bother with them much, except where the crack runs through machined surfaces.

Blow holes, or pin holes, the other obstacle in cast iron welding is usually caused by the absorption of gas from the torch, or by the burning of impurities in the metals; such as the porous spots mentioned above. Probably the best method to remedy the defect is to melt the cast iron deep and fluid so as to allow these gases to escape and to permit the molten metal to flow together and close the hole after the gas has escaped.

A heavy layer of dull metal will often trap the gas pockets before they can escape, but the operator should be careful about approaching cast iron and try not to get the metal to flow too quickly by pushing the white cone of flame down upon the melting surface. The heat should be given time to soak in or else the spot is burned. This causes the very thing to be avoided.

But, let us discuss these things in turn as

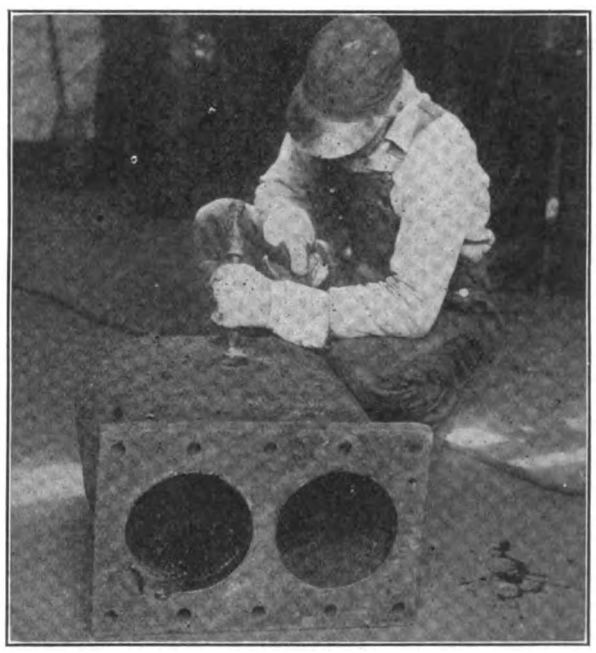


Fig. 1. Cutting the V groove with a diamond point chisel.

they came up in the progress of this particular cylinder job. First, the job was prepared for welding by grooving out the crack to form a V-shape groove about twice as wide at the top as the metal thickness and extending the full depth of the crack.

This offered opportunity to weld the full thickness of the metal without having to resort to boring the welding flame deep in the

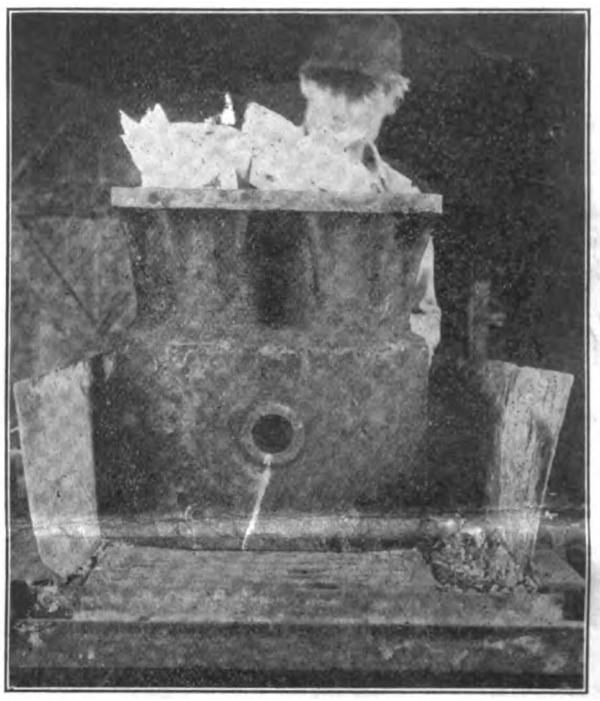


Fig. 2. Pre-Heating position of the block. Cylinder bores stuffed with asbestos. Location of Chiseled fracture.

melting metal in order to reach the bottom; a practice which is not safe because it tends to make hard spots and porous sections in the weld if not expertly achieved. Considerable depth can be melted by allowing the heat to soak in, however.

After grooving, the surface of the cylinder on each side of the crack was thoroughly cleaned of all paint, grease, rust, etc. This was for the purpose of preventing any of this substance from entering the melting weld either in gaseous or solid form. These materials are often the cause of blow holes if they are not worked out of the molten weld, or if the weld is not fluid enough to permit them to escape automatically. The best way is to eliminate the danger as much as possible by cleaning the vicinity of the weld. In this particular case the matter was removed by passing the welding flame along the sides of the groove to burn the dirt and grease to a cinder, when it was readily removed with a steel wire brush.

Preparation for Pre-Heating

After cleaning and grooving, the next step was to prepare the casting for preheating. This was arranged by placing the block upside down upon the preheater section of the welding table. In this position the natural gas flame could arise beneath and on both sides of the casting, thus enveloping it in flames and heating all parts of it equally or evenly. At least the main body of the block would heat sufficiently. The upper part, as it stood on the grating, did not need to be heated quite as much as the part that included the crack. This was the reason for placing the casting with the head or cracked end downward.

The bores were then stuffed full of scrap asbestos paper to prevent the gas flames from coming in direct contact with the polished surface of the bores. This was in the nature of an insurance against overheating since the mere contact with the gas flames did not necessarily mean damaged metal. The asbestos was not packed tightly in the bores; just enough to deflect the gas flames without preventing the passage of heat. It was desirable to have the heat circulate through the inside of the cyliders as well as around the outside of the casting. Thus the whole major part of the block would heat uniformly.

After the bores were filled with asbestos some large pieces of the paper were spread over the top of the block to hang down around it and in this was confined the preheating; not only for the purpose of heating the casting but to cause it to heat more rapidly and thus save time.

The gas burners were lighted and turned on until the flames were high around the casting. The job was then allowed to heat this way until the main body was considerably above dull red above the crack. This condition was ascertained by peeping beneath the asbestos covering from time to time. A wide strip of sheet iron around the grating completed the preheating arrangement.

While the block was heating the torch operator attended to details of adjusting the tank regulators, fitting the proper tip to the torch, selecting the right size and quantity of filler rod, and replenishing the flux pot with powder. These are little details which count so much in the success of any welding job. It is useness to give here any exact sizes or other figures, since the variation in the different makes of welding apparatus requires that each welder should follow the instructions of his respective manufacturer.

By the time these little things were arranged the casting was hot enough to change from the first preheating to the second, which was also the welding position. This was done by lowering the block upon one side. It then rested with the cracked side upward ready to weld. In this position the weld would be horizontal. This is essential on cast iron work since this metal has but little surface tenacity when molten; it will run or overflow the weld to cause a poorly connected bond, or give trouble in executing proper fusion. Then, too, the heat of the gas fire would be on the under side and outer edges while the heat of the welding would be on top, thus tending to keep the job balanced.

It might be well to insert here a few words in explanation of the reasons for preheating and for keeping the preheater burning during the entire welding process. The heat would expand the casting metal so there would be no sudden strains when the intense heat of the welding flame was applied. Therefore when the fully expanded filler metal was deposited the casting would also be expanded. Then, when the whole thing cooled the expanded filler metal would not shrink and pull away from the expanded casting metal, because it would shrink in unison with the filler.

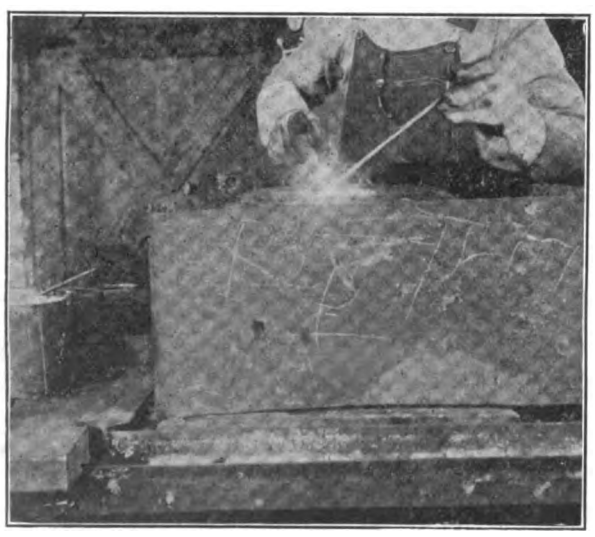


Fig 3. Welding position of the block. Applying the flame and filler.

Reason for Failures

This is where most failures in cylinder welding occur. The operator does not expand the casting enough so that its contraction can follow the contraction of the weld inward; a strain is set up and the filler metal shrinks and draws away from the surrounding metal because the resistance is so great that the weld cannot pull the casting metal inward. Therefore a crack must develop, either in the weld itself or in a weak adjoining part of the cylinder jacket.

The moment this casting rested upon its side the operator lighted the welding flame and applied it to the grooved crack. A neutral flame was employed, consisting of equal proportions of oxygen and acetylene gas. It was brought within an inch of the groove, playing back and forth along it for a few minutes, gradually drawing closer until within

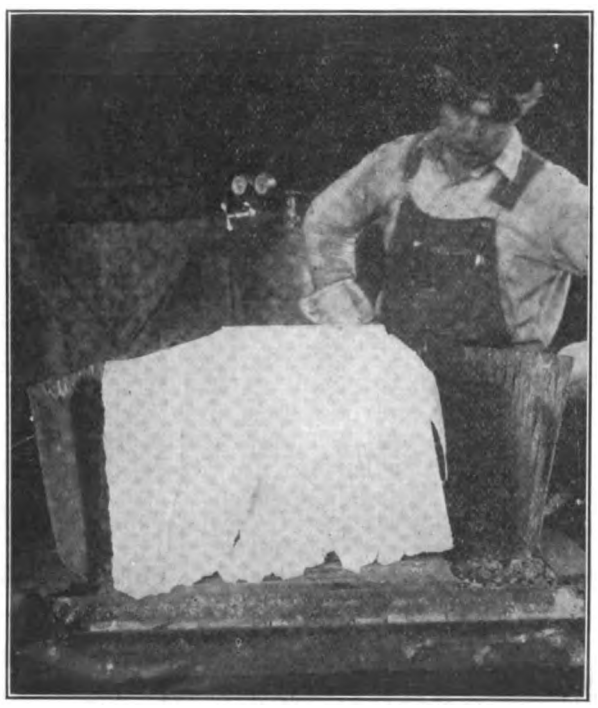


Fig. 4. The cylinder block wrapped with asbestos paper for slow cooling.

a quarter of an inch of the groove. Then the flame was concentrated upon one spot at the end of the groove near the hole in the side of the block. Here it was slowly revolved in a tiny circle over the groove and a half inch of the adjoining metal. When this turned bright red the welding flame was confined as near as possible to the groove, swinging in short arcs back and forth across it. The operation covered about an inch of the length of the groove. As this portion melted, the filler rod, which had meanwhile been brought close to the flame to heat, was introduced to the molten groove.

The flame was kept in motion, swinging across the end of the rod and the melting groove, melting the rod as it was twisted into the melting groove, to fill this part of it with new metal. Care was taken to see that the sloping sides as well as the bottom of the groove were molten when the filler was deposited.

While the first inch of the groove weld was being completed the flame was gradually working toward another inch of the groove, to melt and fill it in the same manner. Then inch by inch the entire groove was filled, each inch being but a continuation of the previous ones. A slight, well rounded, surplus of filler metal was piled on top of each inch of the weld. This extra metal was shaped and knitted to the casting along the edges by the force of the welding flame.

The Actual Welding

The pressure of the flame was utilized to sweep the metal smooth and guide it about at the will of the torch operator. In fusing the edges of the surplus metal the flame was played back and forth until both metals became fluid and settled into one mass.

During the progress of the groove welding the filler rod was utilized to carry flux to the melting metals. This was accomplished at frequent intervals by dipping the heated end of the filler rod in the powder and quickly returning it to the weld. The rod was also used to clean the weld by flicking out bits of dross or dabbling portions of the weld that appeared to be melting improperly. In fact the rod as well as the flame were never motionless long, but followed the needs of the weld automatically, so to speak.

When the last inch of the weld was ready for the slow-cooling, this was accomplished by carefully wrapping the main body of the casting in asbestos paper before turning out the preheating fire. This gas was permitted to burn for several minutes after covering the casting for the purpose of equalizing any irregularity in the expansion. But there was little need of this since the weld assumed the heat condition of the surrounding casting metal almost as fast as the torch moved along the weld.

Little danger of Cracking

The heat was radiated to the outer air or passed by conduction to the adjoining casting metal. A few seconds after the weld was finished it was the same color as the rest of the block. Therefore there was little danger of cracking and little need for the re-heating procedure of keeping the gas burning after the job was covered for slow-cooling. However, this re-heating is very essential on many jobs of cylinder welding.

This cylinder block was allowed to remain under cover of the asbestos until it was nearly cold. It had to be cold enough that it would not burn the bare hand of the operator. Then it was removed from the preheater and examined for leaks. After this it was practically ready for the owner, all but filing the hole and the bearing surface for the head.

JES' RIGHT

"Rastus, how was that flask of whiskey I gave you?"

" es' right, boss, jes' right."

"What do you mean, jes' right?"

"Well, if it had been any better you wouldn't a guv it to me, an' if it nad been any wuss it would have killed me."

SUCCESSFUL

"Were you trying to catch that train, sir?" he asked pompously.

The panting would-be passenger eyed him balefully for a second before he hissed in reply: "Oh, no, I merely wanted to chase it out of the station."—*The Arklight.*

AT THE PUMP

"Had a puncture?" "No. I'm just changing the air in the tires. The old air's worn out."—*American Tribune (Dubuque, Ia.)*

When the average man is mentioned, nearly every man thinks that someone else than he is meant.

The man who is opposed to the public enterprise of others is likely to find others opposed to his own private enterprise.

It is necessary to watch some of your friends every minute or they will let you in on a get-rich-quick scheme.

Once in a while a man who offers readily to accommodate you with a loan has nothing at all in the back of his mind.

The man who is irritable about home can exercise a lot of patience when holding the end of a fishing rod.

Business is a game. Not a game of chance, but a game of skill. Play it with all your might—with all your strength, but play it fair.

Little Johnnie saw a tug pulling a steamer, and heard the tug whistle loudly and shrilly.

"Oh, Pa!" shouted Johnnie, "the big ship's got the little one by the tail, and it's squealing."

Good intentions will not save the man who is careless about using the money of other people.

A History of Blacksmithing

The Multiplication of Crafts Leads to the Advance of Factory System

By H. H. Manchester

THE best illustrations of early shops and smiths are embodied in the woodcuts by Jost Amman, which were produced for Schopper's "Description of All the Arts" which was published in 1568. Inasmuch as the sale of this book was expected to be chiefly among the craftsmen themselves, Amman took pains to have his drawings as true to life as possible in the comparatively small space allotted to each. For this reason, the drawings are a mine of information concerning the actual practical conditions and methods under which the every-day work of the period was carried on. He shows us nothing of the new machinery which was just being experimented with, or of the independent factories which were springing up in a few isolated places, but gives a very vivid representation of the guild craftsman at his work.

The Nailer's Shop, 1568.

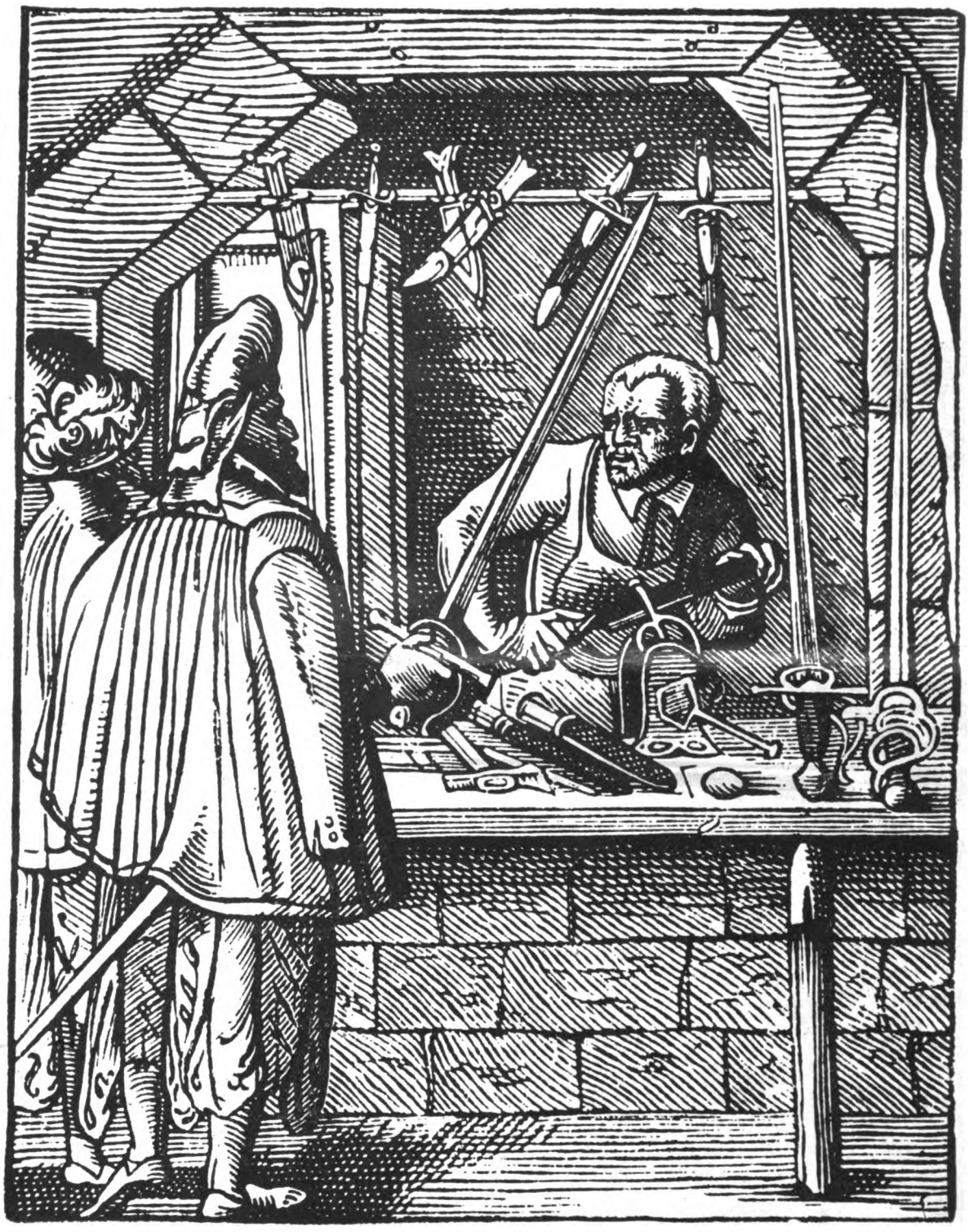
The Locksmith's Shop, 1568

That date in many ways marked the high tide of the guilds as a basis for the organization of industry. This is shown by Amman's pictures themselves, which divide each of the into various independent guilds, suggesting that their growth had been so great that they were able, like a tree, to shoot forth many branches which were more or less independent, and interconnected only by the trunk. Instead of showing one guild of smiths, Amman shows the armorer, the chain armor maker, the spurrier, the sword smith, the scythe smith, the locksmith, the nailer, the horseshoer, the file maker, the gun maker, the gun barrel maker, the pistol maker, and the wire drawer, besides such allied crafts as the coppersmith, tinsmith, lantern maker, and the like.

This very multiplication of crafts, however, inevitably led to petty jealousies and squabbles over the division of labor and the right to certain work, all of which had to be settled by conferences between heads of the guilds, or by the intercession of the government of the city, which in many of the free towns was controlled by the guilds themselves. Eventually these interguild struggles kept them from preserving a united front against the encroachments of the new factory system.

This new basis of organization was, in fact, aided by the exclusiveness and selfishness of the guilds. Each guild required a seven years' apprenticeship, and strictly limited the number of apprentices which any master workman could indenture. As a consequence, many a boy was unable, unless he had relatives of influence in a guild, to enter a trade which he might desire to, while the fact that as an apprentice he would receive only a few dollars over his living for his seven years' work, made him lend a more willing ear to some factory which was being established outside of the guild-controlled city.

It was also the period of the great geographical discoveries; the adventures in foreign lands and on the sea held forth promises of returns far greater than those of a craftsman. In view of recent events, it is interesting to note that prices rose rapidly at the end of the 16th Century, wheat in England, for example, jumping from 32 cents a bushel between 1551 and 1560 to a level of over a dollar in 1600. This increase was maintained, because the factors which gave rise to it, such as the exploitation of the new countries, were permanent. In the meantime the craftsman's wages increased from about 14 cents to 24 cents a day. Thus they, too, though in a lesser degree, were raised by the general increase of commercial activity.



The Swordsmith's Shop, 1568

An examination of Amman's pictures will show how much of the work of the time was still done entirely by hand. In his illustration of the armorer's shop we see no intimation of machinery, though we know that bellows driven by water power were already in use in certain places.

An important detail illustrated in the picture of the cutler's, or swordsmith's shop, is a vise. This is no doubt worked by means of a screw, which is turned by a small iron wrench. The vise itself was probably of iron, but of this we cannot be certain. Other vises appear, though not so plainly, in the shop of the spurrier and of the locksmith.

The spurrier seems to depend largely upon his file for finishing his products. One noteworthy point in this picture is the chimney

for the forge, and the rather peculiar shaped bellows behind it.

In the scythe and sickle maker's shop, four men are at work at once in forging a scythe, probably on the principle that it pays to strike while the iron is hot.

The locksmith's shop discloses a bellows worked by hand, and the use of a punch in making holes in the side of a lock. The punch in this case is a pointed hammer with a handle which is held by one man, while another workman hits it full force with a small

The Farrier's Shop, 1568

sledge hammer. At the show window two assistants are finishing locks and keys with files. Several completed products are hung on a bar across the top of the window.

The cut of the nailer's shop shows that there were dies in the anvil, which were no doubt used in forging nails, a number of which are shown on the block. The forge in this shop is partly enclosed with four brick

The Scythe and Sickle Maker's Shop, 1568

pillars, which at the top have a roof with a hole only large enough for the escaping smoke.

In the farrier's shop, two men are at work forging a horseshoe, which is held by one of them in rather well developed tongs. A horse is peering through the window watching the operation, and apparently criticising the job.

In almost every case the shops show a vaulted window. This was, in fact, the show window. It was without glass, but could be closed at night with wooden or iron shutters. On the sill, or suspended at the top of the window, the craftsman displayed his wares. The sill was likewise the sales counter, for the customers often talked across it. The shop itself was in the room behind the window. In many lines of business this was located in the front of a dwelling in which the craftmaster lived together with one or two apprentices, and perhaps a bachelor journeyman who boarded with him. The whole arrangement had the advantage of a family-like association of the master and his few workmen, but the disadvantage that it could not be enlarged to take advantage of the invention of power-driven machinery.

HELP WANTED

Nancy was saying her prayers. "And please, God," she petitioned, "make Boston the capital of Vermont.

"Why, Nancy!" exclaimed her shocked mother, "what made you say that?"

" 'Cause I made it that way on my examination papers today and I want it to be right."—*The American Legion Weekly.*

Some of the lines you carry are such slow sellers that they net you a loss every year. Weed them out or speed them up.

Many things remain undone because somebody who could start the doing fears that he may incur the displeasure of some.

The Spurrier's Shop, 1568

Another Answer to Mr. Hansen

From J. D. Arrowood, Texas: W. R. Hansen wrote not long ago of a competitive smith who was angry with him . That man can easily be made a friend, and to show this I will tell how I won a man over, and that will do in his case.

I used to think that if a man got angry and said all kinds of hard things about me, the thing to do was to feed him out of the same spoon, but I find that that is not the best way.

This man thought I charged too much and told my friends that I was robbing the people. They would come, of course, and tell me, expecting me to say something bad about him, but I fell on this plan. When they would tell me what a hard name he gave me, I would always say something good about him, so he would pass the shop and wouldn't speak, but I made it convenient to speak to him and try to be friendly with him.

I had a small shop and found that it would be best to take up auto work and increase my shop. I bought the lumber and started the frame work for the addition. When the man came by again, he simply "boiled over" and went down to the store and told the people that they could see positively that I was a robber, that they were helping me to spread out. They came and told me, of course, but I only answered, "Surely you are helping me; that's the only way I can build, —from the profit that I get out of my work."

You see, I tried the old stunt of building a fire of kindness on his head, and it wasn't long before he sent a man to find out what my price was for a certain job. I gave him the price and made it high, I'll admit, but he sent his work, and it wasn't long before he was bringing it. Now he is one of my best friends.

Some smiths will say, "Well, I wouldn't go to such lengths to get any man's work," but it wasn't so much the work that I wanted—I wanted to make a friend out of him.

In fixing prices, just figure the cost of your work, charge a fair profit and if they kick, just let them kick, treat them well, and they will come back and be better than ever the next time.

Mr. Hansen, go over to see the old fellow, show an interest in him and you'll be proud when you make a friend out of him. Don't say anything against him and see if I am not right.

I am sending herewith a sketch of a churn which I made from the differential of a Ford car and front hub. I think it is the best churn I ever saw, and it cost nothing to make, since I obtained the parts from an old car.

A, is the differential main gear riveted to the front hub, B, and its bearings back end C, of hub where the long bolt goes through in the axle or car is laid flat, two pieces D, riveted on the frame so as to make a hanger to turn back out of the way when it is necessary to take the churn out. E is the small pinion or drive shaft of the car, fastening on the dasher F, crank G, clamped round the hub, H, Angle iron J, is a hinge to hold the dasher in place. I used a cam bearing K, drilled a hole through both sides, bolted one on side of the angle iron J, the other to hinge L, made a swing back so the dasher could come out, fastening the hinge with staple M, and wedge key N. O, is the frame.

This churn surely does get the butter right. It is easily turned; the little pinion in the big one makes the dasher fly. I used a square block of wood and grooved it for the dash paddle and sloped them so as to press the milk to the bottom of the churn.

The lid must be made in two pieces and stay on the dasher as the cogs on one end and the dasher on the other won't let it come off.

AN EYE FOR BUSINESS

"To what do you attribute your great age?" asked the city visitor of Grandpa Eben Hoskins.

"I can't say yit," answered Grandpa cautiously. "They's several patent medicine fellers dickerin' with me."

In a large department store: A little child vigorously, lost her mama. Floor approaches and asks why she didn't to her mama's skirts. "Cause, cause couldn't reach 'em," the child replied.—*The Lightning Line.*

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For Blacksmiths

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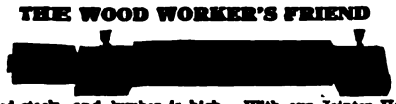

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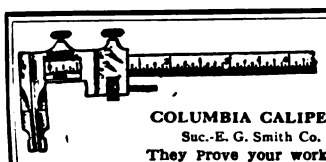

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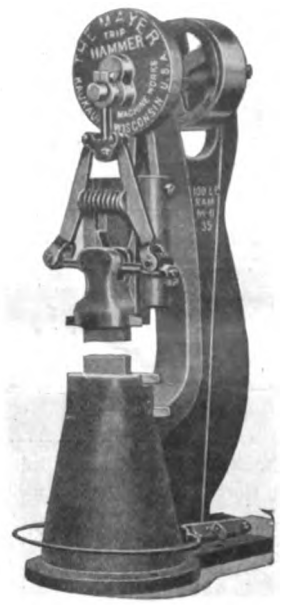

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Are Horses Profitable?

It is a well known fact that many horsemen and farmers do not know at the end of the season whether a certain horse in their stable has shown a good profit or has been kept at a loss. A lame, blemished horse cannot do as much work as one that is sound yet it costs as much to keep a cripple as it does one that can work in the field day after day. Many cases of lameness can be prevented and blemishes removed, by the prompt use of a reliable liniment. Even cases of long standing will very often yield to continued treatment.

Absorbine has been well and favorably known to horsemen for over a quarter of a century. It is a germicidal antiseptic, made of herbs and essential oils, safe and pleasant to use. It does not remove the hair and horse can be worked during treatment.

Absorbine is made by W. F. Young, Inc., 55 Temple St., Springfield, Mass., who will be glad to give any information desired on the treatment of your customer's horse, if you will write, describing your case.

WELDING A STEEL AXLE

From C. Smith, Pennsylvania: I think that any practical blacksmith who has seen or developed a useful method of welding this kind of carbonized metal ought to give the idea to his brother smiths. I came across an instance in which a smith had tried twelve times to weld a steel axle. I have found out that indirect heats are liable to be uncertain, so I adopted the following plan:

After I allow length for waste, I heat soft and upset the end and cut open (as per sketch at A) the first piece, cutting the end in tail, and throw up a burr with the corner of the chisel. I heat soft and cover with the welding flux, while very hot and lay it aside. Then I take the next half and heat soft and cut open long enough for a good scarf, open and draw down the ends. Next, heat soft, and cover the surface of the scarfs with the welding flux and while the scarfs are soft, I close them on the fan tailed scarf and spur as closely as possible.

While hot I heat well in a good rich fire and flux with Climax with a spoon. I take a holding heat and make the scarfs all properly fast and then take a general heat or several to finish the welding. Always have stuff enough to draw out to length.

This is the method used in the axle mill. When they weld all kinds of axles, all flying heats are avoided. I have never seen this method of welding steel axles fail. It allows the smith always to have the work straight in the fire. Some smiths might think this a long way of welding, but experience has demonstrated its correctness above all others. Flying heats are always liable to become dirty whereas with closed scarfs this is entirely avoided, and the weld can be made more perfect. Always make a long scarf as this is best.

RELATIVE TO MR. OTT'S FORD

From W. L. Shriner, Oregon: Several months ago Mr. Ott wrote a letter which was published in the B. & W., in regard to trouble that he was experiencing in starting his Ford. In answering Mr. Ott, I will say that starting a Ford in cold weather is like milking a cow. Some are hard and some are easy. Most all Fords start hard in cold weather.

Mr. Ott's Ford may have stomach trouble and not digest its food very well. If he will take the carburetor apart and set the float so that when he turns the gas on, it will come up through the needle hole about the thickness of a hair, I think he will find that this will help.

At times Lizzie's teeth may need filing, so that they will make a good spark. If the magnets are not the right distance from the fields, that also will make starting difficult.

Index to Advertisers

CLASSIFIED BUYERS' GUIDE

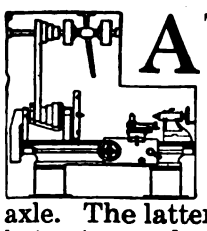
BLACKSMITH AND WHEELWRIGHT

and TRACTOR REPAIR JOURNAL

Vol. LXXXIV. No. 4 OCTOBER, 1921 TERMS ONE DOLLAR A YEAR

Practical Horseshoeing

A Continuation of Last Month's Article Regarding the Construction of a Travis



AT one end, the axle is fitted with a ratchet. A pawl is secured in place on one of the posts so as to provide against an unwinding action on the part of the axle. A suitable crank is fitted to the axle. The latter is not round in cross-section, but octagonal. There are thus eight faces on the axle. In a row on one of these faces are set six hooks which correspond to the six hooks, *gg*, on the fixed bar *f*. At the rear end of the travis, two brackets are secured to the two posts. These provide, by means of the 6-inch rings *t*, for the reception of a heavy cross rod. The brackets have such a reach out from the posts as to put the centers of the rings about 18 or 20 inches from them.

The ox is driven into the crib through the opening between the rear parts, the cross bar being out of the way at the time. At the head of the travis, the neck and breast pieces will previously have been set well out of the way, the neck piece above and the breast piece below. A rope is flung round the horns of the ox and then wound in by the windlass on the fifth post. The operation serves, when carried out properly, to fix the head in correct position. The neck and breast pieces may now be adjusted back of the head.

A belly-band six inches wide is to be provided. The strip may be about six feet long. At each end a rope is secured. These are each provided with a metal ring at its free end. Each rope when attached should be, say, two and one-half feet long. The whole affair, from ring to ring, will now measure about 11 feet in length. One ring is put on one of the hooks on the fixed bar *f*. The band is passed beneath the body of the animal and the other ring hooked on at the proper point to the octagonal axle. By operating the crank attached to this axle, the belly band may be drawn tight, and—if necessary—sufficient force applied to lift the fore or rear part of the ox clear of the ground. Or, the whole weight of the animal may, at times, be properly supported. Before operating the axle, the "breeching may be fastened to the point marked *u*."

Holding the Feet

To shoe a front hoof, the foot may be fastened to the side bar of the travis by means of a cord, or rope, secured to the fetlock and wound round the bar and finally secured to the hook *r*. To shoe a hind hoof, the foot is secured in a slip knot of a rope arranged at the fetlock and drawn up over the bar, which should have been passed through the rings *t* on the two brackets *s*. This bar is to be wrapped so as to have its central portion padded. When the foot is drawn up onto this bar, the front surface of the fetlock is to be placed on the padded part. The animal's foot may be maintained in this position by passing the cord having the slip knot several times around the bar and then fastening it in any convenient way.

The actual shoeing of a front or hind hoof may be done by the workman proceeding in a similar way as if he were shoeing a horse. The foot is secured. He has only to deal with it as with a horse's foot, passing it between his legs or supporting it on his knee.

In caring for the hoofs, one is to be guided by his knowledge of the proper things to do with a horse hoof, paying attention to the obvious differences. If a certain oil or mixture works well in preserving a horse hoof, it will probably produce good results with an ox hoof. So, also, if a certain oil or mixture dries out a horse hoof, one will do well to avoid using it on the hoof of an ox. Water is to be used to freshen the horny wall just as with a horse. As to questions relating to the way the weight comes on the hoof, one will probably have to rely partly on his judgment and partly on what he has learned in connection with horses and mules.

I doubt if much study has been given to the ox separately. Whether faults of standing and the like can be as well corrected, it is hard to say. Probably, in the easier cases, something can be done. The shoe can be made thicker at the toe or the heel in order to throw the weight differently. Similarly, if an ox wears one part of the working surface of a shoe more than another, this may be expected to be made plain simply by examination of an old shoe. As such uneven wear may put a new shoe quickly out of commission, it is worth while trying to provide for it by thickening the shoe at the proper places—or, if it be possible, by widening the area of wear.

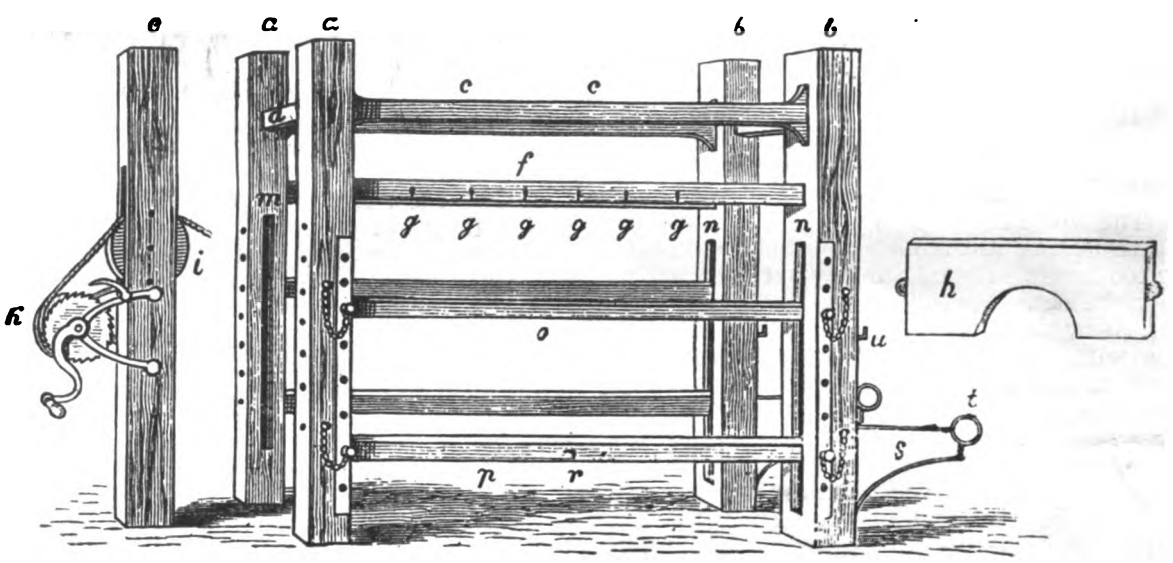


Fig. 1. Travis for Cattle. (This travis is used for horses also).

Special Points in Respect to Horse-Shoeing

The business of shoeing horses is one involving many diverse matters. One of the most important of these concerns the *white line*. This is the region where the farrier places the nails. It is a kind of boundary between the horny sole and the horny wall. That is to say, if we think of the hoof as a box having sides and a bottom, but no top, then the white line is the region where the sole or bottom is fitted in. It may be traced for perhaps three-quarters or more of the circuit.

Naturally, the horny wall is thick. Its lower edge is, in fact, thick enough to provide a large part of the surface on which the horse rests his weight. If this is pared off so as to show a clean and new surface and the cut made broad enough to take in the margin of the sole, then the white line will appear as a line of white color between wall and sole.

The laminae of the wall are in this region seen individually. These are small streaks of a whitish color. They are parallel and lie close together. In the foot itself, the individual laminae of a horny character are separated by the sensitive laminae. In the wh line, however, these intervals are filled in with a waxy, horny substance. It is yellowish and semi-transparent.

This horny substance is softer than the horn of the sole, and it is also more yielding. In fact, the white line is largely a kind of mixture of horny substances. This mixture yields more easily than does the horn of the sole or the horn of the wall. It may readily be discerned by the eye when the bearing surface of the wall and the margin of the sole are pared as already described.

If the white line be carefully traced in the heel region, it will be found that it does not stop at the angle where the bars come close to the horny wall. The white line, in fact, follows the horny wall at the angle and runs with it towards the toe and towards the center of the sole.

The white line divides the sole from the bars for about half the length of the frog. This part of the white line is not so distinct and apparent as in the region where nails are put. If there is difficulty in tracing the white line next the frog, one may cut away more of the bars. At the front of the frog where the bars approach each other, the white line disappears. In fact, there is a region here where bars and sole are united and no white line intervenes.

The white line is useful in horse-shoeing, partly because it helps us to determine the actual thickness of the horny wall. There is a diseased or injured condition in which the horny wall and the horny sole are separated from each other right in the region of the white line. This abnormal condition constitutes what is termed "loose wall."

Between the white line and the outer edge of the horny wall is the bearing surface of this wall. In general, it is wider than the real thickness of the wall. The reason for this is that the wall does not ordinarily stand vertical to the ground. Thus, in a normal horse, the horny wall will slant, at the toe, at an angle of, say, 50 degrees. Then the wall gets more and more vertical as it continues back towards the heel. It may, in fact, become almost or quite vertical before the heel is reached.

Naturally, if the real thickness of the wall is everywhere the same—that is, if the thickness measured perpendicularly through the horny substance is the same all over—then the bearing surface will be broader at the toe than elsewhere, because the wall is most inclined from the vertical at this point.

In fact, the breadth of the bearing surface is a deceptive thing unless one takes into account the inclination of the wall to the ground. The white line helps us to determine the exact bearing width of the horny wall. Then, if we take into account the inclination to the ground, we shall be able to determine or judge the real thickness.

It is at times important to know what is the actual thickness. Otherwise, one may get an erroneous view of the strength of the hoof wall.

For example, we may have a case where, in front near the toe and at the toe, the breadth from the outer edge in to the white line is only moderately broad. Upon noting the slant of the hoof in this region, it may be seen to be quite flat. Upon considering both facts, one may find that the real thickness is less than one would have supposed.

Again, back towards the heel, the width of the bearing surface may be rather narrow. If, at the same time, the wall is nearly vertical, then this width will be just about the true thickness.

Naturally, other things being equal, the *true thickness* is a guide to the strength of the hoof, and every farrier should be alert to note what this thickness is, so that he may make no mistake in forming and shaping the shoe.

Top Surface Broader

The top or bearing surface of the shoe will be broader than the bearing surface of the horny wall, for the reason that the shoe will ordinarily cover also the white line and a narrow margin of the horny sole. The groove for the nail holes must accurately follow the white line, for the reason that each and every nail must enter the white line.

The reasons governing the matter are these: (1) The nail must not be further in towards the center of the sole, since then it may strike some sensitive part of the foot and effect an injury. (2) The nail should not be set further from the center than the white line, for the reason that it [illegible] enter the solid horny [illegible] the result [illegible] material, a [illegible], or some other blunder. (3) The white line marks a region of reasonable resistance to the nail—neither too great nor too small. Here then is where the nails are to be set.

If, then, the outer edge of the shoe is to be flush with the outer edge of the hoof when pared underneath and trimmed round the edge on the side—if shoe and wall are, on the outside edge, flush, then the distance, on the metal, in to the nail holes is to be made exactly the same as the distance from the outer edge of the bearing surafce of the wall in to the white line. The two distances must be the same, so that the nails will enter at the white line. Of course, allowance must be made for the side trimming of the wall.

Setting the nail groove over the exact distance is enough, if the shoe is properly rounded on the outside to fit the hoof. Only, account must be taken of the fact that the distance in to the white line from the edge of the wall *varies*. If this is done, then the nails will be located right.

Place Nails in White Line

The farrier must look on the requirement that the nails are to be placed nowhere else than in the white line as an ironclad rule, only to be broken for some unusual purpose.

It seems a most fortunate thing that Nature has provided the horse with such a thing as the white line where nails may be driven without encountering too much resistance and without injuring the hoof. Further, the shoe may thus be firmly held. The ox has a white line but it has probably never been utilized for shoeing purposes. This is probably due largely to the fact that the hoof is cloven.

I doubt if anyone knows just when nailed-on shoes were introduced. "No Greek or Latin writer on military science, hippology [the knowledge of horses], or agriculture mentions shoeing with nailed-on shoes." This would seem to mean that in the olden days, men were unacquainted with the possibilities of the white line. Nay, they may not even have known of its existence, if this evidence is to be trusted. The writer Flavius wrote descriptions of the forging of weapons and other instruments. But he does not mention nailed-on shoes or nails. Alexander the Great (around 325 B. C.) put a good deal of dependence upon his cavalry. There are old mosaics which represent the overthrow of th last monarch of the great Persian empire. But these mosaics show nothing of the description of a horse-shoe, although horses are depicted. In fact, early writers tell of methods of making the hoof hard. For example, Xenophon, a general and historian, who wrote in the fourth pre-Christian century, tells how he thinks the horse should be dealt with to promote hardness of the hoof. Many years later (about 303 A. D.), there was an edict of the Emperor Diocletian, which set prices for fees and the necessaries of life. Since the edict mentions paring of the hoofs and cleaning of the head, it is thought that if at his time there had been a business of nailing shoes on horses the edict would have mentioned the putting on of shoes. So then the old Romans and Greeks probably knew nothing of nailed-on shoes.

Nailed Shoe Very Ancient

The negative evidence that horse-shoes of the nailed-on type were not mentioned by ancient Greek and Roman writers is, like pretty much all negative evidence, of no great value. For there is evidence of a positive character which favors the existence of the nailed-on shoe in very olden times. Thus, the French scientists, Capstan, found, in the course of excavations on the site of an ancient town in France, whose name was in the olden times Alesia, certain things of an interesting character. Thus, he found wheel tires, horse bones, pieces of bronze horse-shoes and a lot of nails. The horse-shoes were worn at the toe and the nails had heads like those of violin pegs. This evidence is inconclusive because the shoes do not seem to have had nail holes and there is apparently nothing to connect the shoes and the nails, except that both were found in the same location. How close together they were found, I do not know.

However, the same scientist found or inspected a lot of Celtic antiquities. He noted the bones of men and horses and other animals. Underneath was a triangular file, a piece of a flat file, a chisel, some iron dross, and a part of *a small horse-shoe with a nail attached.* Here we get real, substantial evidence.

In a part of France between the towns of Langres and Dijon, there have been discovered, at a depth of two or three feet below the surface, a considerable number of small horse-shoes that had been fullered. Some of these carried nails in the form of a T. These were provided with clenches, which showed how the shoes were secured to the feet.

Shoes of the same character have been found in Celtic monuments by the French scientist Toquet, the Swiss Troyon, and others besides. "Quiquerez discovered some in the Bernese Jura [in the district of the Jura mountains near Berne, Switzerland], buried in an earthen mound along with horses' bones, and, from the evidence furnished by the superincumbent earth, referred them to the sixth century B. C."

These shoes are especially characterized as having six nail holes. These are round or roundish. The border of the shoe bulges outward opposite the locations of the holes. These holes are rather large, so that the bulges are perhaps to be explained as due to the spreading action of a punch. Some of the shoes have heels; some have not. They are rather weak affairs being about three-sixteenths of an inch thick and perhaps five-eighths to eleven-sixteenths of an inch broad. The weight ranges round three or three and one-half ounces.

The shapes are irregular and not especially good. The nail-heads are flat and are rounded on the side. The shanks are four-sided and short. The shanks taper and are also pointed. One concludes that the nails were driven in, but were not cut and clenched after driving. Probably, the ends were simply turned over and then beaten flat against the horny wall.

Here we have some good evidence, though it is perhaps not all equally good. We may conclude, then, with a good deal of assurance that nailed-on shoes were made and used in quite ancient times. This would mean that men at that time probably were well aware of the *white line* and the use to which it could be put.

REPORT OF THE C. B. N. A. CONVENTION

DURING the week of September 19th the Hotel Gibson in Cincinnati was filled with wagon and carriage language for this was the week of the 49th annual Carriage Builders' National Association convention. As each year passes, the C. B. N. A. gathering becomes more important.

The prevailing idea that the horse is being displaced by the automobile and the truck is one which must be dispelled. It is a fact that the truck is replacing many horses, but for every truck sold in the larger cities, comes a need for more horses. Every farm truck sold means more horse equipment because the horse is needed for the short hauls.

And the C. B. N. A. is in a position to promulgate the doctrine of the "Horse for Haulage," in fact it is their business to do so and if the Hotel Gibson could talk it would probably tell you that the horse, the mule and the donkey still have their place in the general scheme of things.

The President, Mr. H. A. White of High Point, N. C., brought up the point, at the first meeting, that the American public is "sold" on transportation. The public is in the habit of riding and though it is true that many people of this same public have contracted the automobile habit, a large percentage of this class is finding the automobile to be a drain upon its diminishing resources.

Mr. White went on to say that for the past few years money has been obtained with comparative ease by nearly everyone, (we doubt if he included the smith however) this meant that nearly everyone could afford some sort of an automobile. During the past few months, however, finances have been in a poor condition; retrenchment has been the password and people have stopped to figure costs. Farmers in looking over their accounts have found that "joy riding" costs money. Under these conditions he assumes that farmers, and a large percentage of the general public, will return to the horse-drawn vehicle.

William H. McCurdy of Evansville, Ind., in his address said that the proposed adjustment of the railroad rates would be a large factor in bringing business back to normal. The fact that the present high tariffs stood in the way between the farmer and the consumer was discussed and the convention drew up a set of resolutions in favor of tariff reductions.

P. E. Ebrenz of St. Louis, formerly the chairman of the Executive Committee, was elected President of the C. B. N. A. for the coming year. George W. Huston of Cincinnati, was re-elected to hold the office of Secretary-Treasurer. The following vice-presidents were elected: W. L. Delker, Henderson, Ky.; W. C. Heitzman, Union City, Ind.; W. G. Norman, Griffin, Ga.; J. H. Birch, Jr., Burlington, N. J.; B. F. Taylor, Oxford, N. C.; T. M. Robinson, Nashville, Tenn.; L. R. Jones, Franklin, Va.; and Thos. J. McNamara, Cincinnati, Ohio.

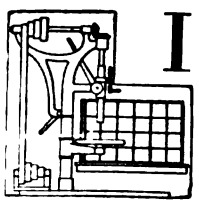
The following members of the executive committee were elected: F. H. Delker, Henderson, Ky.; C. R. Crawford, St. Louis, Mo.; T. M. Sechler, Moline, Ill.; H. A. White, High Point, N. C. and R. J. Jones, Henderson, N. C.

It was voted to raise the annual dues from $10 to $25 and everyone seemed to feel satisfied.

Repairing Worn Valve Seats

Not Strictly a Welding Job, But It Cannot Be Done without the Welding Torch

By David Baxter



IN THE line of tractor repairing the blacksmith will find many more uses for the oxy-acetylene welding torch than the mere fusing together of broken castings and other metal parts. He will find many things that it would be impossible to mend except by welding. In fact, after he becomes acquainted with his welding apparatus, he will find that it is about the handiest machine or tool around the place.

Consider, for instance, the building up of worn bearing or other parts of a farm tractor; and city tractors too for that matter, since the tractor is rapidly gaining a foothold in many kinds of city work. Here is one use for the torch a building up repair which could be accomplished in no other way, with the possible exception of the electric welding outfit. A specific instance is the building up of worn valve seats such as is illustrated in the accompanying photographs of a tractor engine cylinder head.

This might be termed a welding job but strictly speaking, is not, since two parts are not fused together, which is welding. In this, new metal is built up or "put on" around the worn valve seats. Of course the new metal is fused with the casting metal, and in reality forms a part of it, but it is merely added metal of the filler rod and doesn't in any sense join two edges such as is the strict meaning of welding.

Fig. 1. Preheating a Welding Position.

The flame adjustment and manipulation is much the same for this class of work as it is for fusion welding; as is also many of the other fundamentals of the welding process; referring of course, to the oxy-acetylene process. In some ways the building up process requires more skill but in several details it is much simpler.

However, let us take the cylinder head illustrated and endeavor to see just what was done; let us see how the job of building up the worn valve seats was achieved; instead of trying to say how the work should be done.

The first step in the process was to clean all grease and dirt away from the vicinity of the worn seats. In fusion welding this comes under the title of preparation and is usually accompanied by considerable grinding and beveling along the weld. But with this job the part was merely cleaned by first burning all of the grease, dirt and carbon to a cindery mass with the welding flame; not being particular about the flame adjustment. Then the cindery deposit was thoroughly scraped and brushed off with a wire brush. The worn seats and surrounding casting metal was brushed bright and bare.

Reason for Cleaning

This cleaning was for the purpose of preventing any foreign matter from entering the weld when the fusion started. For, in building up a valve seat it is necessary to keep the new metal free from porous spots or pin holes, a great many of which are caused by outside impurities working into the weld; bits of rust get trapped in the new metal to burn and form small gas pockets; others burn and leave a tiny crater where they escape from the fluid metal in the form of gas.

In attempting to work these impurities out with the welding flame the operator is liable to burn or to harden the added metal to such an extent that it is likely to be too hard to machine; a part of the machining must be done by hand which makes it doubly essential to keep the new metal clean and soft.

So for these reasons the welder should do everything in his power to make the new metal homogeneous. And for the same reasons it requires more skill and care than the ordinary weld. The careful welder will not take chances when building up worn valve seats by omitting the cleaning part of the process.

After cleaning, the next step in the process was to preheat the casting; to heat it previous to applying the welding flame. On account of the complex design of this cylinder head casting it was necessary to have it fairly well expanded before adding new metal; therefore the preheating, which is in reality pre-expanding.

Had the operator applied this new metal without heating and expanding the casting, cracks would have developed when the fully expanded new metal cooled and started to contract. That is, the new metal, which was fully expanded when added, would have shrunk when it cooled and therefore tended to pull away from the surrounding casting, the shape of which would have offered stubborn resistance to the pull of contraction.

Where the surrounding metal is of such shape that it cannot give or be drawn inward by the contracting weld metal, one or more cracks are bound to appear, either in the new metal or in some weak portion of the casting. The preheating does away with this danger because the casting is expanded and can therefore respond to the pull of the contraction If it cools when the weld cools its shrinkage will follow the shrinking weld inward and literally squeeze inward upon the new metal if the cooling is timed right. Therefore this job was heated before and

Fig. 2. Covered with Asbestos for Slow Cooling.

during the application of the torch flame.

The heating was accomplished with a battery of natural gas burners, over which the cylinder was placed with the valve seats upward as is shown in Fig. 1. These gas preheaters were situated below the surface of a combination heating and welding table. The flames were turned on full force, after a few moments of slow heating to prevent sudden strains. The gas flames enveloped the entire casting on all sides, heating the whole of it uniformly. This equalized the expansion through out the job.

The casting was permitted to heat about twenty minutes before starting to weld. Some welders prefer to heat a job like this until it shows dull red all over; to facilitate which they cover the casting with asbestos paper or pieces of sheet iron. The heat thus confined will naturally act quicker; however, this job was heated in the open and not covered until ready to start the slow cooling, since that was the most particular stage of the work.

Size of Tip

While the head was heating the welder filled in the interval by selecting the proper size welding tip for the torch, the correct size filler rods, and fresh flux powder. He

(*Continued on page* 12)

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Our Editor's Letter

SOMETIME ago I sat down to my old battered typewriter, which is as dear to my heart as one of your rusty and battered old anvils, is to you, and pounded out an article about business conditions in our trade. I think that I mentioned something about the ordinary increase in business which everyone might hope for in the spring, but as soon as some of my readers received this particular forecast they sat themselves down and sent some fairly stiff letters to me.

I might have managed to put the article across if I hadn't said something about repairing ice cutting machinery. I guess that that this was the last straw because a husky smith from Texas wrote me asking how in the dickens I expected him to sharpen ice machinery when the only ice he ever saw was in pictures of the Alps.

I figure that the safest topic I can talk about is the weather and even then I'm taking a chance with some angry man whose shop has just been lifted by a playful cyclone. I'm in the position of the fellow who has just signed some one's else name to a check and is being told by the investigator that whatever he says will be used against him.

To tell a Texas reader how to boom his business and at the same time have the advice apply to a fellow, muffled in furs, sharpening ice picks in Alaska is a rather difficult proposition.

There is a nonsense ryme which expresses an excellent idea and I might quote it here:

"You can't teach a kitten to fish for eels,
Or a Robin to chase up mice.
A hen won't go gunning for polar seals,
Or an elephant digging for lice."

In other words everything has a special thing to do in life and what might seem entirely proper for a kitten might seem out of place for an elephant. And so it is with our trade, some of us seldom see a horse and we wouldn't know any more about putting on his shoes than we would know about the inhabitants of Mars. Our Southern brothers have no more need for ice machinery than for a pair of paper wings. And because of these conflicting interests it is almost impossible to say something that will interest every one.

But for this month I think I've got an idea which will bear passing on to every reader. I don't care whether you are putting the shoes on yaks in Iceland or drilling oil wells in Oklahoma, the idea is of value to you if you will only use it.

The keynote to my idea is "personal publicity." Suppose it would be possible for you to hire the youngest son of the former German Kaiser as your helper. I understand that he is by way of being a blacksmith and occasionally makes horse shoes. Don't you think that within a few weeks you would have so many visitors to your shop that you couldn't begin to take care of them all? The farmers for miles around would dig out some work just as an excuse to see your helper at work. And as long as he worked in your shop you would have plenty of business.

Do you, for one minute, think that this business would be due to your reputation or the ability of your helper? Of course not! It would mean simply that curious people were interested in seeing the ex-kaiser's son. And why? Simply because the young man has been given a whale of a pile of personal publicity. People like to see a character who has been in the public eye.

You can't expect ever to be nationally known like Charlie Chaplain, Douglas Fairbanks, Samuel Gompers or Jack Dempsey, but you are not looking for national business. What you want is to be in the public eye in the community where you live. It stands to reason that if every one in your community knows you, then you are in a position to get business. At any rate you will get more work than if you are known but to a few people.

"This is good advice," I can hear you say, "but how am I to set about getting my name before the public?" Well, there are a number of ways to do this, you can make a point of going to all public meetings and having something to say, for instance. What you have to say may not be "popular," but it makes your personality stick out above the other fellows' who sit and listen.

I remember one man who made a practice of writing letters to the newspaper in his town. He would always write about something which was attracting lots of attention at the time and generally this started things going. Others would reply to his letters and by the time the argument was dropped he was ready on another subject.

In the smaller cities and towns a public office of some kind is often easy to obtain and the work required is but small. The mere fact that your name is on the ballot, even if it is only for the office of dog catcher, is enough to call it to the attention of the voters.

One man I know obtained a pile of publicity for his business by driving around town in an orange colored automobile upon which he had spattered a lot of green and purple paint. You could see that car for miles and it was the talk of the town. It looked like a bad case of spotted fever complicated by delirium tremens but by the end of a month everyone knew the car and its owner.

In a small town the best way to make friends with your customers is through the children. Every smith has spare time and if he is wise he will utilize this spare time for making friends with the children. Many workmen seem to think that a ten year old boy is a nuisance, he puts his fingers into most everything and can cause more trouble in fine minutes than a cyclone in twenty, but this is because the workman doesn't known how to manage the kids.

If you can get the friendship of a few healthy boys, the kind that like to look at your fat muscle and "rough house" with you, and get their admiration, then every one of them will talk about you and your fame in the town is assured.

If you have a child you know how wrapped up you are in the kid. Most everything he or she says you listen to and you find yourself acquainted with those people whom the child admires most. You begin to like the people that the kid likes and hate those whom the kid dislikes. And what is true of you is true of every father.

And so I say that though you can't mix business into your friendships you can mix friendships into your business. You can't afford to depend upon the ties of friendship to bring you business, but you can easily make a practice of obtaining more friends through your business acquaintances.

I've only given you an idea to work on. I know that the idea is perfectly sound but it must be worked out in your own way and to suit the conditions in your locality. Try it and see how successful you are.

Accepting Advice

ONE of our blacksmith readers recently asked our opinion as to the use of oxygen and acetylene tanks for welding, without the regulator equipment. The reader went on to say that a friend of his, who had done considerable welding work, had told him that the pressure regulators were not entirely necessary, though the friend had never tried the scheme.

As our readers know a large part of the cost price of welding equipment is in the regulators. If tanks could be used without regulators, then the smith could buy only a torch and a few feet of tubing and be ready for work. The investment would be comparatively small and the profit on a few jobs would pay for the torch and the tubing.

If our reader had taken the advice of his friend there is but little doubt that he would have departed from this earth in a very abrupt fashion and we would have lost a subscriber.

Oxygen is forced into the tanks under a pressure of approximately 1800 pounds per square inch and is just about as harmless as so much blasting powder. So long as it is in the tank it is entirely safe and so is powder. But if it is not properly handled, then the fireworks commence and a tank of oxygen can furnish far more excitement than a similar amount of powder. It is said that if a pin hole were to develop in the side of the tank, the escaping oxygen would disintergrate the metal and the hole would become an open seam is less than a second. The rapid release of the oxygen would be in the form of an explosion and the tank would burst. This would reduce the shop to kindling wood and kill anyone within reach.

Obviously, then, the oxygen tank is nothing to play with. The escape of the gas must always be under perfect control. One simply can't expect to make a mistake in handling the stuff and escape alive. A pressure of 1800 pounds is enormous and an ordinary rubber hose would be ripped from one end to the other by it unless it were controlled, hence a regulator on the oxygen is absolutely necessary, not only for safety but for making its use practical.

Acetylene gas in its free state is liable to explode if the pressure exceeds 15 pounds per square inch. The gas in the tank is under a pressure of 225 pounds per square inch but is not dangerous, while in the tank, under this pressure because it is dissolved in a liquid called acetone.

The acetylene gas in the container, while it may have enough pressure to kick like several mules, is fairly safe unless it is released to its gas form and the pressure in the hose or torch is thereby increased to a point above the 15 pounds per square inch. But if the gas is not controlled and does happen to accumulate in the hose to the 15 pound pressure limit, then it may ignite and explode. If the hose is connected with the

torch at the time, the chances are that the oxygen hose will also be blown off and there will be a brisk fire which will heat the tanks and explode both of them.

And so it is not safe to run the acetylene tank without a regulator.

The various dangers which we have pointed out, so far, are always present, so long as the oxygen or the acetylene tanks are connected directly to the torch without regulators. But if these dangers are great, there is another which is several times as soon as the torch is lighted.

The average torch is made to operate on very low pressure, only a few pounds per square inch. Most of the modern torches utilize a balanced pressure of gases, that is to say the pressure of the acetylene is only a fraction of a pound more than the oxygen pressure. The regulators permit only a measured amount of gas at a controlled pressure to pass through them. If the regulator is in condition it is impossible for gas to work back from the hose into the tank. Thus there is absolutely no chance for oxygen to get into the acetylene tank or vice versa.

Suppose, however, you were to connect the two tanks directly to the torch. (You have already made arrangements with the nearest doctor and an undertaker in case of trouble.) You open the acetylene valve just enough to give a good glaze to the torch and then you turn on the oxygen until you get a welding flame. So far nothing has happened and you still have two hands and your head to work with.

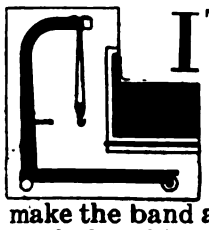
Under these conditions the torch is ready for the welding work and you start in. For a few minutes all goes well, but you came to a stubborn bit of metal and you forget yourself for a second, you happen to get the point of the torch too far against the work. The 1800 pounds pressure of the oxygen tank overbalances the meagre 225 pounds of the acetylene and in about two seconds or less the acetylene tank is a mixture of oxygen and acetylene. Such a mixture is highly explosive and the tanks, you and your shops all go up in a blaze of fire.

And the moral of this is not to accept foolish advice. Don't try experiments with dangerous elements, let someone else do the playing and be guided only by people who *know* what they are talking about.

Small Florida Smith-Shops

How It Is Possible for a Measure To Be Both Right and Wrong at the Same Time

BY JAMES F. HOBART



IT don't seem much of a trick to weld up a flat bit of steel into a hub-ring, or to calculate the length of metal used so that the ring will be of exactly the right diameter to fit the hub, for it is easy to make the band a trifle too small and then rasp the hub a bit to make the band go on while heated.

But when a band must be made to be driven on over the end of a cracked axle box, then the smith must figure stock-length pretty accurately if he doesn't want to stretch the band over a mandrel or to try making it smaller in a pair of make-shift fullers. I saw one Florida Blacksmith get tangled in such an undertaking and what he did, and didn't do, looked so interesting that I will pass it along.

A customer brought in a wheel with the big end of one of the boxes cracked as shown in Fig. 1, he wanted the smith to take out the cracked box, shrink on a steel band and reset the box in the wheel again. After having been removed and cleaned up, the box calipered about two and five-eighths inches in diameter and the smith set about marking off a bit of steel from which to weld up the band.

Length of Band-Blank

"I know how long it will be," said the smith's son who had been working in the office of a machine shop:—"3.1416 times 2⅝, which is about 8¼ inches.

"Let's see about that," said the smith as he wrapped a narrow strip of paper around the box, marked where the end lapped and then spread out the paper as shown in Fig. 2 at A, and found that it measured almost exactly

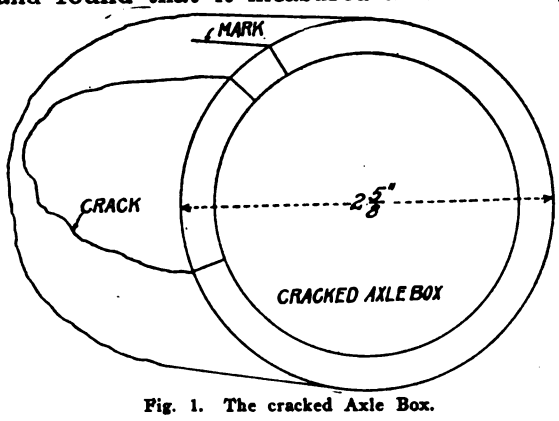


Fig. 1. The cracked Axle Box.

8¼ inches to the mark. "That's pretty smart, son, and if I allow for the weld, say a quarter of an inch, seems it oughter come about right?"

"Say," said the customer who had been fussing with the cracked box: "Are you sure 8¼ inches is right? Just look at this," and the Customer wrapped a bit of cord around the box, marked across the cord with a pencil and then stretched the cord beside the paper. (See Fig. 2 at B.)

"Look at this, the string shows longer than the paper and it measures 8 17/32 inch, more than a quarter of an inch longer. What do you make of that?"

Three Different Yet Correct Lengths

"What seems to be bothering you?" asked the Smith's father who chanced to enter the shop at that time.

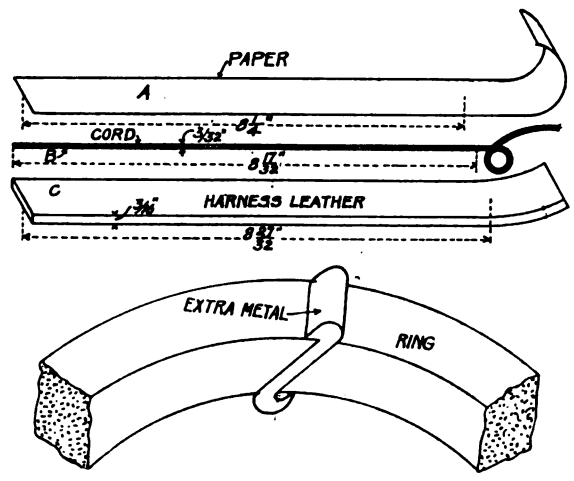


Fig. 2. Measuring the Axle and Welding the Ring.

"Measure around this cracked axle-box, will you Dad, and see how long a piece of steel I must cut off for a shrink-band to fit over the broken end?"

"All right, Son," said the father, and he picked up a bit of harness leather which chanced to be on the bench, wrapped it around the axle-box and made a pencil mark thereon fair with one end of the strap. Then he carefully unrolled that end of the strap a bit and brought the other end down across the mark and carefully made a pencil mark upon the strap, fair with the mark on the broken box. (Fig. 2, C.)

"Look at that, Sir, will you," said the Smith as he laid the bit of leather beside the paper and the string; "What is the matter with us that we can't measure alike? Now, Sir, your measurement is 8 27/32 inches; more than either of us made! What is the trouble with us?"

"There isn't any trouble, Dad," said the Son. "You measured with thin paper, he with a cord and Grandad with thick leather. Everybody is right and all of you are wrong. It is because thick metal 'takes-up' when bent and after you measure around the cracked box, you must add three times the thickness of the steel from which you make the shrink-band. That's the way the boiler-makers do. I can't tell you just why they do it. Here is Mr. Hobart, let's ask him."

"It's like this, gentlemen," I said, wrapping the strap partly around the cracked box as shown by Fig. 3 "The diameter inside of the strap is 2⅝ inches, while outside, it is 3 inches. This shows that the inside of the strap is shorter than the outside and the inner edge of the strap must have become shorter while the outside stretched when it is bent around the box."

The "Neutral Axis"

"There must be a place in the thickness of the strap which has neither stretched or shrunk, and that is very likely right in the middle of the thickness as shown by the dotted line or circle which has a diameter of 2 13/16 inches. Multiply this diameter by 3.1416 and the product will be 8.8357 inches, which is pretty close to 8 27/32 as found by your grandfather."

"Same with the string measurement as shown by the right-hand sketch. The cord is about 3/32 inch thick, and adding that thickness to 2⅝, gives 2 23/32 inches for the bending diameter of the cord and 3.1416 equals 8 17/32 closer than any other fraction. They call that part of the strap or string which does not shrink or stretch, the *neutral axis* and if all measurements be made for bending, upon the diameter of this axis, then there would never be straps cut too short and no need of adding 'three times thickness of stock' to the length before cutting off."

"Even then the length will not be exactly right. There should be added, 3.1416, or about 3 1/7 times stock thickness. If this be done with the paper measurement, the band will be of proper diameter. Where great exactness is required, the thickness of the paper strip should be taken into account, but it can be neglected in this rough bit of work."

"But how about the other two lengths, found with string and leather? You can't say they are both right can you?"

"Sure, Son. They are both right. If you make a band of 3/32 inch steel, the string measurement of 8 17/32 inches will be right, with a bit added perhaps, for weld take-up. But if you make the band of 3/16 inch steel, then the leather measurement will be O. K., and 8 27/32 inches is right for that thickness of steel. So you see, Son, if you could make band measurements with a piece of leather same thickness as the steel to be used, then there would be no length additions to be made for take-up, save that necessary for the weld."

"If you are expert enough to make the weld without a particle of loss by burning, and you hammer the weld to exactly the thickness of the rest of the band, then no weld addition of metal will be necessary. But it is better to allow a little, an eighth or three-sixteenths inch; then leave the weld a bit too thick and you will have a bit of leeway to 'go and come' upon if the band should be found a trifle too small."

The Amount of Shrink

"Will you tell us, Suh, how much allowance to make for shrink in that band, how much smaller than 2⅝ inches should it be when

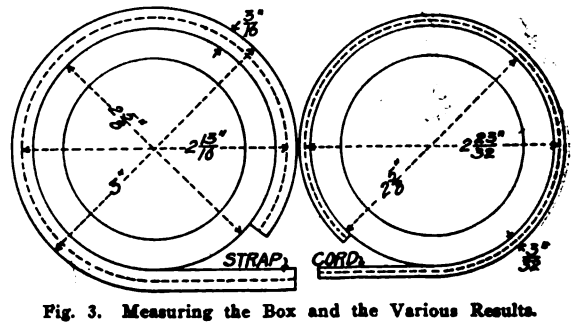


Fig. 3. Measuring the Box and the Various Results.

cold in order to have it hold tightly by shrinkage?"

"But very little shrinkage will be required, Sir. If the band be made just small enough that it cannot be driven into place cold, it will probably be found about right when heated and driven in place. Probably not more than 1/32 inch of length should be taken out for shrink. More than that will put great stress upon the box and the band."

"How much does steel expand when heated, Suh? Perhaps you can tell us some way of reckoning it, so we can tell how hot to heat a band or a tire?"

"Sure, ordinary soft steel such as you use for bands will stretch about .0000065 its length for each degree its heated (Fahrenheit scale.) So, if you heat it 500 degrees, or about to the temperature of melted lead, a piece of steel will stretch .00325 of its

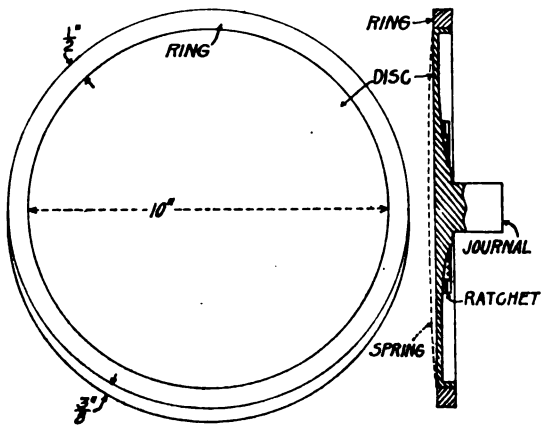


Fig. 4. Effect of Excessive Shrink.

length, which means that a bar 100 inches long would expand .325 inch or a trifle more than 5/16. From this, it can be roughly figured that the eight inches of metal in the band would expand about 1/12 of the stated amount, or about 1/40 inch. This would mean that the diameter of the band will be increased about 1/125 inch by heating the band 500 degrees."

Effect of Excessive Shrink

"Just what happens when too much shrink is given?" asked the Smith. "I know that I nearly spoiled a wheel one time. It took so much dish that it wouldn't match the other rear wheel at all and when that axle was set, we had to give it a different angle from the other end, and then, the top of the too-dished wheel hung out so far as to look bad and awkward."

"But it was not the shrinkage of the tire which dished the wheel too much and caused the trouble, Sir. It was caused by your cutting a bit too much wood out of the felloes, causing the spokes to bend in order to let the felloes come together. There is not much danger of setting a tire too tight, but it should be remembered that there is a length of 12 feet more or less in an ordinary tire and that heating it 500 degrees will expand the steel a good deal."

Over-Shrinking A Ring

That a good deal of judgment—genuine "horse-sense" is necessary when determining the amount to be allowed for contraction, was made evident by a small job which I recently saw done in a small shop not over 200 miles from Tampa, Florida. A printer had occasion to "stretch" his printing press to the limit and found that were the ink-distributing disc an inch larger in diameter then he could print the required size of form.

The 10-inch cast iron disc was taken to the smith shop with request that a steel ring, one-half inch wide and three-eighths deep be shrunk around the disc with the upper edges of disc and ring flush with each other. In order to "make a good tight job" as the smith expressed himself, he made the ring small enough so as to give it nearly 3/32 inch "draft." That is, the ring was welded up 3/32 inch smaller inside diameter than that of the disc.

The smith had to heat the ring to a bright red heat before he could coax it over the edge of the disc and he had to work very lively in order to get the ring placed fair with the disc before it became too cold to be moved. But it was managed and set aside to cool. When the smith went to file the face of the ring a bit, he found the disc had "humped-up" in the center all of one-eighth inch higher than at the edges and along the ring. (Fig. 4.)

The printer could not use the disc in that condition as the ink rolls would be lifted from the edges of the disc by the high spot in the middle. The Smith was unable to remove the ring by driving it off for it was so tightly affixed that he was sure to break the disc while driving off the ring.

Finally the ring was removed by making a hack saw cut through it and as soon as the cut had reached within a sixteenth inch of the disc, the ring cracked apart with a pop like a gun and the hack saw cut sprung open a sixteenth of an inch, and remained thus, still clinging fast to the edges of the disc.

Stretching a Ring

The ring was re-welded and made larger in diameter. Extra metal was inserted in a very ingenious way, something as shown in Fig. 5, in which a peculiar shaped bit of metal is shown hooked fast in the joint of the ring. The sawed-off ends were sprung apart and chamfered or bevelled on a corner of the anvil, then a bit of soft steel about 1/8 inch thick was bent over at either end and slipped into the joint where it was supported by the ends of the ring which in turn held fast the bent-over "dutchman" which was then heated and welded into the ring and flatted down flush therewith until the required increase in diameter had been made, a little less than 1/16 inch smaller than the diameter of the disc. This time, the ring remained in place but the disc did not "hump-up" in the middle, showing that very little shrinkage is necessary in small shapes.

REPAIRING WORN VALVE SEATS

(*Continued from page* 9)

also set his regulator valves and made certain there was sufficient welding gas to finish the job. All of these little details count for so much in any good job of welding.

A number six tip was chosen with the regulator set at seven pounds. Quarter inch gray cast iron rods were selected and conveniently arranged for filler metal. The flux pot was replenished with cast iron flux powder.

A larger tip would have made a flame too hard to control and therefore liable to produce a burned weld, brittle and dirty. While a small tip would have caused trouble in keeping heat enough supplied to replace that lost by radiation and conduction. It would also have tended to produce a hard spotted weld; probably poorly connected to the seat metal. The casting metal would draw the heat away so rapidly the welder could not keep the casting melted and also melt the filler rod. Therefore a medium size tip was selected as a happy, half-way ground.

A rod a quarter of an inch in diameter was selected because a larger one would supply too much metal and would require so much of the welding flame heat that there would not be heat enough left to keep the casting metal sufficiently molten to receive the filler. A smaller road would have caused danger of burning both the filler and seat metals. The weld space being so narrow around the seat the welder could scarcely take advantage of flame manipulation to overcome the other difficulties.

A cast iron rod was chosen because that is the proper rod on nearly all cylinder jobs except brazing. Like filler metal should be applied to every job where possible. There is then no difference in melting points with which to contend and the knitting together of the metals is easier.

The flux powder selected for this job was factory mixed for use expressly on cast iron, intended to make the metal more fluid to float any slag formation. It was used also as a protection against oxygen of the atmosphere and the welding flame. When applied to the weld it would melt and spread out over the molten metal to keep it from oxidizing.

When the cylinder head was hot enough to commence to weld, a piece of sheet iron was placed around it to afford some protection to the torch operator. The preheater was permitted to continue burning during the entire operation of building up all of the worn seats. This was to eliminate any chance of unequal expansion and contraction. This heat condition is difficult to put into words. It might be fitting to say that it was not red hot but still very hot. Hot enough so that its radiation could be intensely felt a couple of feet from the casting.

The torch flame was ignited by holding the tip close to the heated casting and turning on the acetylene first so it flared until the smoky edge no longer showed. Then the oxygen valve was opened a little. Then the oxygen and acetylene were manipulated alternately until the white flame in the center formed a clear blunt cone or pencil of white. This is the standard neutral welding flame.

Such a flame is best for castiron welding as then there is less danger of burning or oxidizing the melting metal, that is, to turn it to a porous brittle stuff. With the neutral flame there is less danger of hardening or carbonizing the metal. Not only should the welding flame be strictly neutral at the start but it should be continually watched and tested to keep it neutral. A hot job often causes the torch itself to expand which influences the flame condition. Then too the gases expand in passing through a heated torch; this also causes slight changes in the flame adjustment. Other things affect it which are needless to mention since the novice is particularly cautioned to watch the flame and to test it at frequent intervals during a long hot job.

When at last everything was in readiness the neutral flame was applied to one of the worn seats, where it was played around the ring until it burned the metal red hot. Then the tip of the flame was concentrated over about an inch of the worn part. Here it revolved in tiny circles until the iron beneath it commenced to whiten and show indications of fluidity. Meanwhile the filler rod was dipped in the flux and brought close to the flame. Then as the seat metal melted the heated rod was brought in contact. The flame played over half an inch of the rod in conjunction with the melting of the seat metal. The melting of both were timed so the melting rod was ready to be deposited the moment a spot on the seat was molten ready to receive it.

Then the flame was gradually moved to

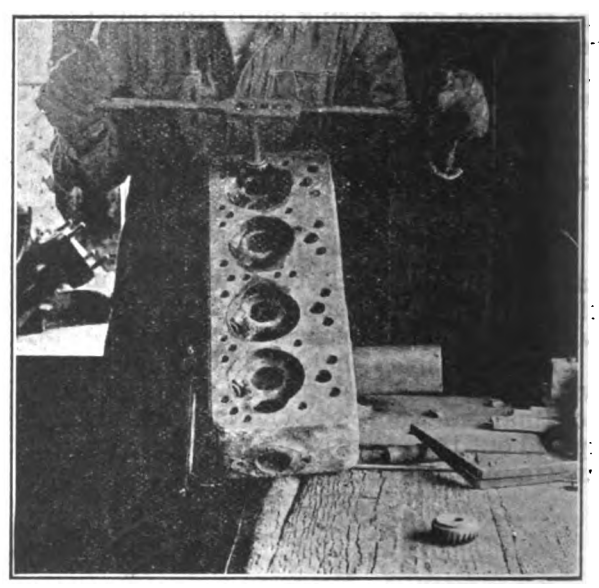


Fig. 3. Dressing the New Seats with a Hand Reamer.

another section of the seat ring, melting this portion as it moved. The rod was closely following, continually feeding into the melting seat metal, raising its fluid surface about a quarter of an inch. At no time was the filler permitted to drip into the weld but was literally twisted beneath the molten surface.

Thus the seat was covered with a layer of metal in a continuation of meltings, each one of which was joined and blended thoroughly with the preceding section. At these

intervals the heated end of the filler rod was dipped into the flux pot to immediately return with a quantity of the powder to the molten weld.

Thus the entire process was applied twice around the first valve seat without removing the flame. Then the second, followed by the rest of the seats, was treated in a like manner. By the time each filling was complete its color and temperature had receded to that of the surrounding casting. So that by the time the last seat was built up the whole job was at a balanced state of expansion ready for cooling.

The cooling was achieved by covering the entire cylinder head with a pile of scrap asbestos paper. This covering forced the job to cool very slowly, thereby causing the contraction to act slowly and evenly. The gas preheater was allowed to burn until the job was entirely covered with the asbestos. Then it was turned off and the fire permitted to die normally.

The covering held a heated space around the casting by retarding radiation. This retarded radiation held the conduction back so that the heat passed from thick to thin portions gradually. The heat was then gradually passed to the air beneath the asbestos. From where it filtered slowly to the outside air. This promoted slow cooling which caused slow contraction. The whole thing contracted practically at one time with no cross-pulls in any direction.

The cooling process required perhaps an hour, so the job was left under cover that long. When it would no longer burn the bare hand it was removed and made ready to grind new valve seats in the added metal. Fig. 2 shows the casting covered with asbestos scrap ready for cooling.

Fig. 3 shows the built up valve seats ready for "machining." Which was done by hand with the reamers shown in this picture. This is a slow tedious process and should clearly prove to the welder that it is best to appy clean soft filler metal. Hard, or spotted, metal would be most impossible to cut.

A Tire Heating Furnace

From F. H. McCaffery, Ohio.—I wish that some of my brother smiths would write a letter about making a tire heating furnace. I would like to know how to build one but don't know how to go about it.

I would like to heat the tires while they are lying flat. I would like to make one of the low kind and use a regular blower for the blast.

I would also like to hear from my brother smiths about the use of kerosene as fuel for gasoline engines.

A Number of Questions

From Wm. Olsen, South Dakota: Will someone tell me what kind of a plow frame is the best to use for dipping the lays in water so they won't shrink crooked.

I have noticed that when I temper some of my plow lays there are a lot of little white spots in the metal after they are finished, what causes these spots?

How big a tank should I use for quenching plow lays? What kind of stuff shall I put in the water?

Copper Finish for Ironwork

BY ARTHUR W. JORDAN

ALTHOUGH to the writer's mind bright or polished ironwork is a beautiful color, an opinion which doubtless many share, it is generally a very transient finish unless frequently cleaned, for the disfiguring rust soon appears and the pleasant silvery grey color is soon covered by red corrosion. Of course, it is possible by the use of a colorless acquer to arrest this disappearance of the natural beauty of the iron for some time, and if the coating is renewed from time to time to prevent it indefinitely.

Many small iron articles are put on the market with a copper or bronzed surface and doubtless most blacksmiths have jobs to which they could apply such a finish. Often they have no idea how this is obtained, and think it is by a process too complicated for them and too far removed from their line of business. Whether that is so will be best judged after reading this article, in which it is proposed to tell of the simple way the finish is obtained. Whether the very inexpensive plant necessary is worth installing depends on the use that can be made of it.

Now, it is not pretended that this mode of finishing iron will prevent rust, nothing will do that for all time although the Bower Barff process will perhaps be as good as anything to delay it longer than most other means will. But a copper or bronze finish will help to put off the evil and if lacquered will do so for a considerable time. But it is as a change of color or to match something else, that the coppering may be desired and therein may be the value of the process to the smith who has to do many odd jobs.

In the first place, to get the full value of this finish, it is necessary after the article has been made that it be polished. This does not necessarily mean a higher brilliant polish. A surface bright enough in many cases can be obtained by grinding on an emery disc, or if handwork alone is available, after finishing with a smooth file, a rub over of a coarse, and then a very fine emery may suffice. This duller polish resulting from the use of finest emery is preferred by many to the more brilliant finish got by machine hobs, mops and lime, so the matter need not worry the smith who has only his hands and a couple of sheets of emery cloth to depend on.

Having got the ironwork as bright as desired the smith will naturally think it is clean enough for anything. Here is just one of the little pitfalls the smith is most likely to walk straight into, and if he does he is going to spoil his job at once. No matter how alluringly clean the finished ironwork may look to the interested eye of the man who fashioned it, for the purpose of this process it has to be got absolutely clean, in fact chemically clean.

To make it so is not difficult. All that is necessary is to dissolve half a pound of potash, or three quarts of soda, in half a gallon of water, to do which it should be brought to boiling point. Then put the ironwork in, suspended on a wire. Tie a bit of old bagging tightly round the end of a stick and scrub the ironwork well, with it, especially in the greasy parts. When clean enough rinse in cold water and hold up for examination. If there are any spots or patches on the surface where the water runs off they mean trouble if not tackled at once. They are grease spots, perhaps only finger marks but with handsful of trouble in each, if neglected. Give them a good scouring with the bit of old bagging, after again dipping in the boiling potash.

If, on rinsing in clean water again, the water finds the entire surface covered evenly, all is right, but there must be complete certainty about this and the article must on no account be touch by the fingers again, however clean they may be. This cleaning job is really the most important and exacting part of the whole process, so do not rush it.

Although not absolutely necessary, it is a good thing to pass the ironwork through a very weak dip, made by adding one part of hydrochloric, or sulphuric acid to thirty parts of water. After a mere dip in this and a thorough rinsing in clean water it is ready for the coppering bath. Before going on to this, just a word about this rinsing. Providing the iron is a plain piece of solid metal the job of rinsing is of the simplest, and may be dismissed at that. If there are any hollow parts, however, it is quite another matter. In such a case, take some little pains to see the hollows are run free of any potash or acid that may linger there, and that such parts are well washed out by the clear water before transferring to the coppering bath.

This bath is not difficult to make up, and it costs only a trifle. Keep it covered up when not in use, so as to prevent it from getting dirty and this is very important. There are several recipes for these baths, but here is that of one which is about the best. Dissolve three ounces of sulphate of copper in one pint of boiling water and add it to seven gallons of cold water when all melted. Then dissolve six ounces of cream of tartar in the same way and add it to the larger solution.

Having got the iron article perfectly clean, as described before place after careful rinsing, in this bath, suspended by the wire from a rod or stick. The solution should be kept in a vessel of earthenware, never in a metal one. Leave in the solution until uniformly covered with copper, which unlike that deposited from some baths will adhere well although it will be slower in the process. It can be hastened by increasing the amount of copper sulphate but this is not advised as the deposited metal will probably be less strongly adherent.

If properly prepared before hand the iron should now leave the bath, after immersion for about half an hour, brightly coated with copper of good color. It must not be expected that this thin deposit will stand much wear, but given a coating of lacquer or varnish it will last a long time, if the article is more for appearance than wear. A hard celluloid lacquer is best for this purpose. When taken from the bath, rinse the ironwork in clean water and dry out, rubbing out any stains with a soft leather or cloth very lightly.

Having got the copper on the ironwork, it may be desired to bronze it. This is done by immersing the article in a solution of four ounces of hydrosulphide of ammonia in one gallon of water. This should be brought to a heat of 170° F. Keep the article in until the right depth of color is reached, then rinse in clean water and dry out.

The ironwork will now be of a dark brown to black color, and it will be desired to relieve it in parts and to show the copper beneath. To do this take a soft leather and a little lime, very fine rottenstone, crocus, or double washed finest emery. Dip the leather in either of these fine abrasives and go over the most prominent or raised parts, rubbing very carefully and lightly. Remember the copper is very thin and too much energy may rub through it.

This relieving can best be done on a lathe with a soft mop and one of the polish—abrasives mentioned. Just lightly touching the parts to be relieved is usually quite sufficient to bare the copper, and if judiciously done, the appearance of the article is much improved. When finished it should be lacquered with lacquer of good quality as it is poor economy to try and save on this, especially if the ironwork is exposed afterwards to the elements.

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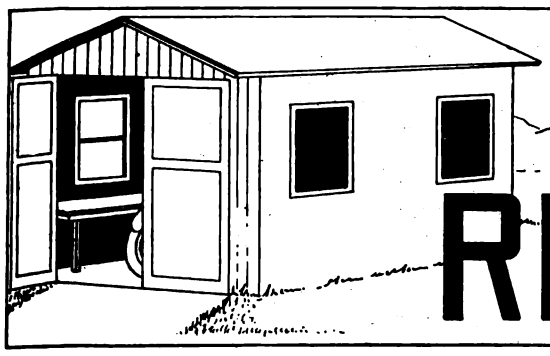
Vol. LXXXIV. No. 5 NOVEMBER, 1921 TERMS ONE DOLLAR A YEAR



OUR OWN REPAIR SHOP

THE BLACKSMITH who is contemplating the enlargment of his regular business and intends to go into the automobile repair business, as well as the smith who cannot find work enough in his own line to keep him busy and wishes to make a similar business venture, is confronted with a big problem. He may know the smithing and wheelwright business thoroughly, but when it comes to automobile work he is venturing upon an unknown proposition.

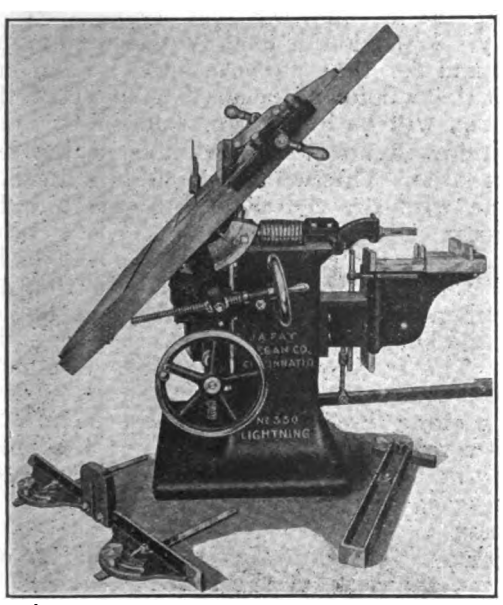
Unfortunately, though there are many books and many magazines devoted to automobile work, there is none which can be singled out as being based upon a sound, mechanical foundation. Theoretical knowledge is all right in its way and without we would be lost, but it has its limitations. Practical knowledge, the kind which can only be secured through actual exeperience, is what we are all eager to acquire.

It is true that Experience is the best teacher, but her prices for tuition are high. All of us cannot pay her price and unless we can profit by her lessons taught to others, we must go without.

In order that we may be in a position to help our readers in practical ways as well as through theoretical articles we decided some time ago to install a repair shop of our own. We went into this venture with the idea of gaining practical knowledge of all the problems which vex the would-be automobile repair man.

If you are interested in this phase of the work, and you should surely be interested for your own satisfaction, you will do well to follow up our magazine and this particular department.

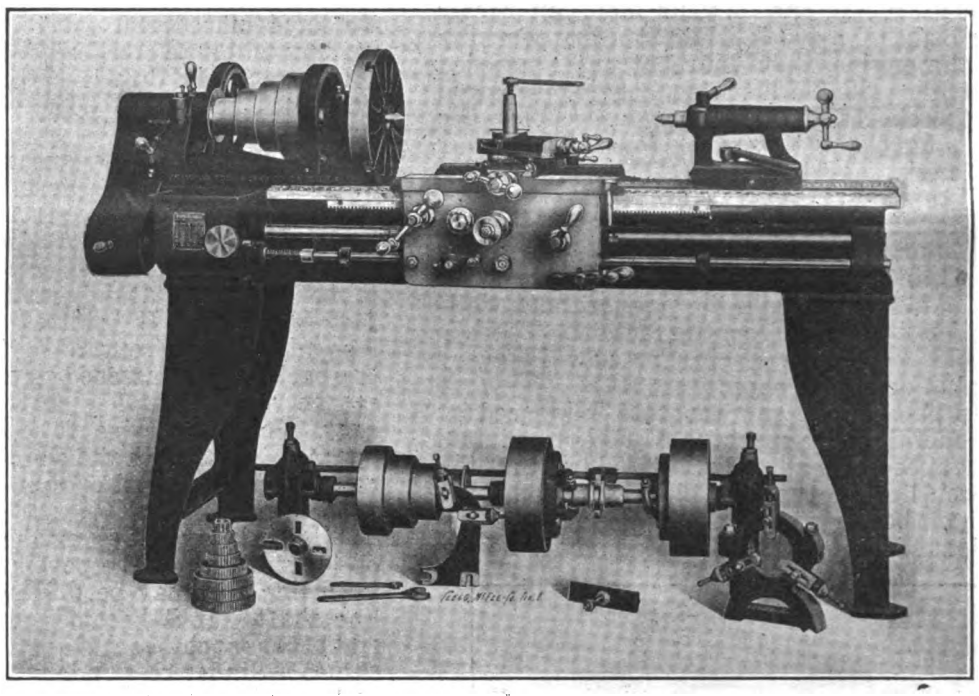
In introducing our shop to our readers we want to make one thing clear, we do not claim that it is complete at the present time. As time passes it is our purpose to add to our equipment and with each addition we know that our magazine will be benefited.



Number 330 Lightning Variety Saw Made by J. A. Fay & Egan Co. of Cincinnati, Ohio.

Those of our readers who are interested in tools and machinery will do well to follow the series of articles devoted to the equipment in our mechanical department. Bear in mind that from the beginning to the end we will base the articles upon theory and build them upon practical experience. We will not tell you what we *think* might happen or how we *judge* an operation *should* turn out; our articles will be in the nature of reports of actual mechanical operations, correct both theoretically and practically.

The installation of the machinery presented the first problem and since it is a vital one it will be discussed at some length. The construction of the shop itself, or the adaptation of the shop already built to the equipment, is just as important and deserves earnest thought. In presenting the lay-out of our shop to you we do so with the statement that the location of every window and the placing of every machine has been carefully considered.



The Champion, 12-Inch, Six-Foot, Screw Cutting, Engine Lathe. Made by the Champion Tool Works of Cincinnati, Ohio.

For a single-man shop, or a small shop in which but one machine of each type is needed, the dimensions may be limited to a floor area measuring 25 by 30 feet. We would not recommend a shop of less than 30 feet in length, but if the width is at least 15 feet it will be sufficient. We consider that 25 by 30 foot dimensions as being nearly ideal for a small shop.

The location of the windows and doors will be taken up after the installation has been discussed. By referring to the plan given herewith it will be noted that the general arrangement of the machinery and benches is in the form of the letter "L." The important machines, those requiring the most light, are along the 30 foot side of the shop. The work and tool benches are at the end. Various factors enter into the placing of the machines and the points involved will be taken up in due course. A space of approximately 12 x 20 feet is available for an assembly floor, and this space is so marked on the accompanying plan.

Placing the Lathe

In placing the lathe we had in mind the fact that this machine was the one most in use. Simply by virtue of its manifold uses this machine should be placed in the most accessible space. The matter of illumination is important, as well, and therefore there is but one place for the lathe, in a corner with its tail toward a window.

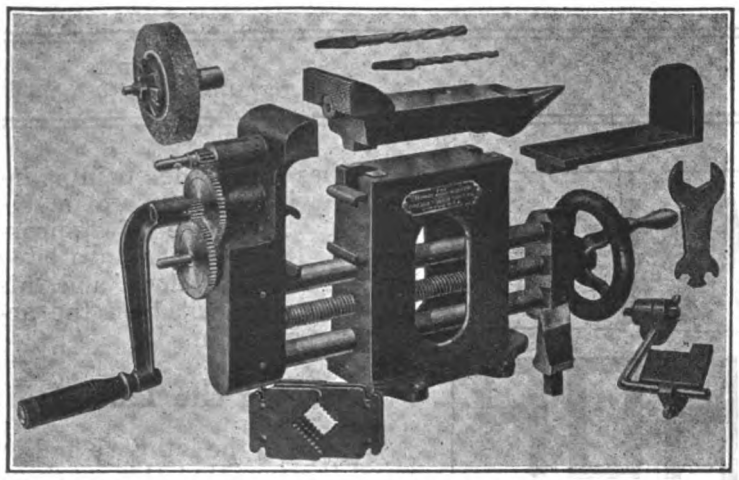
A clearance of at least 18 inches should be allowed at the back of the lathe, more would be unnecessary, less would be a handicap. It often happens that one must walk behind this machine to make an adjustment; it often happens that two people are required to lift a job into place and therefore the 18 inch clearance at the back.

The countershaft for the lathe should be located as nearly against the wall as possible, first because it will mean maximum belt length and tend to make for a more positive drive and second, because a slight slant to the belt is advisable. If the ceiling is low, then it is all the more reason for placing the countershaft at the rear where it will not limit the head room.

If, as in our case, there is no crowding of the machinery, it is well to leave a space of two feet at the tail between the lathe and the end wall. It often happens that one wishes to face off a rear axle housing or do a job of a similar nature and unless there is room at the tail of the lathe, for clearance, the job cannot be done. A 24-inch space can be utilized, if necessary, for the setting up of a "dummy" tail center where the work is too long for setting up in the ordinary way. We cannot see any reason why the space should be greater if the machine is used for automobile repairs only.

We feel that no argument is needed to convince the repair man that a lathe is necessary equipment for automobile repair work. That the lathe is essentially necessary, is an axiom. You cannot expect to do even ordinary repairs without a lathe any more than you can build a house without a hammer.

The next tool which we consider may require a word of explanation for its installation in our shop, we speak of our "Variety Saw." In installing this tool we had in mind the fact that there are thousands of shops in the country located in farming districts where harvester and tractor work is general. We consider the circular saw, of the type we have, to be indispensable in such a class of repair work.



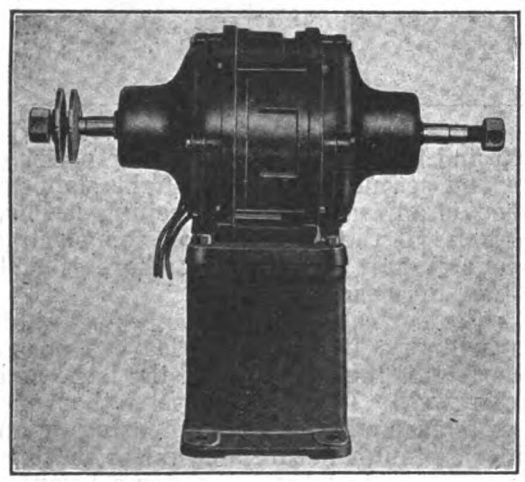
The "Stewart Handy Worker" Made by the Chicago Flexible Shaft Co., of Chicago, Ill.

The Circular Saw

Once you have installed a saw you will wonder how you managed to get along without one in the business. Instead of running your shop on a losing basis during the dull times of the year you will find that you can manage to utilize every working day. You will soon find that your patrons are growing in number because they realize that you can do body work as well as the mere mechanical adjusting. If one of your men can repair the body of a truck while you are working on the engine, then your patron is satisfied that his valuable machine is being repaired in the shortest space of time possible. He don't have to wait a week for you to repair the engine and then a second week for some body maker to repair the body.

The variety of uses of this machine are in its favor. If your patron is in a hurry for a certain part it is possible for you to make the pattern and build the part without waiting for it to come from the factory. There is ample reason for a circular saw in every garage or repair shop.

In placing our saw we were influenced by the fact that this machine requires maximum clearance from all walls. It follows that the center line of the saw blade should be far enough beyond the front of the lathe to permit sawing a 12-inch plank and as nearly central as possible in regard to the length of the shop. For practical purposes it is not considered advisable to bring the saw to the center of the shop as regards width because such a location would limit the working space of the assembly floor.



The Valley Electric Motor-Grinder Made by Valley Electric Co. of St. Louis, Mo.

We located our saw three feet from the wall and the saw table is approximately three feet square which means that the saw blade itself is about 4½ feet from the side wall. The inside edge of the table is 2 feet from the end of the lathe which brings the center of the saw approximately 12 feet from one end wall and 13 feet from the other; as near central as practical without wasting space.

The objection which might be brought up relative to the fact that 4½ feet from the side wall limits the saw to cutting-off lengths of that amount or less will be answered later in this article.

Since the clearance for the saw, at the back, is three feet it is permissible to locate the next machine, the drill press, fairly close to the wall. A space of two feet is left between the saw table and the base of the drill press and the latter is placed one foot from the wall. The post of the drill really limits the range of that machine at the rear and it might be argued that the drill could be set against the wall without impairing its usefulness.

To a certain extent this is true, but one must not forget that there are many automobile units which have "over-hanging" members. We have in mind the front and rear braces of the frame, for instance. If it were necessary to drill into either of these braces the job could not be accomplished were the drill placed against the wall. If, on the other hand, the drill is brought out further from the wall there is danger that the work will be limited because of its confliction with the supporting column of the saw. Taking all things into consideration we feel that we have placed the drill in an ideal location for general work.

The Work-Bench

Four feet further along on this wall we have placed the work-bench. Our readers will note our designation of this bench as being different from that of the bench next to it. The work-bench, as the name indicates is used purely for handling of work, and not for the storage of tools. The bench should be kept clean, at all times, from tools not being used for the job in hand. This bench is made of two-inch oak planks; it measures two feet in width and six feet in length. It is fitted with three legs along the front and three along the back. It is fastened to the wall but can be removed and relocated if necessary. It is not wise to build such a bench integral with the shop simply because additional tool equipment may be needed in its place.

With this lay-out along the front side of the shop, all of the power machinery is in line and may be driven from one line shaft. If it becomes necessary to add other machines such as milling machines, cylinder re-grinders or re-borers and so on, they may be placed either along the wall and in place of the work-bench or away from the wall and in line with the rear of the saw bench. Any low machine which does not conflict with the saw bench may be placed in line with that machine.

The Tool-Bench

The tool-bench may be built integral with the shop. Our bench is eight feet in length by three in depth. Cupboards, shelves and receptacles for small tools are located on the wall at the back of the bench. Since the bench is merely for the display and storage of the tools and for the holding of tools when they are being used from time to time for work on the work-bench, there is no necessity for special lighting. On the other hand, a good, clean wall space is necessary. Have a place for every small tool and keep the tools in place except when in immediate use.

In the writer's experience, which covers some 15 years of machine shop and laboratory work he has found that the rule stated in the foregoing paragraph is an excellent one. Before starting each new job put *all* of the tools in place and you will save time.

Place the tool bench as near to the work-bench as practical, bearing in mind the fact that you will need at least two feet clearance. Also bear in mind the fact that the end of the bench should not conflict with long boards which may be ripped in the saw. In our case the bench is located five feet from the front wall.

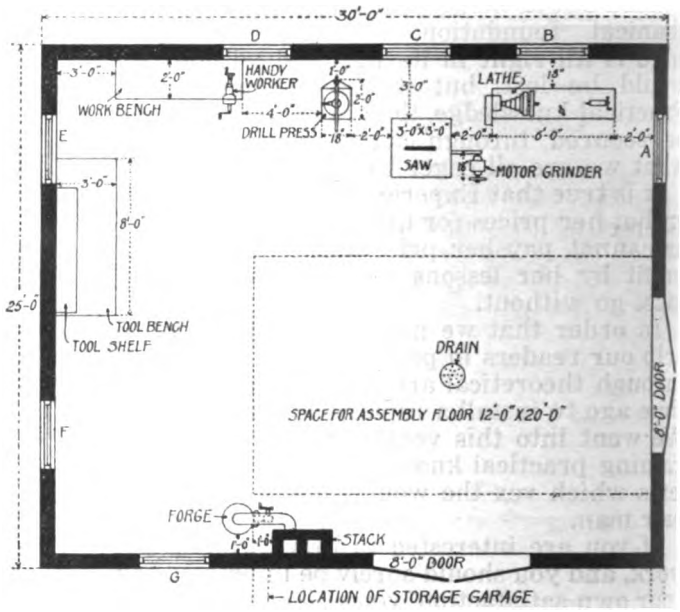
The location of the forge depends entirely upon the location of the stack. It is our suggestion that the stack be located 12 feet from the end wall as shown in our plan and the forge will then come in the location shown. Experiment has shown us that the forge should be placed as near to the stack as possible. We have also found that the best draught is obtained if the forge smoke-stack leads into the big stack high up on the latter. At any rate the forge smoke-stack should not have a right-angle bend in it as we know much to our sorrow after working with tearful eyes in a smoke laden atmosphere.

We consider the forge to be an essential unit of the repair shop. The forge has many uses, not only for tool making processes but also for mending frame members and the like.

The placing of the vise, which in our case is an all-around machine, the Stewart Handy Worker, was a problem. We considered placing it upon the end of the tool-bench and by so doing bringing it nearer to the forge but finally compromised by placing it upon the work-bench, at the right-hand end. We have found that it is near enough to the forge for practical work and being on the work-bench, has a heavy foundation.

Windows and Doors

The matter of locating windows and doors is extremely important, not only from the standpoint of lighting but from that of utility. A window is usually placed to admit light and for that purpose only, but in our plans the windows are used as part of the shop, as will be hereafter seen.



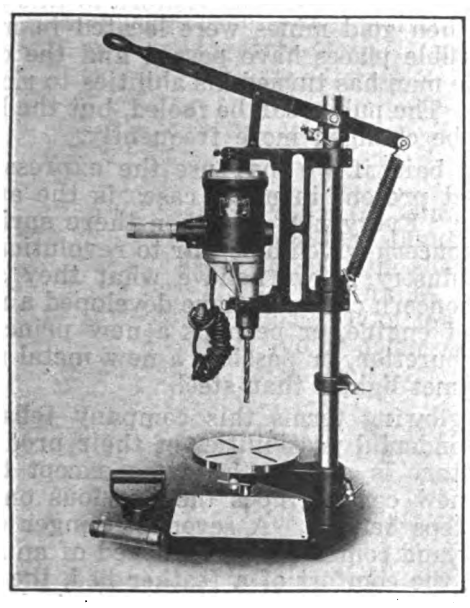
Plan of Our Shop Showing Location of the Various Tools Described in This Article.

Window A on our diagram is at the tail of the lathe. This window should be directly in line with the center of the saw and its sill must not be higher than the saw table when the latter is at its lowest point. The same holds true of window E. By this arrangement a board or plank much longer than the shop itself can be run through the saw. The front edge of window A should not be nearer the front wall than a line drawn along the front way of the lathe. In other words the wall at the tail of the lathe should be unbroken to form a solid base for the rigging of a dummy tail on the lathe if necessary.

Window B should be so located as to illumine the head of the lathe. The sill to this window should not be higher than the lathe bed. If this sill can be placed exactly level with the lathe bed, then the combination is ideal. Long pieces can be extended through the window.

Window C should be located with its

center on a line with the center of the saw. The sill should be even with the lowest saw table position. This window should be at least three feet in width and serves to illumine the drill press as well as to admit long boards to the saw.



Drill Press with Portable Drill Made by Standard Electric Tool Co., of Cincinnati, Ohio.

For appearance's sake the sill and size of window D should be the same as that of window B. It should be located so as to light the drill press from that side and the work bench. If this window is extended beyond the edge of the vise, so much the better.

The edge of window E should come to the end of the tool-bench and its height has been mentioned previously. Windows F and G are merely for illumination and should be placed for this purpose.

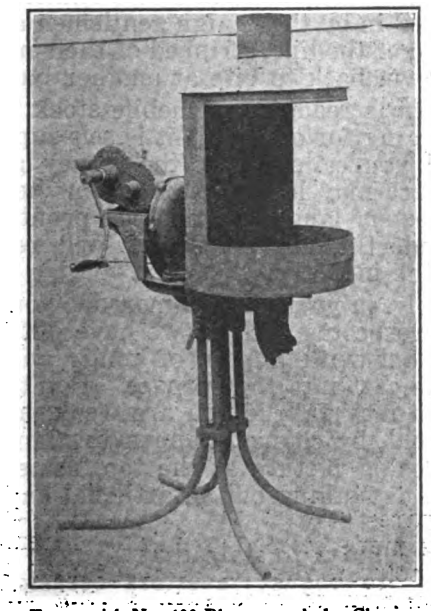
One large double door, wide enough for admitting the widest truck is located directly in front of the assembly floor.

Location of the Stock

We spoke about the location of the stack and a further word might be helpful if one is erecting the building. With the stack as shown there is opportunity to use it for carrying off the smoke from the heater, should such a device be installed in an adjoining storage shed.

For the man who is constructing such a building we suggest that he consider the location of the storage department upon the side which we have indicated.

The matter of power is one to which we have given much thought. As we have said, the placing of the machines has an important bearing on this subject. The owner has a choice of driving each machine by an individual motor or installing one large motor or a medium sized motor for driving one machine only at a time.



Forge with No. 400 Blower made by Champion Blower & Forge Co. of Lancaster, Pa.

In our shop we decided to adopt the most economical method of all, of installing a small motor which could be used as a grinder or buffer and using its power to drive any one of the machines.

Unfortunately no electric power line is available to our shop and we were forced to use the lighting circuit. Under these conditions we were limited to the use of a ½ H. P. motor and though this motor is theoretically inadequate for the purpose of driving the average shop it answers our purpose. The reader must understand that with this small amount of power we can drive but one machine at a time and that machine cannot be operated to its full capacity. We have found that a motor of two horse power is satisfactory and that a three-horsepower motor is more nearly the ideal.

Whatever the size, however, the placing of it, as shown in our diagram is the most satisfactory. Our motor runs at 1800 R. P. M., an ideal speed for the purpose, and drives the saw directly by a belt. One end of the motor shaft is fitted with a pulley, the other with a grinding wheel. The latter may be removed and a buffer, or other device attached in its place.

The main driving shaft may be placed directly over the pulley on the motor and fitted with two or more pulleys of different sizes for driving the lathe, the drill press or other machines. When the saw is in use the belt to the main shaft is removed and the saw belt substituted. In a later article we will explain more fully our plans for a variable speed transmission system for our shop.

The various machines in our shop will be fully described in this magazine in succeeding issues. For our equipment we are under obligations to the following manufacturers:

12-inch lathe—Champion Tool Works, Cincinnati, Ohio.

Variety Saw—J. A. Fay & Egan Co., Cincinnati, Ohio.

Drill Press—Standard Electric Tool Co., Cincinnati, Ohio.

Motor Grinder—Valley Electric Company, St. Louis, Missouri.

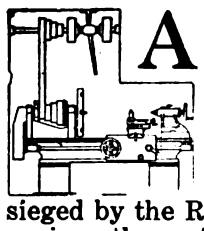
Forge—Champion Blower & Forge Co., Lancaster, Pa.

Vise and Handy Worker—Chicago Flexible Shaft Co., Chicago, Ill.

These six machines are illustrated herewith. Our small-tool equipment will be considered in a special article.

Practical Horseshoeing

Description of Iron Shoes and Sandals Used in the Early Days of Civilization



A VETERINARY-SURGEON by the name of Mathieu reported still other shoes which have closer resemblances to our modern horseshoe. Alesia was an ancient French town which was besieged by the Romans about 52 B.C. In this region, the natives of the country fled towards Mendon through the Sevres Valley after suffering defeat at the hands of Labienus, the famous lieutenant commander under Julius Cæsar. In 1871, excavations were being made on the occasion of erecting some new buildings at the Sevres porcelain factory. Mathieu hoped to find horse-shoes here and so at his suggestion careful excavations were made. The search resulted successfully, for at a depth of about nine feet shoes were found.

Altogether, it seems fairly clear that nailed-on shoes were in use in Gaul (France) before the Romans completed the subjugation of the country. These early Frenchmen, the Gauls, are to be regarded as the first known users of the nailed-on shoe. No clips were in use, and the nails were simply turned over. Apparently, the hoof was not pared.

Between the time when the Romans conquered Gaul—say, the middle of the 1st century B. C.—and the fall of the Empire in 476 A. D., other horse-shoes were in existence. This is known from the fact that examples have been found in considerable numbers in the ruins of buildings. Some at least were found in association with coins and weapons. Such examples may be found in principal museums of Germany, France, Belgium and England. These shoes are a good deal like those belonging to Celtic times. Thus, the shoe shows bulges at the locations of the nail-holes. On the other hand, they are of larger size and weigh more. In fact, the weights run around six and nine ounces. Does this mean that the breeds of horses were undergoing improvement? or that heavier and bigger horses were now being chosen? The nails are regularly four-sided, and the heads are smaller. The points were left uncut. They were simply folded over on the horn. This folding over was simply a single bend or else ringed. The clinching was incomplete. It resembled what is practised today by Eastern peoples and by certain wandering tribes. Shoes found in Switzerland, Germany and Belgium are usually distinctly fullered and have six or eight nail-holes. The toe is wide. Some shoes have narrow and thick heels. Even calkins have been found on some of the shoes, and sometimes a toe-piece.

There was in ancient times a Germanic tribe known as the *Alemanni*. Hassler is said to have examined certain graves of pre-Christian Alemanni, and to have found one in which were remains of weapons, and near

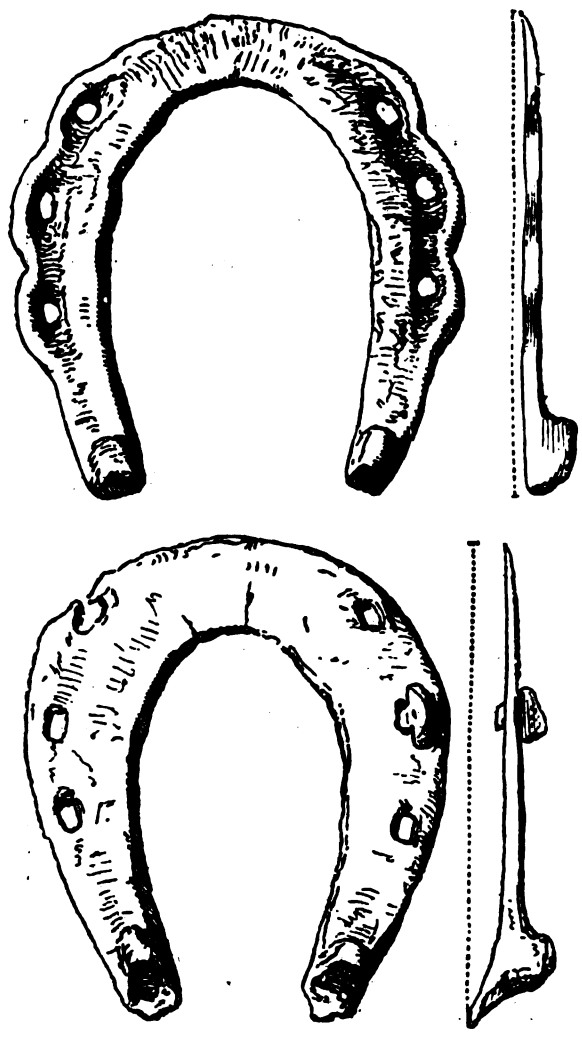


Fig. 1. Shoes of the 13th Century Found in Excavations at Borna.

by a horse-shoe which resembled other horse-shoes found elsewhere in the same general region. It has a broad toe, three nail holes and square or rectangular calkins. The graves have been assigned to the period comprising the third and fourth centuries.

Altogether, it seems quite probable that amongst *some* of the old nations of Europe the white line was known and understood.

That nailed-on horse-shoes date from an early time has already been indicated as very

(*Continued on Page* 11)

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Our Editor's Letter

FOR the past two or three years I have made it a habit to write an Editorial for our November magazine concerning the market situation. I'm not sure that the Editorials have always been printed in the November issue because I might wish to get the thing in ahead of time, or sometimes hold it. But my idea is to start the Winter season with a word of advice.

From the letters which I am receiving from the readers of this paper I judge that the question of buying supplies is a difficult one to decide at this time, many of you have held off and find your stocks greatly limited.

The indications are that there will soon be a big business boom and if we can rely upon past experience we may expect that business will revive very suddenly. The prices on commodities have dropped steadily for the past six months and many of us feel that they will continue to drop. Those who feel this way overlook the fact that there is a bottom to everything.

As blacksmiths and metal workers we are interested in three products, iron, steel and fuel and it is about these things I would write.

I feel that the iron and steel market is at its lowest point and that any change in price will be upward rather than downward. Even if there is a slight downward drop it will not be for long or be far. For this reason the smith wil make no mistake in buying a fairly reasonable supply of iron or steel to carry him through the Winter. The chance that the cost will go up is a large one; the chance that it will go down is very small. If the smith buys now he can feel fairly sure that he is adopting the safest plan.

The U. S. Steel Company has recently announced an increase in the price of one of their lines, probably due to an Export demand. This is merely a straw which shows which way the wind blows and it is probable that other lines will soon be affected in a similar way.

Although iron and steel may be at their lowest it does not necessarily follow that horse shoes and metal products are similarly affected for the same reasons. However I think that at the present time metal products are as cheap as they ever will be, and I'll tell you why.

In normal times the prices on finished products do not fluctuate at exactly the same time as does the raw product from which the finished articles are made. The manufacturers must balance the prices and the stocks in the warehouse act upon the prices in much the same way that the governor acts upon a steam engine.

But this has not been a normal year. Merchants have seen the trend of the depression and acted accordingly. The banks have acted through the Federal Reserve system in such a way as to withdraw credits and prevent large accumulations of stock on hand. Deflation has been forced so that, despite demand, products have gradually fallen.

Raw materials have been purchased more or less only as needed and as the saying goes, "from hand to mouth." This means that for the past few months the fluctuation in raw products prices have been closely reflected in the finished products.

There is still another reason why I think that products in the horse shoe and wagon iron class are at their lowest ebb. Wages, which represent the main part of prices of products, have fallen to a marked extent. And though it may seem that wages and salaries may drop still further, it must be considered that such a further drop will be absorbed in the shape of profits and passed on to the stockholders.

By this I do not mean to say that I think the manufacturers will reap a harvest, for I'm pretty sure that they cannot. One need but look over the stock market reports and the announcement of dividends to stockholders for the past year to be convinced that there are very few concerns operating on a safe margin of profit.

To my mind all signs point toward an increase rather than a decrease in prices. I feel that the whole market, in all lines, ends toward greater stability. There will be an upward trend in prices of commodities, raw and finished, but we need not worry about big fluctuations.

And so, in view of these reasons I believe that the smith should not hesitate to carry a normal stock of material, just as he did ten years ago. To use a metaphor we might say that the sharp, high waves of the storm have ceased and the large, heavy swell has subsided and we are now sailing on a smooth ocean; we still will have the regular but smooth waves as we did before the storm, but need not fear them.

The coal situation is still a matter of conjecture because of the many factors involved. Railroad tariffs, miners' wages and seasonal reasons, all play an important part. My advice on this point is to "sit tight." Buy what you need as in normal times, but do not be too conservative or you may regret it. Winter is coming and since coal is absolutely essential to your business you cannot afford to be too careful in your effort to save a few dollars and by so doing risk all you have.

Insofar as scrap iron is concerned I would advise the smith to hold it, if possible, until next Spring. I doubt that even then the price on junk will rise to any great extent and unless it is entirely convenient to store the stuff I would advise its sale now.

Fraudulent Stock Selling Schemes

THE days when nearly every town was honored by a prosperous individual with a carpet-bag load of gold bricks for sale; when the Brooklyn bridge was sold several times a day to credulous visitors to this city and when gold mines were located in most impossible places have passed and the confidence man has turned his abilities to richer fields. The public can be fooled, but the bait must be changed more frequently.

The bait, if we may use the expression, used at present in many cases is the automobile. Every now and then there springs up a concern which bids fair to revolutionize the industry, if we believe what they say. This concern claims to have developed a new type of engine, or perhaps a new principle in carburetion, or possibly a new metal several times lighter than steel.

In glowing terms this company tells of the wonderful possibilities of their product. The story is always the same except that each new concern goes the previous one a few steps better. "A seven passenger car, roomy and comfortable, the speed of an airplane, the comfort of a feather bed, the endurance of a locomotive, as economical and as cheap to operate as a motor cycle."

The mere fact that the marvel will run from 40 to 50 miles on a gallon is hardly worth mentioning, (but always is mentioned) and as for tire expense; "why, one set of tires will last longer than the car itself."

And on the prospectus is a picture of a graceful machine which looks like an aristocrat. And the prospectus goes on to state that, "By our improved process, by eliminating useless parts and by our perfection in design, this beautiful machine can be produced at a lower cost than any car now on the market. We expect to sell it at a profit of about $200 per car and our slogan will be, 'a car for every home'."

In glowing terms the promoters tell about the great demand for such a popular car. Production and sales are spoken of in terms of millions per year. Profits are huge and the only thing, which stands in the way of a fortune is available capital. The benevolent promoters want to benefit mankind in general and are fighting to keep the corporation out of the hands of the trust, they want the public to share in the profits, they want to benefit YOU.

Their zeal toward favoring as many as possible prevents them from letting you invest all you want to, in fact you are not allowed to invest in more than a certain number of shares. (True, later on in the circular they hint that you can invest for your grandfather, your wife, your sweetheart or your children.)

And after the credulous public has snapped up the bait, hook, line and sinker they are hauled in by the benign gentlemen at the other end of the line, stripped of their money and thrown back to bite at another bait.

No, gentle reader, automobile stock never goes begging for owners if it is self supporting and you cannot beat the money game. The future may look promising but beware of the flowery language, immense profits and the wonderful new car which will revolutionize the industry.

Possibly, in your mail to-morrow, you will find a prospectus such as we have outlined. Pick it out with a pair of tongs and see that it is cast into the furnace. Don't read it or you may fall, if you are weak, and if you should, by chance, happen to glance at the imposing picture at the top, remember that this is nothing but an artificial bait for suckers.

I do not mean to state that all new stock ventures are bogus; investors occasionally have made money on wildcat schemes. But my point is that the average man is not in a position to take such a long chance, he should leave it to those men who have plenty of money to throw away or can investigate the matter personally. Play safe.

PRACTICAL HORSESHOEING

(*Continued from Page 9*)

probable in an earlier article. In fact, they probably date from the beginning of the Christian Era or earlier. But, even so, this does not mean that everybody knew about such shoes. William the Conqueror, who

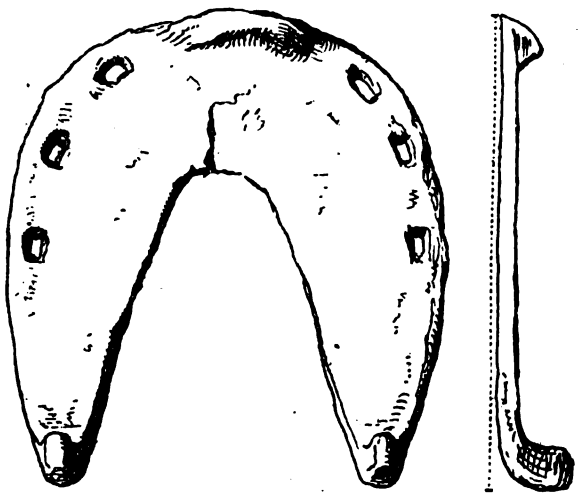

Fig. 2. Thirteenth Century Shoe Found at Borna.

invaded and conquered England in the year of the Great Comet 1066 A. D., is thought by some to have introduced horse-shoeing into England. But others suppose that he found the art already practiced in the island.

At any rate, William commissioned one of his noblemen, a certain Wakelin von Ferrarius, who was promoted by him to be

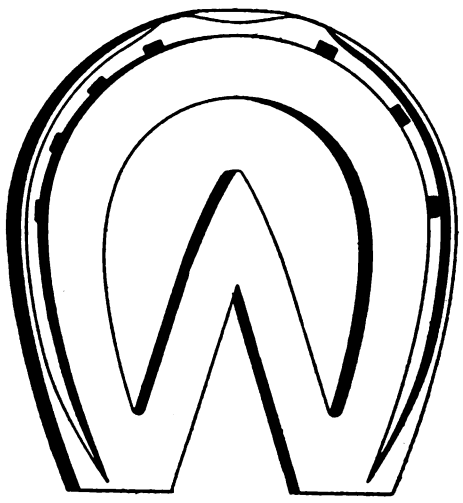

Fig. 3. Fullered Fore Shoe (for Harness Horse) with Frog Plate. Made from 1 by ½ Inch Iron.

Count of Ferrers and Derby. He was to superintend and give encouragement to the art of the farrier. The shield of the Ferrers family has on a silver ground six black shoes. "Their castellan at Oakham, in the county of Rutland, has the privilege of demanding a horse-shoe as tribute from every nobleman or baron of the Kingdom on his first journey through the town. The shoes, together with the giver's name, are affixed to the door of the castle. "This right is still in existence, and was exercised as late as the present year (1897)."

The first written descriptions of horse-shoeing date, it seems, from the ninth cen-

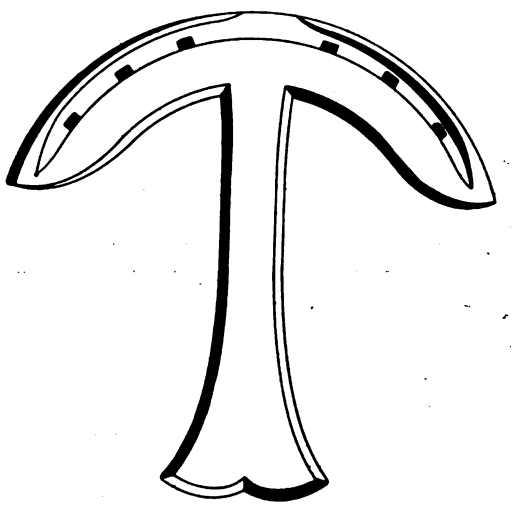

Fig. 4. Tip for Producing Frog Pressure Made from ¼ by ½ inch Iron

tury A. D. The earliest mention appears to be in the Military Regulations of Emperor Leo IV of Constantinople. Here the crescent shaped shoes with nails find special mention. It is possible that the Eastern Roman Empire of which Constantinople was the capital got its ideas as to horse-shoeing from some invading nation of Teutonic blood. At any rate, certain French investigators believe that the art of the farrier was introduced into the Western Roman Empire "at the time of the barbaric invasion by some Germanic race."

From about the ninth Christian century on, the use of nailed-on shoes became more and more general. Certain very old law books are said to contain references to horse-shoeing; and, in 1034, Duke Boniface of Tuscany, had his horse shod with silver shoes, upon the occasion of his marriage. About a century later, the horse of the Norwegian King Sigard, the Crusader, wore crescent-shaped shoes of gold upon his master's entry into Constantinople.

Shoeing was known in Sicily in the eleventh Christian century. At this time, the Saracens held the country. Upon a disagreement amongst themselves, the party which was the weaker, called to its aid some Greek cavalry, with the result that the combination won the day. The party defeated threw behind sharp-pointed spikes, with the intention of impeding their pursuers. It is stated, however, that "the horses' feet were so shod that the spikes could not injure them, nor impede their pursuit."

What has already been said in connection with William the Conqueror (of England) occurred also in the eleventh century, or about the same time as this event, in the far distant island of Sicily.

The golden shoes of King Sigard were seen in the following, the twelfth, century. In the next century, that is in 1214, French history makes mention of horse-shoeing. The occurrence mentioned had to do with the transportation of a noble prisoner, the Count Ferrand of Flanders, to Paris. In the account, it is stated that the Count's carriage was drawn by "four well-shod horses." The art is explicitly mentioned or at least indicated in a work by the writer Rufo about the time that Columbus was making his first voyage into the New World.

About 1531, appeared a work on veterinary science, written by a certain Rusius. In this work, the writer gives especial attention to shoeing, the treatment of deformed feet, and to injuries from nails.

Another writer who lived about the same time issued a work, the first edition of which

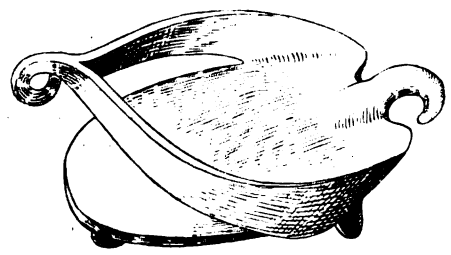

Fig. 5. Iron Hipposandal Found Near Lazenhansen, Germany.

appeared about 1539. In this work, the author not only describes shoes but gives illustrations. These pictures are the earliest known in connection with any work dealing with farriery. In fact, this writer calls attention to the difference between front and hind shoes and also between right and left. He directs attention to heels, toe-pieces, and rounded toes. As to clips, he distinguishes clearly amongst toe, quarter and heel clips.

We shall probably be right in assuming Italy to be the home of modern horse-shoeing. But if Italy is allowed to be the pioneer country with respect to the modern art, then Germany is perhaps to be set down second. At the end of the sixteenth Christian century, a German writer, Seuter of Augsburg, put out a book dealing, perhaps for the first time, with the possibilities of treating contracted feet by means of special shoes.

Many of the ancient horse-shoes found on German soil are of the description shown in Figures 1 and 2. Two were found when the foundations for the Gymnasium at Borna were being dug. They have points of resemblance and difference. Both have calkins. But in the one case, the nail holes are counter-sunk, as it were. The other holes appear to have been simply punched. Naturally, in such case, as the drawing shows, the nails would have their heads fully exposed.

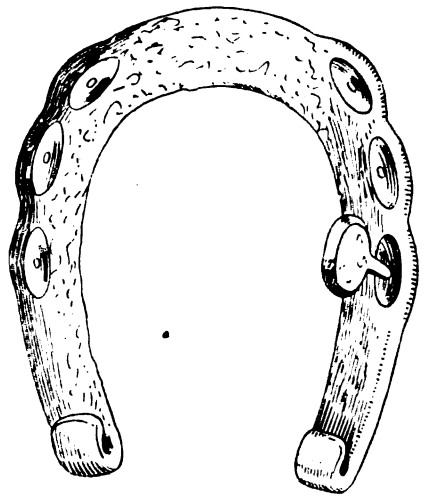

Fig. 6—A Celtic Shoe.

The third drawing shows a very broad shoe with calkins.

Sometimes, it is assumed that broad shoes originated in Sweden. This is scarcely granted by all. One writer, Schmid of Munich, states that broad shoes were employed in Germany long before the Swedish invasion of the country occurred. All these shoes seem to provide, whether accidentally or not, for the contact of the frog with the ground. In a French work of the eighteenth century, there is clear recognition of the advantage of contact between ground and frog. Another French writer of about the same time established what was perhaps the first of all veterinary schools. This was in 1768. British veterinarians began about this time to give real attention to shoeing. A number of Englishmen, in fact, devised special shoes. "Most of these were fashioned with a knowledge of the elasticity of the hoof, as is shown by their horizontal and seated-out foot surface."

One writer, in particular, Bracy Clark, expounded the anatomy of the foot and set forth the elasticity of the horny box. "This author advanced the theory of the expansion of the posterior rear portion of the hoof during movement, and the simultaneous sinking of the frog and flattening of the sole, from which originated many new views and experiments . . . Clark (Bracy Clark) rendered great service by drawing attention to the injurious contraction which followed the existent system of shoeing. He advocated turning out horses unshod in order to promote expansion of the foot, and made important contributions to the study of laminitis. His views on the changes of form produced in the hoof by pressure were adopted by the Germans and French, and provided a scientific basis for the practice of farriery."

The expansion of the hoof-box, referred to

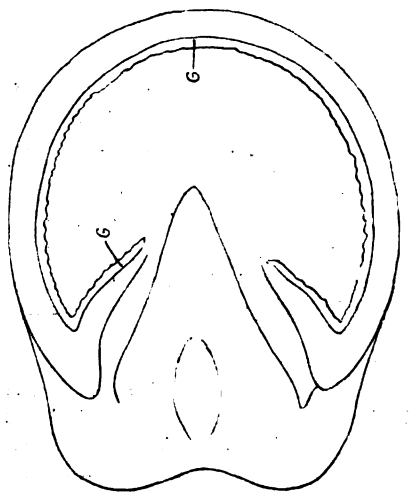

Fig. 7. G, Illustrates the White Line Mentioned in This Article.

above, is caused by the pressure of the animal's weight when he puts down his foot and lets his body rest upon it. Naturally, the soft interior under stress of this pressure

spreads. At the same time, it is forced downwards. The effects are that the sole is flattened and the frog pressed down; and also the horny box is pressed from within outwards. Consequently, the horny box yields somewhat. Probably, the greatest expansion is at the bottom next the shoe and to the rear near the heels.

When the weight, and consequently the pressure, is removed, the frog returns and the sole again becomes concave. And the horny wall contracts back once more. These movements are probably all of them of more or less benefit, directly or indirectly, to the foot They promote, or are indicative of, a healthy movement through all parts of the interior of the foot. The frog action, in particular, is regarded as highly beneficial So much so is this the case, that probably no good veterinarian-farrier would regard a horse as properly shod, unless adequate provision were made for the activity of the frog.

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However, the Germans did not at once follow the new lines of advance. It is said that in Germany up to about 1850 the horse-shoe was not a suitable affair and that the hoofs of the horses were not often of fine form. In short, England seems to have gone ahead of Germany in respect to horse-shoeing. Some exception is to be made with respect to the city of Hanover in Germany. It seems that the Germans had good books on the subject. Apparently, however, they did not generally follow the teachings of these books.

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Now to be quite frank and to get a clear issue before proceeding further, the writer with half a lifetime of experience in metals and metal working does not know of any means of permanently securing immunity from rust for any ordinary iron under all conditions nor does he know of anyone else who does of course, the new rustless chrome-steel is not under consideration here.

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Linseed Oil Treatment

Of late years there has been much research and experiment, not all wasted. Some good preventives have resulted giving much satisfaction for a limited time and under suitable conditions. Every smith is familiar with the process of treating ordinary bolts and nuts for this purpose. After finishing they are thrown into linseed oil that is at boiling point, taken out and then burnt off. Sometimes the oil is used cold but, in either case, the burning off, or "burning in" as some prefer to call it, is effectual in preventing rust under favorable conditions for a time, frequently for a long time, according to circumstances.

Probably the best process for making iron immune to rust is the Bower-Barff system. This is now well known and, as it is a process too intricate and detailed for ordinary blacksmith use, no further mention need be made of it here. The writer's idea is rather to deal with those simple means which have been effective and are readily applied. In this class can scarcely be included the process of turning rust to account to prevent further rust as in the case of gun barrels. This is a complicated process taking days to do properly but very effective, even under unfavorable conditions. For this the ironwork needs to be cleaned in soda water to free it from grease, then rinsed in clear water and wiped dry. After that the following mixture is rubbed over it with a piece of rag. Three parts of tincture of steel, 3 parts spirit of nitre, 2 parts of alcohol, half a part each of nitric acid, sulphate of copper, and corrosive sublimate and 12 parts of water. After thoroughly drying another rub over is given.

When dry once more, the resulting rust is rubbed off with emery, or a wire brush that is not too stiff. Afterwards another coating over and drying in is given, and then the ironwork is boiled in clean water when after wiping dry again, it is lightly rubbed over with the mixture and then left to dry. Once more, the ironwork is boiled and scratched with the brush, then rubbed over with pure animal oil or fat.

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For this purpose an iron box is necessary. Where such is in use for case hardening it can be made to serve this purpose in most cases. A box specially made can be of the most convenient shape and where certain articles are to be treated occasionally, however infrequently, the box made for the purpose will probably be the best in every way. Stout sheet iron, with a lid will answer the purpose if made into a box of the right shape. Make a false bottom of wire netting, or expanded metal, the latter preferably for heavy goods. Into this box place a layer of blacksmiths' coal powdered into a fine dust, half an inch thick. Place over this, the false bottom and on this put the ironwork. See this is clean and free from rust, and it may be polished to any degree of brilliance desired. Put the lid down on the box and then place the latter over a good bright fire, keeping up the heat until the bottom of the box is a dull red.

The heat causes the coal to give off a cloud of tarry vapor which envelopes the ironwork and invests it with a rich glossy coating, pleasing to the eye and strongly rust resisting. When all the coal in the box has been consumed and the vapour ceases to be given off, the box should be allowed to cool. Then the iron work is taken out and placed aside for the coating to set. This process is not much trouble, providing the box is to hand, and it is very satisfactory in its results as a rule.

Closely akin to this process are the various coatings put on by means of a brush. None of these are so resistant of rust as are those processes already given here. The best of them are the various japanning paints, sometimes wrongly called enamels. These, if properly applied at the necessary heats, are undoubtedly a sure and strong protection for the iron beneath. Unfortunately the process is only imperfectly carried out at times, when the results are disappointing.

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WANT ADVERTISEMENTS

ADVERTISEMENTS of SHOPS FOR SALE or TO RENT, SHOPS WANTED or SITUATIONS or HELP WANTED,

will be inserted under this head at 3 cents a word, including the address, for each insertion, payable in advance; but no advertisement will be accepted for less than 60 cents, however small.

Remittances may be made in postage stamps where the amount to be sent is less than $1.00. Address

M. T. RICHARDSON CO., Advertising Department,
71-73 Murray St., New York. **Publishers of the Blacksmith and Wheelwright**

Patents

PATENTS FOR INVENTIONS.

H. W. T. JENNER, patent attorney and mechanical expert, 622 F Street, Washington, D. C. Established 1883. I make an examination and report if a patent can be had and the exact cost. Send for full information. Inventors assisted in developing ideas and inventions. Trademarks registered.

For Sale

Blacksmith shop 22 x 54, two story brick. Only shop in town. Best location in Pike County, Illinois. If interested, write. Harry Kendall, Box 82, Detroit, Ill.

A bargain sale on shoes and calks. About 14 kegs horse shoes, steel front calks and heels turned, sharp and blunt, 2 to 4. New N. S. shoes, 2 to 5 $6.50 per 100 pounds. Toe calks sharp and blunt, $1.00 per twenty-five.
1 Wells Bros. Shoeing Vise with bolt heading dies $15.00 1 Buffalo Blower No. 400 as good as new $15.00. Write to me before you order what you want. E. G. H. Schnoor, Laurel, Iowa.

New Cylinder Grinder with boring attachment, great money maker. Our drill press vises save time, money and drills. Combination Brake lining cutter and splitting shear $8.00. We save you money on supplies and tools. Write for net price list. Bicknell Mfg. & Supply Co., Box 626B, Janesville, Wis.

Compound rests; for lathes, 9 to 13 inch swing $25. Mustin Mfg. Company, Newport, Kentucky.

For Sale. Blacksmith Shop and equipment. Main building 14 x 46, 40 foot shed in rear. Ira I. Scott, Kingman, Kansas.

For Blacksmiths

Brother Blacksmith: For $1.00 I will tell you how I make a Butcher Knife. Hammer it out thin on the anvil temper and leave it straight. Not much grinding required as they are thin before tempering. I have made hundreds of them and sold them from 75c to $1.00 and $1.50 as to size. Have worked at the trade 51 years and used knife making as a side line. A quick man can easily make eight knives and finish them snug in ten hours. In connection with above, will tell you how to weld copper as easy as to weld steel. Also my Rheumatism cure. No medicine to take inwardly, no liniment to rub on. The cure is simple. It cured me, it will cure you and won't cost you more than 50c. Reference. "To Whom It May Concern." This is to certify that I have known Mr. N. H. Hindman of Collier, W. Va. for the past thirty-five years and can testify to his reliability in every particular. John Ralston, Cashier Commercial Bank, Wellsburg, W. Va. N. H. Hindman, Collier, West Va.

For forge welding you need Uniflex "Master of Service" Welding Compound. Easier and stronger welds in less time. Quick, sure and strong welds. A necessity to Blacksmiths or welders. Send for free sample. Goruse Company, Elmira, N. Y.

Toy's Modern Methods doing hard jobs easy will help every smith make more money. Will make a blacksmith of a good helper or handy man. Forging or solid welding, hardening and tempering to standard with colored tempering charts. All for one dollar. Samples free. W. M. Toy, Sidney, Ohio.

Business Chances

Automobile Spring leaf repair and service stations pay big profits. Only moderate capital needed. We supply full equipment tools, spring steel, supplies. Will grant exclusive agency our products. Splendid opportunity. Write today. Indiana Parts Company, Richmond, Indiana.

For Blacksmiths

LAME BACK

Let an old horseshoer tell how he keeps his back strong. No drugs. Costs very little. Jones, Blacksmith, Boone, Colo.

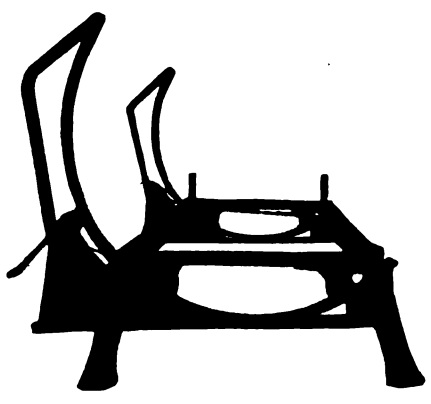
SPARKS AND SHAVINGS

The Topsy Turvy Auto Repair Rack

We illustrate herewith a device which is both unique and interesting, an automobile rack which is designed for tipping a complete automobile upon its side, thus exposing all parts of the car at the convenience of the workman.

It is generally conceded that the engine stand, with its tipping features, is a valuable machine; it follows, then, that this automobile repair rack is of even greater utility to the service station.

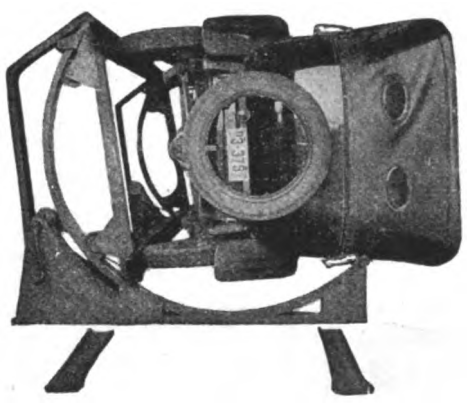
The device illustrated, the Topsy-Turvy repair rack, is made by the Kenosha Boiler



& Structural Co., of 312 S. Clark St., Chicago, Ill. It measures 14 feet 4 inches in length and takes up a floor space of 7 feet 6 inches in width. The channel iron runs for the wheels are regular 56-inch gauge to suit standard cars.

The car is run onto the rack up two inclined runways which are then removed and the car clamped to the tracks through its wheels and a pair of turnbuckles attached to relieve the springs of the strain. The car may then be tipped to right angles with the floor and the mechanics can make the adjustments in a natural position.

The tipping action is through drums and cables and as the revolving units are mounted on wheels, is not difficult.

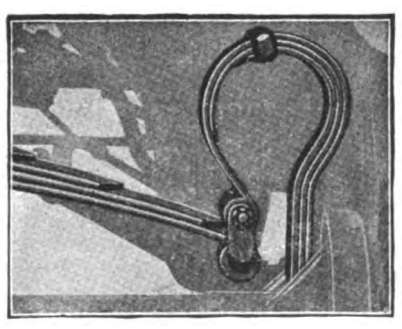


New Ford Shock Absorber

"Grey Goose" is the name selected by the Indiana Parts Co. of Richmond, Indiana, for their new Ford shock absorber. The name is suggested by the goose-neck design of the accessory.

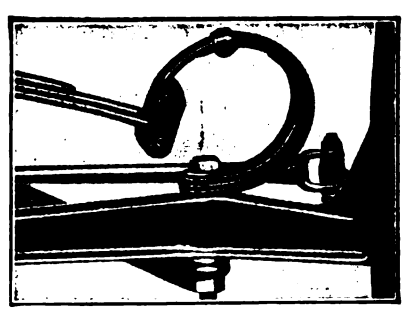
The Grey Goose shock absorber is made in two types, one for front Ford spring and one for the rear. The action is the same; the difference of design is for the purpose of fitting.

Leaf-spring construction is used, the material being chrome vanadium steel, and the design is said to allow free action of



the springs while damping and checking the rebound. The eyes are bushed, reamed and drilled for oil cups.

The set of four Grey Goose shock absorbers can be applied by anyone in from forty-five minutes to an hour, the necessary tool being a monkey wrench. Salesmen and distributors are now being appointed for territory not already covered.



New Heald Publication

The Heald Machine Company of Worcester, Mass., has recently brought out a very interesting and instructive book on cylinder regrinding. This book thoroughly covers the field, and considers the question not only from the standpoint of the advantages in regrinding and the proper equipment to use, but also treats on the problems which are certain to come up with every concern going into this business.

Clamert Renewable Chains

A broken tire or weed chain usually cracks the heart of the motorist when he hears the snap, snap of the broken ends beating against the nicely painted fenders of his car. Those who appreciate this fact will be interested in the product of the Clamert Mfg. Co. of Latrobe, Pa., which is bringing out a renewable chain.

The Clamert renewable chain is made in sections and the cross pieces can be removed and replaced in a moment without the use of tools. When a cross chain breaks, as it often does, through ordinary wear, if it is a Clamert it can be taken off and a new one put on with a minimum amount of delay.

The Clamert chains are heavily brass plated on the cross members while the side chains are galvanized. These chains are made in all standard sizes and extra cross chains may be purchased at an extremely low figure.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, OF The Blacksmith and Wheelwright and Tractor Repair Journal, published monthly at Cooperstown, N. Y., for Oct. 1, 1921.

County of New York, } ss.:
State of New York.

Before me a notary public in and for the State and county aforesaid, personally appeared F. R. Whitten, who having been duly sworn according to law, deposes and says that he is the business manager of The Blacksmith and Wheelwright and Tractor Repair Journal, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, M. T. Richardson Company, 71 Murray Street, New York City, N. Y.; Editor, M. T. Richardson, 71 Murray Street, New York City, N. Y.; Managing Editor, F. L. Avery, 71 Murray Street, New York City, N. Y.; Business Manager, M. T. Richardson, 71 Murray Street, New York City, N. Y., and F. R. Whitten, 41 Pinehurst Avenue, New York City, N. Y.

2. That the owners are: M. T. Richardson Company, 71 Murray Street, New York City, N. Y. Stockholders: M. T. Richardson, 71 Murray Street, New York City, N. Y.; A. J. Richardson, Ridgewood, N. J.; Mrs. A. Lousie Gipardeau, Jr., Monticello, Fla.; Mrs. Mildred Ulmer, New Rochelle, N. Y.; Mrs. H. L. Johnston, New Rochelle, N. Y.; W. F. Etherington, 50 East 42nd Street, New York City, N. Y. F. R. Whitten, 41 Pinehurst Ave., New York City; Cornelius Doremus, 66 Broadway, New York City.

3. That the known bondholders, mortgagees, and other security holders owning or holding one per cent or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustee, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest, direct or indirect in the said stock, bonds or other securities than as so stated by him.

FRANK R. WHITTEN, Business Manager.

Sworn to and subscribed before me this 17th day of September, 1921.

(Seal) ROBERT R. W. SCHMIDT, Notary Public.

(My commission expires March 30, 1923.)

Index to Advertisers

CLASSIFIED BUYERS' GUIDE

BLACKSMITH AND WHEELWRIGHT

and TRACTOR REPAIR JOURNAL

Vol. LXXXIV. No. 6 DECEMBER, 1921 TERMS ONE DOLLAR A YEAR

Practical Horseshoeing

The Function of the Frog and the Construction of the Charlier Shoe

IT will be of interest perhaps to call attention to the frog whose activity has been sought by some of the farriers of the world for a century or more. The frog is a kind of cushion. It consists in part of fibrous material and in part of fatty substance. In shape, it is something like a wedge. It is broad and thick at the rear, and tapers to a point at a location forward of the center of the ring outline of the hoof bottom. There is a right and left part, the two being partially separated by an indentation extending from the middle of the broad base for half or two-thirds of the length of the frog.

There is the outer frog and the inner. The cellular bulbs consist, for the most part, of fibrous tissue in various forms. They are the softest part of the plantar cushion. The horny frog is a product of the sensitive frog and perhaps adjacent parts, in much the same way that human finger nails and outside skin are products of sensitive parts of the body.

The frog by its contraction and expansion, when it undergoes pressure and is then released, seems to stimulate activity through the near-by parts of the foot. It is considered injurious to interfere with the frog movement. Thus, at times, it will be better to thin the shoe at the front rather than raise it at the rear. because the latter change may lift the frog clear of the ground.

Whatever modification of shoe or of the accessories used in curing diseases, one is to remember that the frog must be taken care of—that is, frog action must be facilitated.

Elasticity of the Hoof

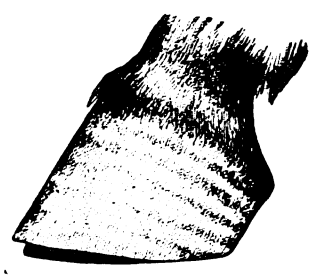
That the hoof is elastic was noted as far back as the latter part of the eighteenth century. Bracy Clark has already been mentioned as one who brought out the facts concerning the elastic nature of the horny box.

This writer divided up the horny box into three principal parts—(1) the wall, (2) sole and (3) frog. He referred the elasticity of the hoof to the formation of the horny capsule, which he divided into three chief parts—wall, sole, and frog. He also laid great stress on the flattening of the concavity of the sole, and the driving apart of the heels by the frog at the moment when weight was placed on the foot. He concluded that any interference with this lateral movement of the heels by the shoe might be injurious, and his observations were, therefore, of great practical importance, for they form part of the foundation of our present system of shoeing.

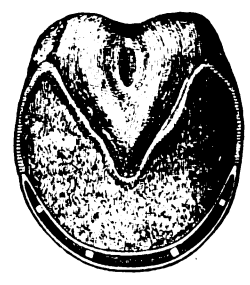
It will be seen, then, that the theories of Bracy Clark are regarded as of high importance. But they did not at once command belief everywhere. He advocated a shoe with no heels, with a horizontal bearing surface, and with all the nail-holes set in the forward half. In 1835, a certain Frenchman, Périer, attacked the foregoing views in part. He said that perhaps the bearing surface of the hoof might have some side movement, but he would not grant that the heels as a whole had a movement of this kind.

Another, an English experimenter connected with the Army Veterinary Department, advanced views contradictory to those of Bracy Clark. This was in 1849. His experiments seem to have been tried on living and dead hoofs. At any rate, he reported no side movement, no sinking of the sole and only a slight sinking of the bulbs of the heel. The results of this investigator, Gloag, were, partially at least, refuted in the following year by Reeve.

This experimenter made use of a special shoe which carried between its quarters a cross bar on which were small upward projecting spikes. The idea here was to test whether in the living horse the sole really did descend or not. After this shoe had been put on a horse, the animal was walked a short distance and the hoof examined. There



Hoof Prepared for Charlier Tip



Hoof shod with Charlier Tip

was no indication that the spikes had entered the sole. That is, there was nothing to show that the sole had descended. However, upon a second trial in which the horse was made to trot and to gallop, an examination showed clearly enough that the sole had really descended. The spikes were upon the second trial at the same distance from the sole during rest, but during motion had entered the sole and left their mark. Altogether, nine punctures had been made. In a similar way, side expansion of the hoof at the bearing surface was proved.

These were probably the first demonstrations of the flattening of the sole and of the distending sideways of the hoof.

A French experimenter, in 1851, is said to have proved expansion of the hoof and flattening of the sole. But I do not know how he proceeded with his tests. An experimenter by the name of Mills, in 1852, experimented as to the question of the hoof. That is, he traced the circumference of the hoof when subjected to weight and when under no pressure. The circumference when the hoof was under load was greater, and this was regarded as a proof of expansion.

Without going into the details of the experimentation that went on for years, one may consider some of the conclusions which have been more or less accepted. In speaking of the movement of the bearing margin of the hoof—that is, of the ground surface of the wall—J. A. W. Dollar says: 'In front, and as far as the center of the quarter, no distant change occurs; from the center of the quarter, however, to the end of the bearing surface, it is always possible to demonstrate dilation in sound, unshod hoofs, especially when the horny sole and horny frog are supported."

"The amount of dilatation varies, with the weight on the foot, from 0.1 to 1.5 millimeter at either side, while it is also greatly dependent on the angle formed by the heel with the ground. In heels which converge in their course from above downwards, dilatation is slight, and, in fact, in narrow-heeled feet, contraction may replace the normal expansion. The greatest obstacle to dilatation, however, is shoeing, inasmuch as it removes the counter pressure of the ground to a greater or less extent, and prevents the horny sole, horny frog, and bars performing their functions in the same degree as they otherwise would.

"In horses working on hard roads, it has been recommended to employ pads of rubber, so as to transmit the counter pressure of the ground to the sole and frog, and so promote dilatation, but the advocates of this plan overlook the fact that pads press *continuously* on the frog, and that much of their beneficial action is thus lost."

As to the sole, I reproduce: "The horny sole becomes flatter under the body-weight, most distinctly at the posterior [rear] parts of the sole, and least so at the toe and toward the periphery. The width of the hoof and thickness of the horny sole are of considerable importance in determining the extent of this movement, the descent of the sole being greatest towards the heels in flat and spreading hoofs. A proof of the changes in form of the hoof may be found in the bright and sometimes excavated friction surfaces at the heels of the shoe. Peters says these prove the existence of two movements of the bearing surface of the hoof, that occurring in the longitudinal direction producing the deepest depression.

One result of this friction is the wearing away of the bearing surface of the heel on the shoe; the loss of horn may amount to 5 millimeters [0.2 inch] or more within a month."

Advantages of Expansion

"The advantages of expansion of the hoof are manifold. I. The yielding of the tissues protects the hoof and its contents from injury, even under the greatest shocks. 2. It greatly diminishes at its point of origin the concussion, which would otherwise be transmitted to the body,—thus assisting the action of the limb and adding to its elasticity. 3. It favors nutritive processes in the parts inclosed by the horny capsule, and is of importance in the production of the hoof itself. Movement is of great importance in insuring sound hoofs and the production of healthy horn. If, for any reason, movement is lessened or prevented, the hoof suffers."

It will perhaps be gathered from the foregoing that the farrier should ponder the significance of the movements of the sole, the frog and the horny wall. Such movements

Special Knife Used for Cutting Groove for Charlier Tips.

are to be taken into account in shaping the shoes, and particularly in forming shoes to be used by horses whose feet are diseased or injured.

The horse-shoer should seek, not to improve upon Nature, but to preserve what Nature gives. These movements are part of what is given, and the farrier's business is to avoid changing any of it. This he is apt to do by the shoes that are put on.

Pretty much all standard shoes tend to hold the hoof rigid. The stiffness of the iron holds the hoof, especially in the part where the nails are. However, with the nails all towards the fore part of the shoe, there is more or less opportunity for the

spreading of the rear half of the horny parts.

The shoe that is high at the rear may lift the frog until it is clear of the ground at all times. This condition of affairs is not wanted. One way to correct it is to remove heel calkins. Another is to thin the shoe in the heel region and far enough forward to affect the frog. A third method proceeds by paring away horn from the rear parts of the bearing surface. This naturally tends to let the frog down. If the frog has to be covered all the time during a period of treatment for some diseased or injured condition, then it may be desirable to put leather or some other material between the cover and the frog in order to make sure that the frog will be under compression when the weight is on.

Such a piece of leather or other material may be secured to the upper surface of the cover—that is, the surface that is up when the cover is in place and the horse is resting on the foot. I have given several ways of dealing with the question. There may be others. At any rate, if the farrier has a case where none of the foregoing methods seems to be applicable, then he will have opportunity to do some thinking for himself, and as a result work out a special method that will be applicable. Let him bear in mind that the effect he is to produce is (1) freedom from pressure when the foot is lifted, and (2) pressure against the frog when the foot is down and the weight is on.

If the farrier is careful to bear these two points in mind, he is doing the right thing. But, let him not fool himself. What is wanted is both results. He must not think that pressure alone will answer. It will not. The pressure must go on and then vanish, go on and then vanish, and keep this up as the horse moves along.

The Charlier Shoe

The system of Charlier, introduced in 1865, seeks to provide for frog action. The shoe is a narrow band of iron curved round to fit the outine of the hoof, like an ordinary shoe; but this band of iron is thicker than usual. There is no fullering. This shoe is sunk in a groove which encircles the entire ground surface of the hoof.

The ground surface of the shoe is to be "on a level with that of the foot." This shoe conforms precisely to the outline of the hoof. It is thicker than it is wide. On the face next the hoof, the width of the metal band is a little less than the width of the band on the ground surface. The upper margin, on the inside, is rounded. There are 6 or 8 nails of oval cross-section. The nail-holes are directed obliquely in order to get the best possible hold on the wall. The heels of the shoe terminate with the heels of the foot. They are rounded and besides follow the wall.

There is a special knife used to form the groove in the hoof, in which groove the shoe is to lie. This is shown in the illustration. The sole and frog are left unpared, unless there are some fragments requiring removal.

"Charlier claimed by this method of shoeing to permit expansion of the foot, to restore diseased feet to their normal shape, to favor development of the frog, and to prevent or cure contraction of the heels, sandcrack, corns, etc." These claims are perhaps too broad. The Charlier shoe will hardly cure or prevent so much. It seems to have had a great deal of vogue in England for a period, and then to have fallen into lesser favor.

Dollar, a British authority, has some good words, however: "We do not deny that the Charlier system, when introduced, had many good points: it taught the farrier to spare the sole and bars, it drew attention to the need of frog pressure, and it showed the advantages of light as opposed to heavy shoes. At the present day, it is still useful as a front shoe for ponies and hunters with small, narrow feet, for animals which slip on smooth pavements, and for those commencing contraction of the foot." These are good qualities, and sufficient to cause farriers to use this shoe now and then as occasion arises.

There were forerunners of the Charlier shoe. Thus, about 10 or 11 years before Charlier introduced his system—that is to say, around 1854—the Messrs. Mavor of London and Duluc of Bordeaux proposed narrow bands of iron of considerable thickness as a means of preventing slipping on greasy pavements. Mavor required his shoe, which was unfullered, to be fitted while still warm and "in such a way as to be slightly incrusted in the foot."

All these shoes are made with thick but narrow bands of iron. They are thus opposed to the ordinary shoe. The latter is a broad band of iron not very thick. In so far as resistance to spreading, the thin, broad band of the usual shoe is probably stronger. The narrow, though deep, band of the Charlier shoe yields more easily. There can hardly be any doubt of this. It is this very point that enables the advocates of the Charlier shoe to claim that it permits the spread of the hoof, etc.

The thickness of the Charlier shoe would tend to prevent the frog from touching the ground, if it were not for the fact that a groove is made in tne bearing surface of the hoof and the shoe set in it. This lets the frog down and offsets the thickness of the metal. However, an objection has been raised in connection with the groove. "The deep groove, cut to accommodate the shoe, weakens the union between sole and wall and, except in specially strong feet, approaches dangerously near sensitive structures." This is a weighty objection, wherever it applies.

Cleaning Greasy Metals

Tools and Instruments of Certain Kinds Must Be Clean and Polished

By ARTHUR W. JORDAN

FEW of the BLACKSMITH & WHEELWRIGHT readers have to get more than a rough finish on their work as a rule, but there are times when it is necessary to finish in different ways. Sometimes a job comes along that needs more than ordinary delicacy in finish. No decent blacksmith likes to take on work unless he can turn it out in a proper manner, and nobody likes to see it go by him because he does not know "how."

One of the most difficult jobs to deal with is that of a tool of any sort which has to be hardened and tempered, yet must be free from grease when finished. In this case the rough and ready method of burning off cannot be resorted to. The writer has had some experience with this class of goods which have had to be made spotlessly clean and free from grease and knows the difficulty with it.

With the aid of caustic potash, using half a pound to a gallon of water, the most greasy articles are readily cleaned, but this method is not suitable for many goods. For instance such articles as surgical instruments are tempered at a heat of 420° to 430° F. and to keep them in boiling water for even a few minutes is to heat them to more than half the temperature at which they were tempered and is going to do them no good. Many of these articles are tempered in molten lead, but there is no hard and fast rule. Many people prefer oil for tempering, and the writer is one of them, but it takes some removing at times.

Without some heat to assist, oil and grease is very intractable and in any case the potash water must be used hot, but for tools, such as those just indicated, that are tempered at a low point of heat, from 130° to 140° F. is the limit and then the article should not be left in long. If a rough mop is made of a piece of old sacking tied to a stick, and some silver sand, or better still, some powdered pumice is well brushed over the goods with it, very considerable assistance is obtained, and the job is easier to do. These agents help to put a rough polish on the goods, which is sometimes an advantage.

Where only a small job is required to be done and boiling potash or soda water is of no use as in the cases mentioned, grease may be washed off in gasoline or wood alcohol. After the use of the latter the article can be lacquered or varnished quite safely. Neither of these protections however, will stay on the top of grease.

A good means of cleansing a lot of metal goods at once is by means of a "tumbling" barrel. This is a small ordinary cask mounted at the ends centrifugally and fixed on a stand. A cranked arm is a continuation of the pivot on which it works, at one end and this is turned at a speed suitable to the contents. The articles are put into the barrel through a door in the side, together with some silver sand, pumice powder, or leather cuttings.

Hoof parings would probably answer very well, but a little pumice, or sand, should be used too. Wood shavings and sawdust absorb grease readily and are useful in some cases. If the barrel is turned by power, about 80 revolutions per minute will be right. If turned by hand this will be too exhausting for anyone to keep up long. The best plan is to have a turn at the barrel "every now and again," running it in between other jobs during the course of the day. If these turns total about an hour, or one and a half hours, the articles should be all right then, and clean enough for most purposes.

Here is a method of cleaning metals electrically but as it it only suitable for dealing regularly with large quantities of work and requires a special and rather expensive plant to be laid down, it is scarcely convenient enough for ordinary blacksmiths use. Otherwise this is an excellent way of dealing with regular batches of dirty metal goods.

A good strong soap will answer for removing grease from most metals, but it must be followed by thorough rinsings in clean water if the job is very particular. All soap is greasy and if not thoroughly well washed off a film of it is left behind and this is fatal to varnish, paint or lacquer if they are to follow. However for many jobs that a blacksmith may want to free from grease a strong soap and brush with a little hot water will answer.

Some readers may wonder why acids have not been mentioned in this article. The widespread mistake which is made is that grease may be removed in this way. However acids are not much used for any metal articles thickly coated with oil or grease. The grease protects the article from the action of the acid which seems to set the grease and make it harder to remove.

Acid dips are very useful at times but they are quite useless unless all grease is first removed from the articles. To leave anything in such a dip that has been handled by greasy fingers means pitting the surface with holes, for the acid will eat in where the metal is clear and will have no effect on the greasy parts.

A HALF BAKED ONE

Time: Before the Great Thirst.

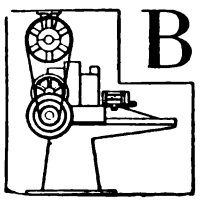
The night was cold and the wine was hot, and the clubman was toddling homeward after doing himself extraordinarily well at the reunion dinner.

"Handsh nearly frozen," he uttered.

Suddenly along the almost deserted street rushed an old-type fire-engine, with smoke pouring from its funnel—and the old gentleman at once gave chase to it.

"A' right, keep your bloomin' baked potaties, then! Don't want 'em anyhow!"

OUR OWN REPAIR SHOP



BEFORE we enter into the discussion of the various units of our own machine shop we wish to make one point entirely clear in the mind of our readers. We do not stand in the position of recommending any particular make of machine or discriminting against any other. Our readers must not gain the impression that because we have a certain machine we consider it the *best*. We have tried to install representative equipment and though we feel that each machine in our shop can be considered excellent, we also know that there are other machines in the same class.

In selecting our machinery we tried to obtain satisfactory equipment. Certain conditions, having nothing to do with merit, arose to make the machines, which we acquired, more available. The reader is not to be influenced by our choice in the least, though if he should consider the purchase of any of the machines similar to those which we have, he can rest assured that he will obtain satisfaction. Our department was inaugurated to demonstrate the utility of each type of machine, not the machine itself.

A machine or automobile repair shop without a lathe is like a steam engine without a boiler; the lathe is not merely a convenience but a necessity. The lathe is the one tool which cannot be omitted from the shop.

It has been said that the modern milling machine is a complete machine shop in itself and that there is no machining job which cannot be done upon it, within reasonable limits of course. As far as automobile work is concerned the writer would state that the lathe fills all of these specifications and doubtless many of the readers are of the same opinion.

Except for the milling machine, which is an expensive tool, there is no one machine of such utility as the lathe. Upon the lathe may be done any kind of machine work if the operator is possessed of an ordinary amount of ingenuity.

Various Lathe Jobs

Ordinary turning, screw cutting facing off, drilling, and grinding are considered as typical lathe jobs. Gear cutting, splining, reamer fluting, tap making, rack cutting, relieving and small jobs of planing are possible, with suitable accessories, in the lathe. As time goes on it is our purpose to consider these various "special" operations in the columns of this magazine.

The size of the lathe is of paramount importance to the repair man. The first cost of a lathe large enough to do all of the automobile repair jobs is not much greater than that of one too small.

The only parts of an automobile which might demand a lathe with a swing of more than ten inches are the wheels and the engine flywheel. Any turning operation upon the wheels would require a swing of over 30 inches, but the chance that a repair shop would be called upon for a job of this kind is very remote. A flywheel turning operation would require a lathe with a swing of at least 18 inches, but this job might occur only once a year and it would hardly pay the small shop owner to consider such a rare possibility. It would be far cheaper for him to take such a job to some machine shop where he could utilize a larger lathe.

As a general rule lathe with swings under 12 inches are of light construction whereas automobile repair work often is fairly heavy. To withstand the heavy duty the lathe should be strong enough to make a heavy cut without chattering. And considering these facts we decided upon the 12-inch swing lathe as being the nearest ideal for a small shop.

Our machine is made by the Champion Tool Works of Cincinnati, Ohio, and what might be termed the "last word" in lathes, in that it is equipped with all modern devices for facilitating work. Its general dimensions may be considered as conforming with the standards of construction so that special tools and accessories may be purchased at any time. And, finally, it is heavy enough to withstand the usage to which it may be put in automobile repair work.

Length of Great Importance

The length of the lathe bed is an important item to consider because of the fact that many units of the automobile require a long turning distance. Axles, propellor shafts and cam and crank shafts are regular repair jobs. If the lathe is not long enough to do machining upon these units, the repair man is sadly handicapped. Unfortunately we were limited as to floor space and for this reason we chose the lathe with a five-foot bed. Had we contemplted making actual repairs as a business, we would have chosen the eight-foot machine.

With the five-foot bed the distance between centers is but two feet, seven inches. The eight-foot machine would give a turning length of approximately six feet and would have cost but little more in comparison with the total cost. Practically every lathe manufacturer is in a position to furnish lathes of this length.

Although we are limited somewhat by the short bed and are not able to machine crank or cam shafts, we can turn shafts up to 11/16 inches in diameter of any reasonable length of running them through the hollow spindle in the head. For rough turning on shafts of greater diameter and greater length than the 2 ft. 7 inches, it is practical to mount one end in the chuck and support the other end upon the steady rest.

By this latter arrangement it would be possible to rough turn a shaft five feet in length and to do a creditable job at finishing off either end.

The Lathe Head

The lathe head is very solid. The spindle is mounted on a 2 1/16 inch by 3⅜ inch bearing at the front and a 1 11/16 by 2⅞ inch bearing at the rear. The first dimensions in each case being the diameter. The hole through the spindle is 1 1/16 inches in diameter.

The spindle is fitted with a cour step cone for two-inch belt and this cone is accurately balanced and machined on the outside. The small step is 3½ inches in diameter and the large step is 8 inches thus giving a fairly large range of spindle speeds on the direct drive. With the back gears in a further reduction of 8 to 1 is possible.

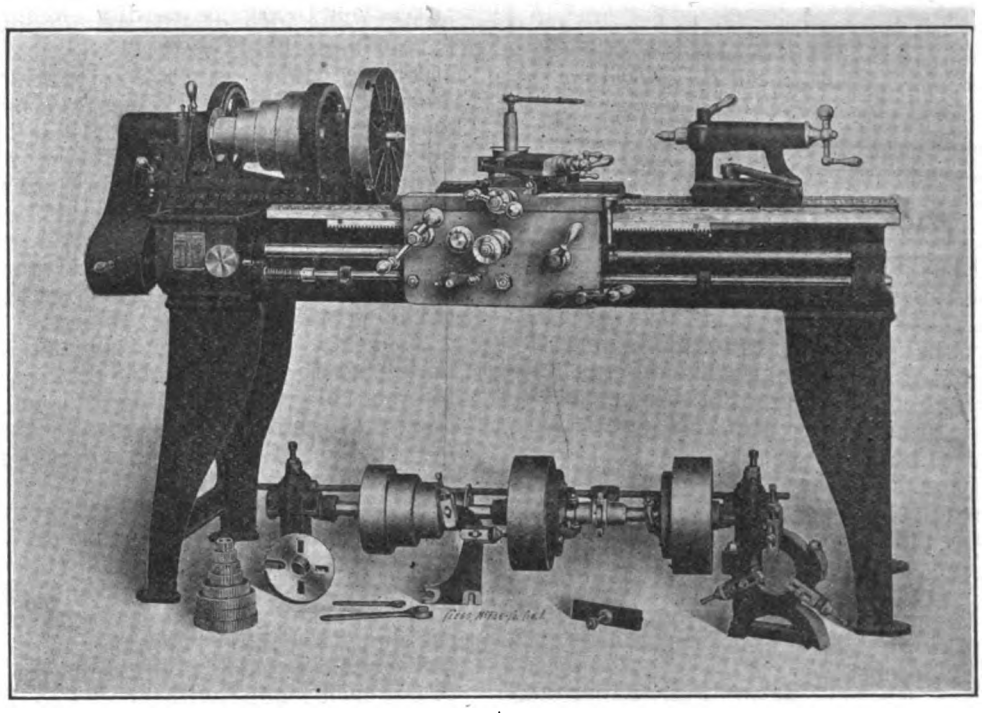
The countershaft is fitted with a well finished cone pulley and two, 10-inch, clutch pulleys. It is planned to run the first clutch pulley at 150 R. P. M. and the second at 200 R. P. M. This will give a range of spindle speeds between the lowest of eight R. P. M. and the highest of 460 R. P. M., approximately.

We feel that this large range of spindle speeds is worthy of note since it provides for everything from a heavy roughing cut to medium speed for polishing. And should it happen that the shop is called upon for a job of wood turning, the speed of 460 R. P. M. is sufficient for the purpose.

In a later article we will discuss the various methods for driving this machine with the idea of suggesting a plan whereby the lathe may be driven at practically any speed within reason, consistent with the driving power.

Next to the head, in importance, comes the carriage. A lathe may be said to be no better than its carriage and surely it is true that work may be sadly limited by a poorly designed apron.

The apron on our lathe is large and solid and is bolted to the carriage in such a way that it is practically integral with that member. Thus the chance for lost motion is minimized. Upon reference to the cut of this lathe one will see that the arrangement of carriage control is along "standard" lines. At the left, near the top of the apron is the manually operated crank, working through a rack and pinion for moving the carriage longitudinally.



12-Inch by Five-Foot Champion Lathe.

Rack Movement Can Be Dis-engaged

The pinion of the manual crank is mounted on a moving arm which is controlled by the lever immediately below and shown in the lower left-hand corner of the apron. By depressing this arm, the pinion is dis-engaged from the rack when the machine is being used for screw cutting.

(*Continued on Page* 13)

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Our Editor's Letter

I WOULDN'T feel that I had done my part in life unless I said something about the Disarmament Conference at Washington. There are many conflicting opinions as to the advisability of scrapping navies and war supplies and when one reads the various newspapers, arguments pro and con, one is at a loss what to believe.

One editor, an authority on things national and international, claims that if we disarm we will be at the mercy of even the smaller nations and that soon we will be slaves to another. He points to the late war as a horrible example of what might have happened had not England and France been in a position of defense.

And then we look at another paper and read what another great editor has to say. This second great editor points to the late war as a horrible example of what *did* happen because some of the powers *were* armed. He goes on to show that if Germany and Russia and England and France had been on averted; in fact never contemplated.
a peaceful basis, the war would have been

And which editor is right? One cannot agree with both of them.

To my mind all of this newspaper talk of possible war and big armament is largely chaff, as far as America is concerned. It takes two to make a quarrel and a whole nation cannot prepare for and declare war in a day.

A careful study of the present disarmament plan will show that it is merely a general scheme for eliminating competition of arms and an excellent plan for home defense. Take away the offensive arms and there will be no chance for any nation, large or small to start a fight. Leave the defensive forces and conditions are such that any nation can mobolize to protect its own territory.

There must be a stop to this continued increase of armament. At present the larger nations are competing for the largest navies, air forces and land forces. There will come a time when the people will stagger along under enormous taxes simply to carry a lot of showy but useless war vessels.

Suppose for instance you, who are at peace with your next door neighbor, were to purchase a couple of cannon and punch two holes through the fence, then mount the cannon so as to aim at your neighbor's house. At first your neighbor would rub his eyes in astonishment, then he would begin to puff up in anger and within a few days he would have three cannon aimed at your back door. This would naturally make you feel somewhat worried and you in turn would prepare for the worst; you would go out and get another pair of guns and in time both of you would be surrounded with a veritable fortress.

By that time you would be looking with suspicion on your neighbor, he would be ready to draw a dagger every time he passed you on the street and it wouldn't be safe for either of you to speak to the other. All was peaceful before you started the armament collection, there was no thought of a fight. If there had been any dispute between you, you probably would have told each other what you thought, cussed a few times and then forgotten about it. If you were really mad enough you might have used your fists, but after the black eyes and dented noses had healed you would laugh with your neighbor at such foolishness. To prepare for war means war.

What is true of the individual is true of a nation, but where millions of people are banded together the chances of suspicion, of anger and of hate are multiplied. A nation unprepared for offensive warfare will not go to war.

I think every sane reader will agree that we are spending too much money for armament. The idea of this armament, if there is any logic back of it, is to be just a little stronger than any other nation, strong enough to defend ourselves against any aggressor. The same logic, if it is logic, compells England, France, Germany, Austria and the other powers to arm themselves just a little better than we have. Then we add another dreadnaught; the other nations follow suit and since everyone cannot be first our armament gradually grows and the world keeps on wasting money.

And Mr. Hughes has suggested that we match up the armaments; discard a certain number of war implements each and get back to a point where every citizen is not paying half his salary to support munitions manufacturers.

To my mind the whole idea seems intensely practical. We have no cause to kick at the plan; we are practically isolated from the rest of the world. We could defend our coast line and our country with one half of the army and navy we carry at present. A few airplanes carefully distributed along our coast, each loaded with bombs could repel an average fleet of war vessels. The amount of money we could save, in one year, on disarmament would more than pay for the possible damage such a fleet might cause.

No other nation could advance against us without previous preparations. Our agents would know of such a move far enough in advance to prepare us for trouble. And finally we could expect other nations to come to our aid.

The matter of blockade need hardly be considered. We are entirely self supporting. The United States is wonderfully well situated to withstand a permanent isolation from all other lands. If necessary we could live for centuries without importing a single thing.

And these are my reasons for indorsing the disarmament plan. Let us all lend our support toward this plan for universal peace.

Seeing the Shows

I SUPPOSE that some of my readers will call me a "deserter" when I begin to talk about automobile shows and feel that as a blacksmith I am a failure. But please remember that I'm just trying to keep your interests at heart and tell you what I believe is the best for you. It is not always easy to take bitter medicine and lots of editors are afraid to say what they think is true in order to keep the readers feeling good. But if I feed you a few bitter pills it is because I think they will help your troubles.

There will come a time when many of my blacksmith readers will need to know something about automobiles if they want to keep their shops going strong. The handwriting is on the wall and it is time that you opened your eyes to read it. "The automobile and the motor truck are big money makers" is what we can see.

Now I'll admit that it isn't always easy for a blacksmith to change his work all in a day. I don't think that such a course would pay, but I do think that every smith should become acquainted with automobiles and trucks and gradually work into the repair game. At first he will repair such things as springs, frames and wheels but as time goes on he will gradually learn more about the mechanical parts until finally he can take his place as a full-fledged repair man. He will continue to be a blacksmith but the real profits will be in the automobile game.

At this season of the year, throughout the country, are held the various automobile, truck and tractor shows. I would advise every reader to attend at least one show of this kind a year. He can learn much, very much about automobiles and gasolene engines.

At nearly every show there is at least one exhibitor who shows a cut-away model machine. Examine this machine carefully you will see just how each part works, just how each part is made and what happens as the engine runs. Familiarize yourself with the mechanical details of the automobile and in this way provide against the future.

There is another phase of the automobile show which should interest even those readers who do not contemplate automobile repair work. At every show you will find exhibits of welding and the man in charge of the booth will be willing to give you all the information you need. At the last New York show I noticed a number of things which interested me from the blacksmith's viewpoint. I had a chance to see both electric and oxyacetylene welding work and to make comparisons.

And so I advise you all to attend the nearest automobile, truck or tractor show this season and keep up with progress.

The Holiday Season

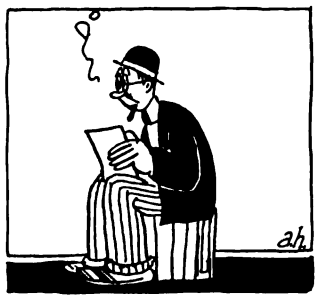
CHRISTMAS—the day so dear to the hearts of children and grown-ups, looked forward to for months—will be here in a few days. It will be the signal for many smiths to lay aside their every day clothes and assume the garb of Santa Claus to cheer some little miss or master.

This year has been a hard one for most of us, it has been a year of sacrifice and denial of the little pleasures that go to make life less drab. Things have just begun to pick up, and all of us are hoping, and with more encouragement than heretofore, that the depression which settled over everything this year will lift entirely next year.

Therefore, let us begin by trying to make this Christmas a pleasanter, happier and merrier one. Let us have more of the old-fashioned fun which we had in years gone by.

Each Christmas, for more than two score years, the BLACHSMITH AND WHEEELWRIGHT has printed its holiday wishes for its readers just before Christmas. That this year may be no different in this respect than others, the publishers of this magazine send their heartiest wishes to all their readers for the most joyous Christmas they have known, and for the Happiest and most Prosperous of New Years!

When O'Reilley Reminisces—



FRIEND O'Reilley was propped back in his corner, near the washstand, sitting on a much abused chair, when I found him with the idea of getting a story from his wise old brain. I have been seeing quite a bit of him since he gave me the one about car washing, which you will remember was in the July issue. Evidently O'Reilley still remembers this story as is evidenced by his greeting.

"I'll be up to your office and put a bit of 'ell into your artist next week if you let him print my name with only one L in it agin," remarked O'Reilley, as he pushed forward a box for me to sit upon. (Our artist, be it remarked, is always getting me into trouble. In July he left one of the "L's" out of O'Reilley's name and O'Reilley won't let the matter rest.)

"An' I'll give ye another tip, ye can tell that same artist, with me best compliments, that if he draws another picture of me and my family, he can add another face, makin' nine, all told."

Having complimented O'Reilley upon his patriotism and inquired solicitously after the family, I asked him what he could tell me about cars in general, some good suggestions for a story. I can't reproduce his brogue, so I won't even try, except where it seems necessary.

O'Reilley Makes Ready

Friend O'R filled up his pipe and when it had started to produce sufficient smoke for satisfaction, tilted his chair at a still more alarming angle and pointed his finger at my nose. Now there is something *convincing* about that finger, when pointed directly at one's nose; it makes me think of one of those sawed off shotguns and I'm always worried for fear that it might explode. O'Reilley knows this and when he wants to emphasize something important he wiggles it up and down just as though it were a Colt automatic in full swing.

"Ye can tell 'em from me," he said, wiggling his finger violently, "that the wisest of 'em are the biggest fools. The more they know, the foolisher they get when it comes to running ortomobeels." (I spell it just as he said it.)

"Fellow in here only yesterday, twelve cylinders, tortoise shell glasses, limousine body with orkids in it, high forehead and big nose, said he was efficiency expert over at the factory and looked it, said that the car was all to the merry except that one of the cylinders wouldn't work. Said that he had gone all over the machine in his most systematic way and knew that everything was O. K. but still that cylinder wouldn't go. Wanted us to make a 12 cylinder car out of it, as nature intended.

"One of our mechanics puttered around for the best part of an hour and couldn't find anything wrong. I guess everyone in the shop finally took a whack at it, including the boss, but they couldn't seem to find that missing cylinder.

"While they were standing around gassing about the puzzle, I kinder wandered over to the car to see if I couldn't show them a thing or two. You remember when I told you about washing a car, how you must keep the water away from the wiring? Well, I thought mebbe water might be causing the trouble, and that's what I looked for. I says to myself that mebbe a drop of water had worked inside the tube which carries six of

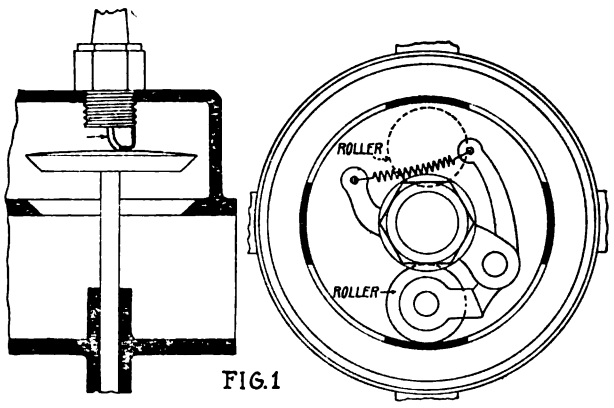


FIG.1

At Left, How the Spark Plug Electrode Was Bent by the Valve; At Right, What Happened When the Timer Spring Weakened

the spark plug wires and was shorting out one of the wires. Mebbe the missing cylinder wire was on the bottom and so was the only one which was shorted.

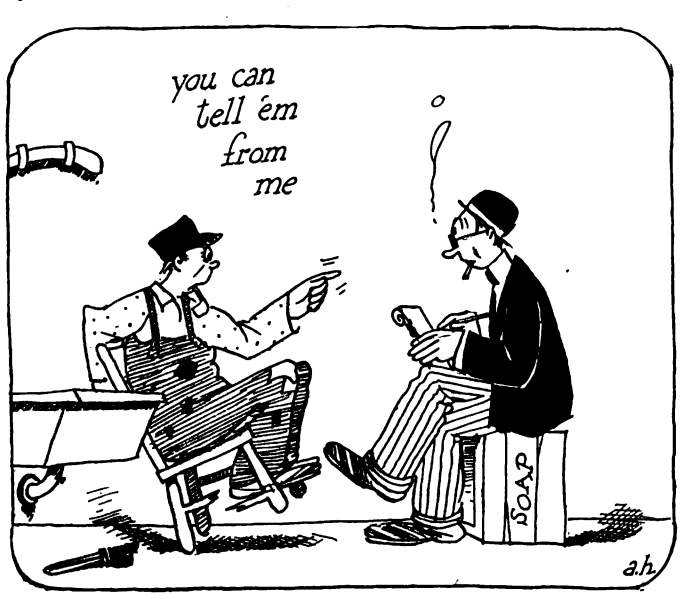
"And so, while no one was looking, I yanked the wire out of the tube and then connected it with the proper plug again. The boss thought he would give her one more trial before he quit and started her up. Go? Say, that engine ran as smooth as a clock without a single miss, so it was up to me to play the shrinking violet and tell them what the trouble had been.

"We looked over the wire carefully and it seemed to be all right. It would carry the current all right, most of the time, but when we put it against the tube or the engine, then it wouldn't always work. One of the boys split the insulation open with a sharp knife and found that the rubber had rotted away at one point, but the covering seemed all O. K. We doped out that the spark would short to the tube rather than jump across the plug when the engine was running.

When Everything Seems All Right

"And I guess that this will make a good story for you; tell the boys about troubles in a car when everything *seems* to be all right. There's always a reason why an engine stops but it's the divil's own job, sometimes, to find that reason if everything looks all right."

With this introduction we will listen to the rest of O'Reilley's hints. His garage is a busy one and O'Reilley has an absorbing mind, much like the sponges which he uses for washing cars. Possibly you are, or have been, worried about some trouble with your car; if so read on, maybe O'Reilley has solved your problem for you. In some cases we have seen fit to illustrate the subject and have added to O'Reilley's discourse the reference figures.



"The Boss owns a dandy little racing car," explained O'Reilley, "and he had the boys in the shop build it from a stock model that wasn't intended to run more than 60 miles an hour. They put in a larger cam-shaft; counter-balanced the crankshaft; re-bored the cylinders and put in larger valves after increasing the size of the parts and seats. The day that they finished the job we held a regular picnic around here and the Boss had his new car christened with a bottle of wine, though I'll say it was a shame to waste the stuff.

"When all was ready the Boss pushed down on the starter pedal and the thing commenced to churn but never a chug did it give. They cranked the car from the front when the battery gave out and it wasn't until ever last man in the shop had spent a day on her that they found the trouble. And you'd never guess what the trouble was! They found a good spark at the plugs and the engine was getting the gas and by all rules the thing should have run, but it didn't. They put in a new set of plugs, and never a puff could they get.

"Well, to bare the little secret, I'll tell you. The spark plugs were located directly over the side of the intake valves and when they put in the oversize valves, with an extra high lift, the valves would hit the center electrodes of the plugs and bend them just enough to short circuit them or spoil them. And when you put in a new set of spark plugs you don't expect to find them all busted before the engine starts, now do you?" (See Fig. 1 at A.)

"'Twas only last week that one of the boys, who knows the game pretty well, called us on the 'phone to ask for help. We had just had his car in the shop for a few repairs and to save time for him, charged the battery. He came for the car late in the afternoon and we jollied him a bit because he was taking the Boss's daughter out for a ride and to a dance. They got to the dance all right and he parked the car out front but when he started for home, along about midnight he couldn't even turn on the lights. At first he thought that someone was playing a joke on him and had "fixed" the wiring, but he checked every connection and wire over as well as he could, with only a couple of boxes of matches to furnish the light. Along

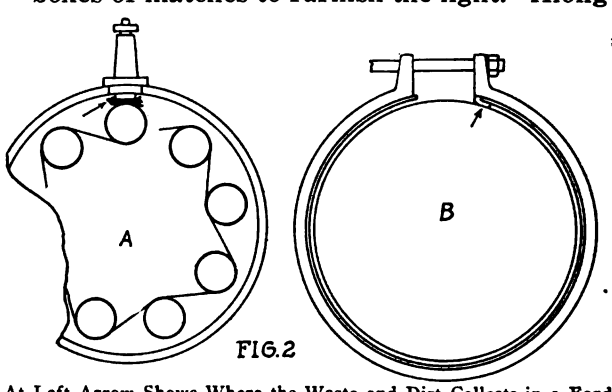


FIG.2

At Left Arrow Shows Where the Waste and Dirt Collects in a Ford Magneto; At Right the Turned Over Lining Which Ran the Ford Backward

about one o'clock he called our night man on the 'phone and asked for help. The night man went out in a car for the young lady but wouldn't take him back to town, told him to walk and air his brain, then mebbe he would find the trouble before morning.

"I guess the walk didn't help, at any rate we had to go out to the town club to fix the car. What was the trouble? Nothing much except that the battery terminal had worked loose on the post just enough to permit the vaseline, which we use to coat the terminals with, to work between the post and the terminal. This formed a good insulator. As long as the car was running, the generator kept the current up but when the engine stopped the vaseline soon worked over the connecting spot." (See Fig. 3 at B.)

"Some people say that seeing is believing, but I don't agree with them. For instance, if I should see a purple elephant, with pink ears and a celluloid collar around his neck I wouldn't necessarily believe my eyes, but I'd try to think of what I had eaten or drunk

a few hours previously. It's the same way with an automobile, you mustn's believe all you see, but you must use your judgment and other senses as well. Even if a connection *looks* all right, try it with your fingers to be sure.

"And this put me in mind of the trouble we had with a closed car last Spring. The engine ran fine until the car came to a right-hand corner, then it would skip or stop altogether unless the car had speed enough to make the turn. A left turn wouldn't bother it a bit. That car had what the ladies would term 'temperament' and if I get the meaning of the word, entirely, *I'd* say it *had*, because it caused plenty of *temper* around here. It

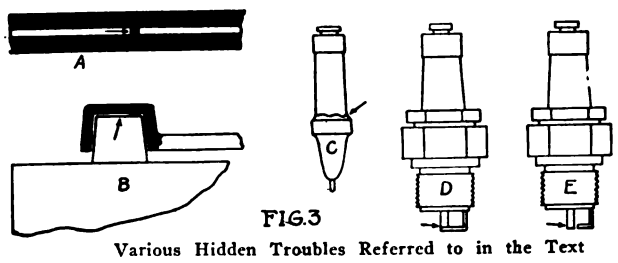


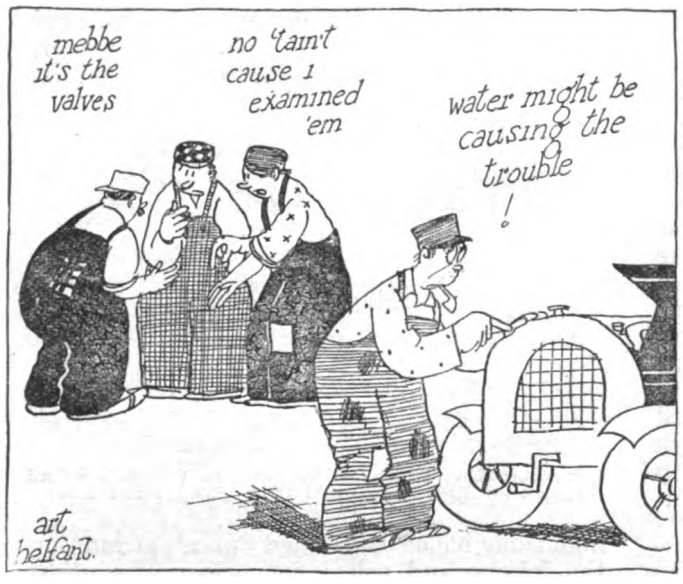
FIG.3
Various Hidden Troubles Referred to in the Text

got so finally that the owner wouldn't go any place, so they say, unless he could get to it by always going straight ahead or turning to the left. We put the Summer body on the chassis in place of the closed one and didn't have any more trouble.

What Was Wrong With the Wiring?

"During our spare time, off and on, we all looked over the wiring on the closed body (that's it over in the corner there)."

O'Reilley eased himself out of his chair and took me over to look at the "temperamental" body. Pointing to a wire which ran from the junction box, along one of the sills and up to the junction box behind the dash he told me that there was where they finally located the trouble. The wire appeared to be perfect but a bright mechanic had finally found, by testing every fraction of an inch with his fingers, that the wire was broken inside the insulation. (Fig. 3 at A.) I suppose that the wire, under normal conditions, would remain connected but the turning of the car to the right would put a strain upon it and pull the ends apart, thus cutting off the ignition current.



When we had returned to our respective seats again O'Reilley with various chuckles recalled what he termed a "steady customer."

"We had one fellow, he said, "who was always getting into trouble and one day he came in to fuss around his flivver. He puttered around the thing for a while and finally started off. We watched him go up the road," (one can see for nearly a mile up the street). "He drove along about 300 yards and his car stopped. He cranked and cranked and finally she started again and ran about the same distance, then stopped. He kept this up until he was out of sight, 300 yards, then a spell of cranking and then 300 yards more or less.

"In about half an hour one of the boys spied his car in his distance coming back, 300 yards at a time and then a spell of exercise and profanity. When he had finally cranked the thing back to the garage he was ready for the hospital. Wonder of it was that he hadn't drowned because the sweat was running down so fast that he looked like the lady under the fountain in Central Park.

"The gentleman had put in a new set of spark plugs which was all right, but they were so fixed that the center electrode stood directly over the wire from the side. When the engine was heated the electrode would expand and cut the gap down until the spark was not fat enough to ignite the mixture." (See Fig. 3 at D.)

"We didn't find this trouble right off because the plugs seemed all right when they were cool. But some bright guy in our establishment put two and two together and reasoned out the answer. If the engine ran when cool and didn't stop until it was hot, and then wouldn't run until it was reasonably cool again, then it must be something to do with the heat. He checked over everything else and tried different plugs which cured the trouble. Plugs should be adjusted so that the expansion of the electrode will carry them past each other rather than towards each other." (Fig. 3-E.)

"And now that we are on the subject of plugs I might mention a fact that often gets past the ordinary driver. If you will take the poreclain center from a plug you will find that it will stay in one piece, even if it is broken, because the nut on the end of the center electrode holds it together. If the poreclain is cracked, as it often is even if you can't see the crack, the best way to locate the crack is to take off the nut on the upper end and give a slight pull to the porcelain. The insulation usually cracks just above the largest part where it is held into the jacket." (Fig. 3-C.)

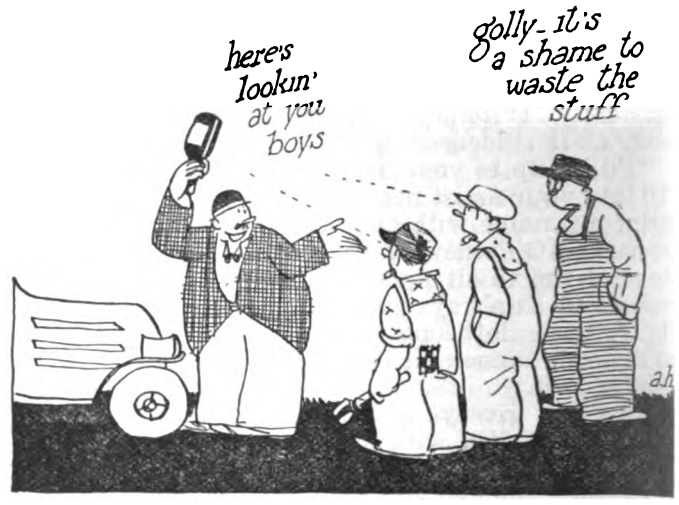
"That same fellow I was telling you about, who has so much trouble, put on a set of spark intensifiers about a year ago. First off, they seemed to help the engine, at any rate the engine ran better with them than it did without them. He kept them on the car without looking at them until a short time ago. At that time he complained that he couldn't start the engine without spinning it for a minute or so. He isn't over strong and spinning a four cylinder Ford car for a minute at a time is a man-sized job. One of our men helped the poor fellow out by showing him that the points in the spark intensifiers had burned off so that the emergency gap was too wide. A pair of pliers and a screwdriver adjusted the points and now he doesn't spin the engine.

"Someone says that a Ford car is something like an old fashioned hat rack,—there's always a place to hang something on. I don't know about this statement, but I do know that there is always a chance for trouble with Ford magnetos that wouldn't give current. Mostly we find that bits of waste, dirt or ravelings from the brake bands, work between the magneto outlet plug and the plate on the top of the coils." (Fig. 2-A.) "I'd advise every Ford owner to have a set of dry cells in his car all of the time. If his magneto goes wrong he can run on the cells and when he gets time to remove the magneto terminal plug he can do so and clean it off.

"Another trouble we have with Ford cars is in the timer. I remember one Ford car that caused us a few nights loss of sleep. It would run on two cylinders only, at low speeds, but hit on all four at high speed. Naturally we though that the trouble was in the carburetor but we finally found that the timer spring was weak. The roller arm would contact against the two lower segments, but when it rolled to the top it would fall away. At high speeds, though, the roller would throw against the contacts all around." (Fig. 2-B.)

"What was the funniest thing you ever saw along this line of idiosyncrasies?" I asked O'Reilley.

"Idio—an' what may that be? I ain't never heard tell about wan o' those idio-what-do-you-call-'ems before. Oh, yes, you mean cranky actions! Now I get you. Well,



let me think for a bit."

O'Reilley's though apparatus, at this point, seemed to need fumigating for he stoked up the old pipe and blew out a few huge puffs of smoke which reminded me strongly of a locomotive with a new shovel full of soft coal, both as to denseness and odor.

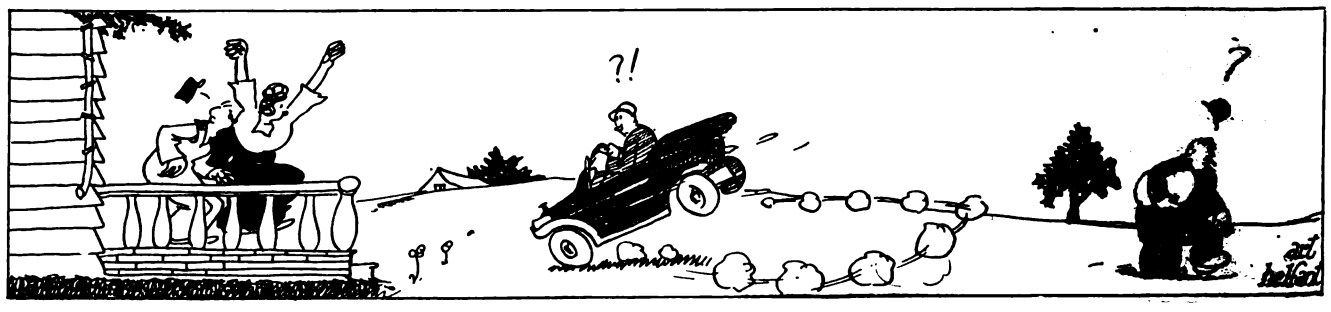
"Speakin' of funny things, did ye' ever see wan of those movin' pictures where they run the picture backwards and the automobile does the shimmy with its hind wheels in front?" I acknowledged the humor of the situation and O'Reilley continued: "Well, I seen one onct and it wasn't half as funny as the time when the thing actually happened before my two eyes.

O'Reilley's Brother-in-Law

"My brother-in-law, an' he's the funniest Irishman you ever saw, bought a 1914 flivver about a year ago and tinkered her into shape so that she would run most of the time. Wan night he came over to the house in the car to take us out for a ride, me and the missus.

"We were sittin' on the front steps when he came bumping up the street in fine style. I guess he wanted to show off a bit, for he waited until he got opposite the house and then he made a fine turn which landed him in front of our door. The flivver had hardly stopped when it began to back up again, trying to go back over the same way it came.

"He made the back turn as neatly as you please, but goin' faster every minute, he kept right on makin' turns until I lost count and then he managed to get the wheels straight. Right over our flower bed he came and missed our step by about six inches, going backwards all the while. Went around the corner of the house into the alley and brought up against the wall at the rear with a bang that you could hear for a mile. He started out of the alley again and was almost back to our flower bed before he finally managed to stop the engine.



"When he pulled the transsmission cover off, he found that a piece of the lining from the reverse drum had turned over and wedged between the drum and the band. Of course this locked the thing into reverse and that was why he made all of those pretty reverse curves." (Fig. 2-B.) "The missus and me could see how funny it was, but my brother-in-law said there wasn't anything funny in it at all."

And so I left O'reilly with full assurance that my artist would do justice to the family, both as to numbers and to habits.

OUR OWN REPAIR SHOP

(*Continued from Page* 9)

At the middle of the apron is located the rack and pinion locking devices for use when an automatic feed is required for turning. This lock works upon the rack and pinion only. The lever located at the right center of apron is for closing the split nut over the feed screw. This cannot be operated if the automatic feed is engaged.

Below, and in the lower right-hand corner is the lever for meshing the apron gears. This lever may be placed in either of three positions and when the rack and pinion is in operation the carriage will automatically move either to the left or right as desired. The gears are so arranged that they may be meshed without stopping the lathe.

The carriage, when used for turning work is moved either through the manually operated crank, or automatically by the apron gears and these latter are actuated through the rod located below the feed screw. The feed screw is not used except in screw cutting.

The lateral or cross carriage is operated by the crank at the top of the apron. This carriage also has an automatic drive and by pulling out a knoo at the side, the apron gears are meshed and the carriage moves laterally. The lateral movement of the carriage is reversible through the lever at the lower right-hand corner of the apron. Either the cross or longitudinal feeds may be operated automatically, singly or together.

Mounted on the lateral carriage is the compound carriage which carries the tool post. This carriage is fitted with a dial, which indicates in degrees, the angle of its position in relation to the lathe centers. The dial is graduated the full 360 degrees of the circle.

Both the lateral and compound carriage cranks are fitted with micrometer indicators reading to 1/1000 of an inch. The average mechanic would be able to set the compound carriage to 1/2000 of an inch and the lateral carriage to 1/4000 of an inch with a little practice. Both of the micrometer thimbles may be set to the zero point regardless of the carriage position. The tool post on this machine takes a lathe tool of 1/2 by 1 1/8 inches.

The cross carriage travels to the capacity of the machine and the compound carriage has a movement of 27/16 inches.

For screw cutting the lathe has a range of from 2 to 96 threads per inch, including 11 1/2. This range includes practically all of the American machine screw standards, stove bolts, S. A. E. and pipe threads. We understand that the manufacturers are prepared to furnish the machine for metric threads also.

The change gears are held by means of nuts and keys. Our lathe is provided with semi-quick dial by means of which three different threads may be cut with one set of change gears. Naturally the speed of the carriage can be varied through the same change gear mechanism. This gives a wide range of carriage feeds.

The rod feed for the carriage is so arranged that, by the setting of stops, the carriage may be automatically stopped at any point. A lever in the change gear box controls the direction of the carriage and screw feed. A chasing dial on the carriage, operated through the threads without stopping the lathe or reversing it.

The tail stock is of conventional design with calibration on the rear for normal taper work. A large and small face plate, steady rest and countershaft complete is the regular equipment.

The ten-inch chuck, the drill chuck and the lathe tools will be taken up in a later article of this series.

Repairing Tractor Valves

The Valves Are the Important Units in a Gas Engine, Yet the Stems Wear Rapidly

By David Baxter

THE blacksmith who is equipped with an oxy-acetylene welding outfit and a small lathe is in a position to work up a quite profitable line of business in the repairing of tractor valves. Nor does he need to stop at that for he can repair automobile and truck engine valves just as easily. Not only the welding on of new stems but dressing the heads either with or without building up new metal on the worn spots. With the welding torch he can fill carbon pits and scored places.

The valve has been called the heart of the tractor engine, no doubt truly. It is just as much the heart of any automotive engine. The tractor valve, however, probably needs repairs or replacement a great deal oftener than the others on account of the rending work the tractor is forced to do. What with plowing, planting, threshing, hauling, grinding, and numerous other arduous labors, is it any wonder a tractor engine has heart trouble?

Among many repairs the smithy can make on tractor valves the welding on of new stems is probably the typical example. And it is no doubt the simplest form of valve repairing, as far as the torch welder is concerned. Except that once in a while these valves are made of tungsten steel which is practically impossible to weld with any degree of real satisfaction. The tungsten variety can be welded all right but the weld is brittle and almost worthless. In fact it is sometimes so glassy brittle that it will break under a light blow. Probably the best way to repair them is by brazing.

The other common steel varieties are simple enough, once the welder grasps the idea, because he is not troubled with expansion and contraction as he is with so many

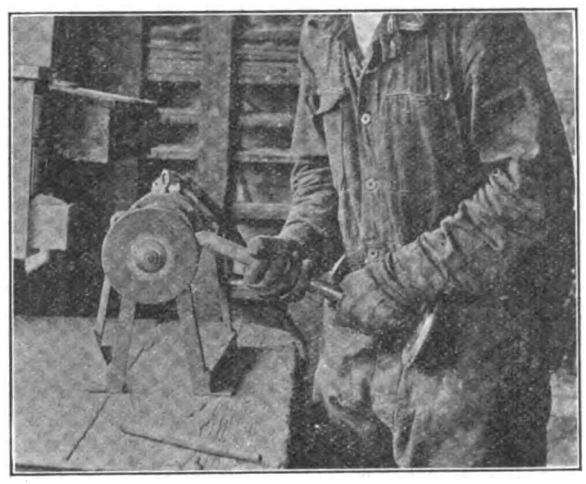


Fig. 1. Beveling Both Sides of the Valve Stem.

welding jobs. Nor is it so difficult to obtain a weld soft and clean enough to machine well, as it is if they are made of cast iron or bronze.

One of the greatest sources of profit in repairing valves lies in the fact that the smithy can nearly always use what he cuts off the larger stems to repair the smaller. That is to say, when he has to weld new stems on a set of valves, he saves the old ones to weld on a smaller set sometime. The owner seldom wants the old stems and is perfectly willing to give them to the blacksmith. Or the smithy may purchase them for a nominal sum.

In tractor or auto valve repairing therefore, the blacksmith will do well to preserve all the old valve stems he gets. Even though they can not be welded on other valves the small stems make the best of filler because they are nearly always sure to be the same metal as the valve.

If the torch operator is at all systematic he can repair the worn stems at about the cost of new ones, so his customers will not insist on sending for new valves.

But let us take a specific example of tractor valve repairing and see how the process works out in detail. When the blacksmith has learned to do the job illustrated in the accompanying photos he should be able to handle any of them where the repairing consists of welding on a new stem.

The job shown consisted of welding on new key ends as the others were not giving satisfaction. To do this it was necessary to cut off about three inches of the old stems and weld on a new piece, in which to machine the new slots. The pieces to be welded on had to be a fraction larger than the stems to provide stock metal for machining to true size.

The first step in the operation was to cut off the old piece and prepare the stem for welding. This was accomplished by grinding a wide V-shaped notch on two sides of the stem. By grinding the notches accurately opposite each other so they would meet in the center of the stem, the welder made one grinding do double duty; removing the defective part and beveling the cut end of the stem. These notches were cut quite easily on the square corner of the emery wheel.

After the ends were removed from all three stems in this manner, the beveled ends of the stems were made more wedge shape by grinding on the emery wheel as is clearly indicated in Fig. 1. Then the new parts to be welded on were ground wedge shape in the same way. These wedges were ground approximately alike so that when the new section was placed in contact with the old stem, the beveling formed a double-V, as indicated in Fig 2 The grooving is shown on opposite sides of the valve stem.

In making the new stems, pieces of new shafting were cut to the desired length with a steel saw. This cutting was carefully attended so as to have the end perfectly true to avoid machining afterwards. The ends opposite from the machined end were ground wedge shape the same as the old stem.

This beveling of both parts to make a double-v groove was for the purpose of permitting the operator to weld to the heart of the stem. That is, so he could start at the center and work outward. Thus insuring a solid weld throughout. When an attempt is made to weld such jobs without grooving there is considerable danger of leaving poorly fused spots in the weld; also danger of oxidized portions, due to forcing the flame into the metal deep enough to weld it clear through. Where grooves are cut the welder can fuse from top to bottom in thin layers and thus be sure each layer is thoroughly melted into the preceding one. He can see just what he is doing from start to finish.

The two-groove idea is no doubt better because it minimizes distortion. Or more properly, it balances or equalizes the distortion by supplying two contractions. The cooling weld on each side of the stem act against each other to keep the welded stem fairly straight. While if the weld is made with but one groove the contraction of this single weld tends to pull or warp the stem out of line more or less.

The grinding in this instance left the groove bright and bare so there was no need to clean the weld, as is so often the case in some welds where dirt or grease adheres

to the adjoining metal. This omission was an added advantage as any foreign matter often is the cause of pin holes or slag spots in the finished weld. This job had to be particularly free from these defects. In other words the weld had to be close grained and clean to give good service in the valve stem.

Using the V Blocks

After grooving the next step was arranging the valves for welding. This was done by placing duplicate V-blocks upon the leveling plate of the welding table, being careful that they were level and exactly in line. The top of the table and the bottom of both blocks were brushed to make sure nothing would throw them out of line. Then the valve section was placed in one block and the piece to be welded on in the other. The blocks were then spaced so the weld would come in between them as shown in Fig. 3. The parts to be welded were arranged so one of the grooves would come exactly upward, with the wedged ends just touching each other. This was to permit the operator to apply the weld metal in a horizontal position which is much easier than a slanting or vertical weld as there is then no tendency on the part of the molten metal to overflow any portion of the groove that may not be prepared to receive it. In a tilted or verticle weld the filler metal tends to flow over faster in parts of the groove which are not molten enough to join with it.

The V-blocks, which are almost indispensable in any repair shop, were for the double purpose of holding the stem in alignment and preventing it from rolling unexpectedly. Also to permit the welder to turn the stem easily without danger of throwing it out of line. It being necessary to turn the job several times before completing the weld.

When these arrangements were complete the torch was lighted and adjusted to a strictly neutral flame. A mild steel rod was selected as filling material. No flux was used as it is unnecessary on steel welds.

A neutral flame was selected as it carried neither element in excess. An excess, even slight, of oxygen in the welding flame for steel jobs as light as this one is particularly dangerous on account of the natural tendency of steel to oxidize. If the flame carries more oxygen than is consumed by the combustion of the flame it will immediately attack the steel and turn it to oxide; literally

Fig. 2. Showing the Double Grooving.

burn it up. The welder can scarcely ever weld fast enough to prevent some of the steel from burning. And when bits of oxide or burned metal get trapped in the weld they are certain to leave it brittle or porous. Then too, an oxygen flame is harder to manipulate. It blows harder and makes the molten metal difficult to control. The presence of oxygen is detected by the sparks that fly from the melting weld. To the novice there is always a lot of sparks but when they increase to a perfect shower he will know the weld is being burned almost beyond restoration. Even when the sparks increase but slightly and fly farther with a miniature explosion at the end of their flight, the operator had best attend to his flame; test it to see if it doesn't carry too much oxygen.

On the other hand, even a slight excess of acetylene gas in the welding flame is bad. For this excess may be injected into the molten steel to harden it and render it brittle. The acetylene is so rich in carbon, and it is this element that causes the hardening action. Therefore the welder should be sure his flame is adjusted so the carbon and oxygen consume each other so to speak.

In this instance the neutral flame was brought close to the bottom of the V-groove, where it was played back and forth until the bottom of the groove turned bright red. Then the tip of the flame was concentrated in tiny circles over one spot in the groove bottom. Here the edges were melted down and flowed together. As this was accomplished the flame was gradually working along the bottom of the groove, melting and flowing the edges of the groove together. The entire length of the groove bottom was melted and flowed together thus, without using the filler rod; which had in the meantime been brought close, so it would be heating.

The Welding Flame

The tip of the white cone of flame barely licking the metal, the flame was again concentrated at one end of the groove. Here it swung in tiny arcs, back and forth across about a quarter inch of the groove bottom. When this section commenced to melt the red hot filler rod was placed in contact with it. Then the flame, which was continually in motion, played over both the rod and groove, to melt a drop of the filler into the melting groove; great care was taken to see that the sloping sides as well as the bottom of the groove were melted when the filler was added.

Then this process was worked along the groove until a layer of metal was added its full length. Then the process was doubled back over this layer to place another on top of it in the same manner. Again being careful to melt down a portion of the sloping walls of the groove when adding the new metal.

At the completion of the second layer in the first groove, the valve stem was quickly revolved to bring the other groove uppermost. Then the bottom of this groove was attacked and melted level in the same manner as the first. Only this time the operator had to be careful to melt and scrape out the partly oxidized metal, which had seeped through from the first weld.

After this groove was melted level at the bottom a layer of new metal was applied. Followed by a second and third layer, which filled the groove about half its depth. And at this point the valve was again revolved to bring the first weld upward. Several more layers were then deposited to bring the weld to within a third of the top. Each layer being gradually shortened to conform to the shape of the stem.

Then the valve was once more turned and the second half of the weld completely filled. And again the valve was turned to enable the welder to finish the first groove. Thus the entire weld was made in a series of layers and alternate revolving of the stem. Then the valve was slowly revolved while the flame played over the whole weld to give it a more solid, pleasing appearance. And to make sure the edges were connected; by allowing the heat to soak in deeply. High spots were melted down and blown toward lower spots. Slag portions were remelted and scraped aside with the filler rod. This after-finishing insured a homogeneous mass of new metal and stem metal.

The other two valves were then treated the same in rapid succession. For it is by making the operations continuous that profit is made in valve welding. No attempt was made to slow-cool or anneal the welds, but the valves were taken to the lathe as soon as they could be handled.

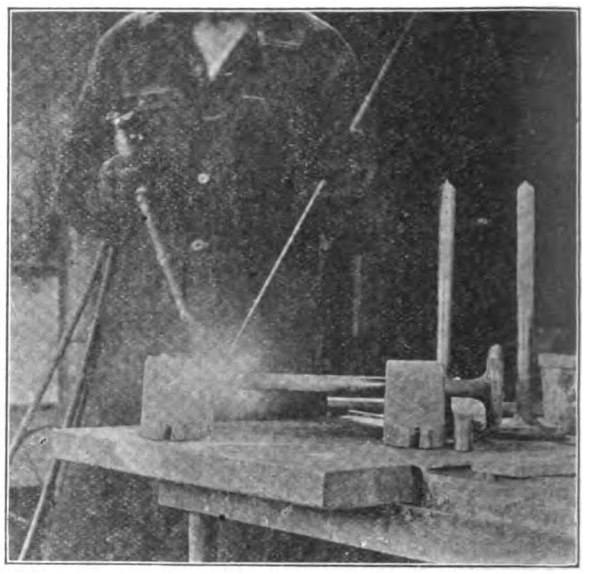


Fig. 3. The V Block Arrangement and the Welding Operation.

Whole new stems are added in the same manner. Worn places, scored stems, pitted stems and seats, are built up in practically the way described above, except that the vicinity of each weld must be cleaned if it is not ground out.

HOW TO MAKE PIPE BUSHINGS OUT OF STANDARD PIPE

By W. F. Schaphorst

IT IS a good thing to know that bushings can be made out of standard pipe. Many pipe fitters don't know that it can be done. Or, if they know that it can be done they don't know the correct size of drill to use for tapping. I have always known that it can be done and have occasionally made bushings out of pipe, but each time I found it necessary to look first into my handbook for the drill size to use and that is so much trouble that it is frequently easier to go to the store and buy a new bushing.

Recently, though, it has been very difficult to buy bushings in stores on account of shortage of all pipe fittings, hence I feel that the following information should be of much value. I have collected all the data together for all bushings that can be made out of ordinary sizes of extra heavy and double extra heavy piping.

To bush from ¼ inch to ⅛ inch, for example, get a piece of ¼ inch extra heavy pipe sufficiently long for cutting the outside thread. Then cut the end off to the desired length, drill or ream with a 21/64 inch drill (diameter of drill 0.328 inch) and then tap with a ⅛ inch pipe tap. That's all there is to it.

The table enclosed tells the complete story for all ordinary sizes: Note that in one case, ⅜ inch to ¼ inch, the internal diameter of ⅜ inch, extra heavy pipe is such that no drilling is necessary.

Also note that in bushing from ½ inch to ⅜ inch either extra heavy or double extra heavy piping can be used.

To Bush From	Use This Size of Pipe	Use This Size drill or reamer
¼" to ⅛"	¼" Extra Heavy	21/64" Drill = 0.328"
⅜" to ¼"	⅜" " "	None
½" to ⅛"	½" Double Extra Heavy	21/64" Drill = 0.328"
½" to ¼"	½" " " "	27/64" Drill = 0.422"
½" to ⅜"	½" " " "	9/16" Drill = 0.562"
½" to ⅜"	½" Extra Heavy	9/16" Drill = 0.562"
¾" to ⅜"	¾" Double Extra Heavy	9/16" Drill = 0.562"
¾" to ½"	¾" " " "	11/16" Drill = 0.688"
1" to ¾"	1" " " "	29/32" Drill = 0.907"
1¼" to 1"	1¼" " " "	1⅛" Drill = 1.125"
1½" to 1"	1½" " " "	1⅛" Drill = 1.125"
1½" to 1¼"	1½" " " "	1-15/32" Drill = 1.468"
2" to 1½"	2" " " "	1-23/32" Drill = 1.72"
2½" to 2"	2½" " " "	2-3/16" Drill = 2.187"
3" to 2½"	3" " " "	2-9/16" Drill = 2.562"
3½" to 3"	3½" " " "	3-3/16" Drill = 3.187"
4" to 3½"	4" " " "	3-11/16" Drill = 3.688"
4½" to 4"	4½" " " "	4-3/16" Drill = 4.187"

E-Z Welding Compound

The Anti-Borax Compound Co. of Fort Wayne, Ind. have made an offer, through their jobbers, to refund the money to any user of E-Z or Crescent welding compounds if they do not give perfect results.

There are many features of these compounds which make them worthy of investigation.

This company agrees to send free samples to all who write to them in order that they may fully test their product.

Roto Announcement

The Rosewater Electric Company recently announced a change in sales policy which will probably be interesting to our readers. In future they will sell direct only when the jobber cannot or will not sell the Roto electric blower which they manufacture.

Readers who are considering the purchase of one of these excellent devices will do well to get in touch with the jobber in their territory, and if they do not know who he is, the manufacturers, who are located at 5516 Kinsman Road, Cleveland, Ohio, will be glad to inform him.

Harvey Springs

The easy riding qualities of the Harvey Racine boltless Automobile Springs have undoubtedly helped to make them so very popular and this of course makes them easy to sell. Blacksmiths have found it very profitable to carry these springs and consider it a quick way to earn money.

They are manufactured by the Harvey Spring & Forging Co., 1115 17th St., Racine, Wis., and full particulars regarding their "sure turn-over" selling plan will be gladly given to all those inquiring about it.

Star Steel Shapes

It will undoubtedly pay blacksmiths to investigate the very complete line of steel shapes which the Star Mfg. Co., of Carpentersville, Ill., is selling under the name of "Star Steel Shapes." They are made from soft center, solid cast or crucible steel and are widely used.

Many blacksmiths can turn out good work, but for some of them it is a painstaking, laborious process, but the manufacturers of the Star Steel Shapes claim that with the use of their product, the smith is enabled to turn out good work quickly and with ease.

Burden Horse Shoes

Nearly every blacksmith who is familiar with the Burden Horse shoes manufactured by the Burden Iron Co. of Troy, New York, uses and speaks well of them, but there may some who do not know the excellent qualities of these shoes.

To them we would recommend that they communicate with this concern and receive full information about the product.

Miller Products

The products of Chas. E. Miller Anderson Rubber Works, 1420 Meridian St., Anderson, Ind., should be of especial interest to blacksmiths. Their vulcanizers, retread and rebuilding outfits deserve places in smith shops where they can easily prove that they will make money for them.

This company publishes a 108 page catalog covering their products which every blacksmith should send for and keep for ready reference.

Columbia Calipers

Up-to-date blacksmiths realize that the hit-or-miss work of former years is no longer permissible, and consequently turn to some accurate method of proving their work.

The Columbia Calipers manufactured by the Columbia Caliper Co. of Marietta, Pa., have proved particularly helpful in this respect and are being used by many workers.

This company is the successor of E. G. Smith Co.

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